

APPENDICES

TO THE

1

REPORT ON THE PLAGUE ADMINISTRATION

OF THE

MADRAS PRESIDENCY

BY

J. P. BEDFORD, I.C.S.,
OFFICER ON SPECIAL PLAGUE DUTY.

2008

"Mice that mar the land." (I. Samuel, vi, 5.)

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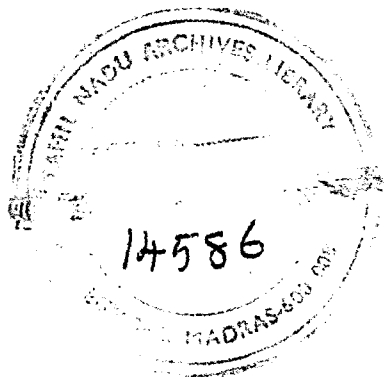
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APPENDICES.

APPENDIX I.

QUESTIONS RELATING TO MEASURES FOR SUPPRESSING PLAGUE.

- (A) Remedial (1) Disinfection.
(2) Inoculation.
(3) Destruction of rats.
(4) Plague Hospitals.
- (B) Preventive (1) Observation.
(2) The passport system.

QUESTIONS ON (A) (1).

- (a) Is increased attention necessary to disinfection?
(b) Are the arrangements for training the plague staff adequate?
(c) Should expenditure on disinfection be greater or less than it is at present?
(d) What is the absolute and relative value of desiccation by burning bratties, &c., desiccation by sun-light and of the chief chemical disinfectants now in use?
(d₍₁₎) What combination of disinfective measures do you recommend for ordinary use (I) in towns; (II) in rural tracts?
(e) To what extent can the re-erudescence of plague after an interval be attributed to the revivification of plague germs? Do you think that this is ever or often the cause of plague re-appearing in a village? Have you any means of gauging with some degree of probability the interval within which this revivification can take place?
(f) Are the disinfectants, apparatus, &c., now supplied to the plague staff, of good quality and suitable for the purpose?
(f₍₁₎) Are disinfectants readily obtainable in sufficient quantities at short notice?
(g) Is the work of disinfecting conscientiously, intelligently and efficiently carried out (I) in towns; (II) in villages?
(h) Are villagers themselves getting to understand something about disinfection?
(i) What efforts are being made to train or advise them in the matters?
(j) Would it be expedient to endeavour to gradually make them more independent of official help in this matter?
(k) What suggestions have you, if any, by which disinfection could be made (I) more effective; (II) cheaper, with no material loss of efficiency; (III) more popular?

QUESTIONS ON (A) (2).

- (a) Are the arrangements now in force regarding inoculation adequate and proper (I) in regard to persuading people to be inoculated; (II) in regard to the performance of the operation? What improvements would you suggest?
(b) Should any inducements by relaxation of Plague rules continue to be given to inoculated persons?
(c) To what extent can an inoculated person be held to be rendered harmless to his neighbours in regard to infection?
(d) So far as your experience goes, to what extent do you think we should persuade people to be inoculated, having regard to (I) the degree of protection afforded; (II) the possible risks involved in the process?

QUESTIONS ON (A) (3).

- (a) Is sufficient attention being paid to this means of combating plague?
(b) Should further attention be paid to the matter (I) as regards advice; (II) as regards inducements?
(c) Do you think that rats exercise an important influence in spreading plague at or after the commencement of an outbreak?
(d) Are any other animals or insects, in your opinion, operative in the same way? Do any practical remedies suggest themselves?

QUESTIONS ON (A) (4).

- (a) Are plague hospitals popular or unpopular in your district?
(b) Can you suggest any method by which they could be made more popular?
(c) To what extent do people avail themselves of the privilege of building private hospitals?

APPENDIX I.

QUESTIONS ON (B) (1).

- (a) To what extent has the observation staff succeeded in detecting and suppressing plague?
- (b) Could expenditure under this head be reduced without serious loss of efficiency? If so, in what particulars? Please let me have your views on this point in some detail. Plague staffs should presumably have some relation to population, extent, difficulty of travelling, &c. Do you think that the plague staffs are satisfactorily and economically distributed from this point of view?
- (c) What is the proper pay for the observation and preventive staff? Please let me know your views in some detail on this point also and favour me with your detailed opinions as to how far the salary and allowances of all or any of the different classes of officers could be curtailed without serious loss of efficiency. Is a Pony allowance always necessary? Is an extra allowance during plague a good thing?
- (d) Is an observation staff useful during the hot months (I) as a means of detecting possible "dropping cases"; (II) as a trained nucleus for a preventive staff in the event of plague breaking out?
- (e) Are any improvements in the training of the observation and preventive staff practicable and desirable? Would the training of the staff by the District Medical and Sanitary Officer be an improvement on the present system? For how long should they be trained and how?
- (f) What is the extent of European supervision over the observation and preventive staffs?
- (g) Do the staff work conscientiously and efficiently?
- (h) Do they exercise a favourable influence on public opinion and sentiment?
- (i) Please let me have any suggestions that occur to you for the improvement of the efficiency of the observation and preventive staff.

IN RURAL TRACTS.—[Questions (j) to (s)].

- (j) Can village officers be depended on as a means of detecting plague cases?
- (k) To what extent are Circle Inspectors useful as a stimulus to the Village Officers?
- (l) Have the Circle Inspectors any means of obtaining information, apart from Village Officers?
- (m) Is there any reason to suppose that the observation and preventive staffs exercise a bad influence in the way of terrorism, favouritism, &c.?
- (n) Is the European supervision sufficient to materially check or mitigate this?
- (o) To what extent do villagers understand the danger of infection by means of contact with outsiders and their cloths, &c.?
- (p) Could villagers be trusted of their own motion to keep out outsiders, merchandize and baggage from infected villages?
- (q) Is it desirable that such an attitude on their part should be encouraged? Could more be done than is being done in this direction?
- (r) Would a system of village patrol with this object in view be desirable? Should it be officially worked or left to the villagers?
- (s) Do you think that in rural tracts the large amount of money spent on the staffs could and should be reduced? If so, in what direction?

QUESTIONS ON (B) (2).

- (a) Are any improvements called for in the passport system? If so, what?
- (b) Is any improvement possible in the arrangements to prevent fraudulent re-booking of passengers?
- (c) Is any improvement possible in the direction of securing and registering correct addresses?

ADDITIONAL QUESTIONS.

GROUP (A) (1).

- (c_(i)) Could the plague bacillus flourish in the floor of a hut (or under any other usually existing conditions) without the support of a living organism? For how long?
- (e) To what extent is the examination and desiccation of imported grain of use?

GROUP (A) (2).

- (e) To what extent has inoculation been practised in your district? Please let me have the figures, as far as they are available.

GROUP (A) (3).

- (d_(i)) What are your views as to fleas carrying infection (I) from rat to rat, (II) from rats to human beings? Has your experience furnished you with any facts bearing on this matter?

- (f) Do you know of any cases in which infection has been spread by rats *spontaneously* (i.e., without the intervention of human agency). How far has the infection spread in this way in any one instance?

GROUP (B) (1).

- (i_(i)) Do the Plague staff insist on seeing dead bodies in cases in which there is no certificate of the cause of death? If so, whose certificate is accepted?
- (i_(ii)) Does the law, as it exists, give the authorities sufficient discretion? Is any change in the Regulations desirable?
- (t) Would a system of rewards be desirable (I) to private persons, (II) to Native Medical Practitioners, for reporting cases of plague? How much would suffice?
- (u) Is the co-operation and assistance of Native Doctors being obtained in your district? Is action in this direction desirable? Should Native Doctors be instructed in the diagnosis of plague?

GROUP (B) (3) PLAGUE POLICE.

- (a) How are the Police controlled? How do they do their work? Have you any improvements to suggest in this matter?
- (b) Could their number be reduced with due regard to efficiency?
- (c) On what duties are they engaged?

APPENDIX II.

STATEMENT OF TOUR OF SPECIAL PLAGUE OFFICER.

June 1904.

Saturday	4	..	..	..	Ootacamund to Coonoor.
Sunday	5	..	..	..	Coonoor and Ilitorai.
Monday	6	..	..	..	Coonoor to Ootacamund.
Tuesday	7	..	..	..	Ootacamund.
Wednesday	8	..	..	..	Ootacamund.
Thursday	9	..	..	..	Ootacamund.
Friday	10	..	..	..	Ootacamund.
Saturday	11	..	..	..	Ootacamund.
Sunday	12	..	..	..	Ootacamund to Méttupálaiyam and Coimbatore.
Monday	13	..	..	..	Coimbatore.
Tuesday	14	..	..	..	Coimbatore, Periyachettipalayam.
Wednesday	15	..	..	..	Coimbatore.
Thursday	16	..	..	..	Coimbatore to Erode.
Friday	17	..	..	..	Erode.
Saturday	18	..	..	..	Erode to Salem and thence to Tiruppattúr.
Sunday	19	..	..	..	Tiruppattúr to Jalarpet and back.
Monday	20	..	..	..	Tiruppattúr.
Tuesday	21	..	..	..	Tiruppattúr.
Wednesday	22	..	..	..	Tiruppattúr to Bangalore.
Thursday	23	..	..	..	Bangalore.
Friday	24	..	..	..	Bangalore.
Saturday	25	..	..	..	Bangalore to Hosúr and back.
Sunday	26	..	..	..	Bangalore to Champion (Kolar) and back.
Monday	27	..	..	..	Bangalore City.
Tuesday	28	..	..	..	Bangalore to Vellore.
Wednesday	29	..	..	..	Vellore.
Thursday	30	..	..	..	Vellore to Chittoor.

July 1904.

Friday	1	..	..	..	Chittoor.
Saturday	2	..	..	..	Chittoor.
Sunday	3	..	..	..	Chittoor to Arkonam.
Monday	4	..	..	..	Arkonam.
Tuesday	5	..	..	..	Arkonam.
Wednesday	6	..	..	..	Arkonam to Bellary.
Thursday	7	..	..	..	Bellary, Kupagallu.
Friday	8	..	..	..	Bellary.
Saturday	9	..	..	..	Bellary to Hospet.
Sunday	10	..	..	..	Hospet.
Monday	11	..	..	..	Hospet to Guntakal.
Tuesday	12	..	..	..	Guntakal to Adóni and back.
Wednesday	13	..	..	..	Guntakal.
Thursday	14	..	..	..	Guntakal to Madras.
Friday	15	..	..	..	Madras.
Saturday	16	..	..	..	Madras.
Sunday	17	..	..	..	Madras.
Monday	18	..	..	..	Madras.
Tuesday	19	..	..	..	Madras, Saidapet.
Wednesday	20	..	..	..	Madras to Trichinopoly.
Thursday	21	..	..	..	Trichinopoly.
Friday	22	..	..	..	Trichinopoly to Salem.
Saturday	23	..	..	..	Salem.
Sunday	24	..	..	..	Salem to Arkonam.
Monday	25	..	..	..	Arkonam to Kurnool.
Tuesday	26	..	..	..	Kurnool.
Wednesday	27	..	..	..	Kurnool.
Thursday	28	..	..	..	Kurnool.
Friday	29	..	..	..	Kurnool to Guntakal.
Saturday	30	..	..	..	Guntakal.
Sunday	31	..	..	..	Guntakal.

August 1904.

Monday	1	..	..	..	Guntakal to Anantapur.
Tuesday	2	..	..	..	Anantapur to Guntakal.
Wednesday	3	..	..	..	Guntakal.
Thursday	4	..	..	..	Guntakal to Madras.
Friday	5	..	..	..	Madras to Trichinopoly.
Saturday	6	..	..	..	Trichinopoly to Ootacamund.

APPENDIX III-A.

WITNESSES CLASSIFIED BY DISTRICTS.

No.	Names.	Designation.
ANANTAPUR.		
1	Adimurti Rao, P.	First-grade Pleader and Chairman, Municipal Council, Anantapur.
2	Amirtaswami Pillai, P. D. S.	Assistant Surgeon in charge of the District Medical Officer's office, Anantapur.
	[Chalke, Asst. Surg. E. L.]	Civil Surgeon, Guntúr.
3	Chengal Rao, M.	First-grade Pleader and Chairman, Gooty Union.
4	Chennapati Rao Nayudu, V.	Deputy Tahsildar, Uravakonda.
5	Gale, A. C.	Acting District Engineer, Madras Railway Company, Gooty.
6	Gibson, Dr. J. F.	Assistant Surgeon in charge of the Inspection Station, Guntakal.
7	Jagannayakulu Nayudu, J.	Tahsildar, Hindupur.
8	Narayanaswami Pillai, M. V.	Head-quarters Deputy Collector, Anantapur.
9	Ponnuswami Aiyar, A. S.	Tahsildar, Gooty.
10	Salapati, K.	Merchant and Chairman of the Uravakonda Union.
11	Scott, E.	Collector of Anantapur.
12	Sequeira, Miss F. C.	Nurse on Plague Duty, Guntakal.
13	Walsh, E. P.	Head Assistant Collector, Penukonda.
BANGALORE AND KOLAR.		
14	Deeks, F.	Assistant Surgeon, Bangalore.
15	Elliott, Dr. A. M.	Assistant to the Chief Medical Officer, Kolar Gold Fields.
16	Krishnaswami Aiyar, Dr.	Civil Surgeon, Champion.
17	O'Donnell, Dr. T. J.	Chief Medical Officer, Champion Gold Fields.
18	Palpu, Dr. P.	Health Officer, Bangalore City.
19	Pawley, F. A.	District Engineer, Madras Railway Company, Bangalore Cantonment.
20	Smyth, Col. J.	Sanitary Commissioner, Mysore.
21	Standage, Capt. R. F.	Health Officer, Civil and Military Station, Bangalore.
BELLARY.		
22	Atkinson, C.	Assistant Superintendent of Police, Bellary.
23	Blake, C. J. M.	Head-quarters Deputy Collector, Bellary.
24	Cowie, D. W. G.	Collector of Bellary.
25	D'Cruz, E. A.	Civil Apothecary, Hospet.
26	Dhanapala Mudaliyar, R. N.	Secretary, Adóni Municipal Council.
27	D'Souza, G. O.	Supervisor, Bellary Taluk.
28	Gopalachari, B.	First-grade Pleader, Hospet.
29	Houbaer, Rev. J. J.	Missionary, Bellary.
30	Krishnamacharlu, D.	First-grade Pleader and late Chairman, Municipal Council, Bellary.
31	Lucas, Rev. B.	London Mission, Bellary.
32	Marisiddappa, Sindigi	Merchant, Bellary.
33	Noyce, F.	Divisional Officer, Hospet.
34	Pemberton, Col. R.	District Medical and Sanitary Officer, Bellary.
35	Ramachandra Aiyar, A.	Tahsildar, Bellary Taluk.
36	Rama Rao, T.	Do. Adóni.
37	Reilly, H. T.	Late Assistant Collector, Bellary.
38	Rice, P. S. P.	On deputation as Revenue Officer in connection with the investigation of the Tungabhadra Project.
39	Sriramulu, P.	Sub-Magistrate, Bellary Town.
40	Subrahmaniya Aiyar, C. S.	Chairman, Municipal Council, Bellary.
41	Wait, R.	Special Plague Officer, Adóni and Alúr Taluks.
42	Xavier, A.	Civil Apothecary, Adóni.
CHINGLEPUT.		
43	Dance, G. W.	Collector of Chingleput.
44	French, Major T.	Commander of the Depôt, Pallavaram.

No.	Names.	Designation.
COIMBATORE.		
45	[Andrew, Hon'ble Mr. J.]	Fourth Member, Board of Revenue.
46	Brodie, N. S.	Late Collector of Coimbatore.
47	Fotheringham, A.	Acting Head Assistant Collector on Plague Duty in Coimbatore Taluk.
48	French, G. A. F.	District Engineer, Madras Railway Company, Podanur.
49	Robb, Capt. J. J.	Acting District Medical and Sanitary Officer, Coimbatore.
50	Rondy, Very Rev. N.	Vicar-General, Coimbatore.
51	Srinivasa Aiyangar, K. V.	High Court Vakil, Coimbatore.
51	Subrahmaniam, N. S.	Plague Supervisor, Coimbatore Taluk.
CUDDAPAH.		
52	Bose, Lieut. S.	Acting District Medical and Sanitary Officer, Cuddapah.
53	Coleridge, F. A.	Acting Collector, Cuddapah.
54	Giri Rao, R.	Head Master, High School, and Vice-President, Taluk Board, Madanapalle.
55	Macleod, B.	Collector of Cuddapah.
56	Swire, B.	Assistant Superintendent of Police, Cuddapah.
GÓDÁVARI.		
57	Graham, J. F.	Assistant Collector, Gódávári.
KISTNA.		
58	Chalke, Assistant Surgeon E. L. ..	Civil Surgeon, Guntúr.
KURNOOL.		
59	Evers, J. S.	Acting District Medical and Sanitary Officer, Kurnool.
60	Muhammad Qadir Navaz Khan Sahib.	Deputy Collector, Kurnool.
61	Ramachandra Rao, R.	Collector of Kurnool.
62	Slight, A. M.	District Judge, Kurnool.
63	Sulanayakam Pillai, D.	Plague Supervisor, Pattikonda Taluk.
MADRAS.		
64	Andrew, Hon'ble Mr. J.	Fourth Member, Board of Revenue.
65	Benson, Col. P. H.	Principal Medical Officer, Madras Command.
66	Bhashyam Mudaliyar, V.	Superintendent of Passports, Madras.
67	Bonham Carter, Major H.	Agent and Manager, Madras Railway Company.
68	Cornwall, Capt. J. W.	Deputy Sanitary Commissioner, Madras.
69	Gibson, Dr. W. R.	Medical Officer, Madras Railway Company.
70	Niblock, Capt. W. J.	Professor, Medical College, Madras.
71	Pears, S. D.	President, Municipal Commission, Madras.
72	Ross, Capt. T. S.	Health Officer, Madras Municipal Commission, Madras.
73	Warren, H. K.	Messrs. Best & Co.
MADURA.		
74	Knapp, A. R.	Acting Collector of Madura.
MALABAR.		
75	Lancashire, J. K.	Divisional Officer, Palghat.
76	MacIver, S. W. G. I.	Do. Tellicherry.
77	Palk, Major C. H. L.	District Medical and Sanitary Officer, Malabar.
78	Pinhey, A. F.	Collector of Malabar.
NELLORE.		
79	Atal, Capt. Pundit P.	Acting District Medical and Sanitary Officer, Nellore.

No.	Names.	Designation.
NILGIRIS.		
80	Balasubrahmaniya Aiyar, M. R. ..	Supervisor, Ootacamund Taluk.
81	Biolly, Rev.	Missionary, Ootacamund.
82	Coleman, G. H.	Chairman, Municipal Council, Coonoor.
83	Crawford, Major F. J.	Civil Surgeon, Ootacamund.
84	Dharmalingam Pillai, T.	Supervisor, Coonoor Taluk.
85	[Evers, J. S.]	Additional Medical Officer, the Nilgiris.
86	Gabbett, Capt. P. C.	District Medical and Sanitary Officer, the Nilgiris.
87	Handcock, E. F.	Chairman, Municipal Council, Ootacamund.
88	Krishnayya, V. K.	Deputy Tahsildar, Coonoor Taluk.
89	Mullaly, C. M.	Collector of the Nilgiris.
90	Saldanha, C. T.	Special Plague Officer, Ootacamund.
90	[Sulanayakam Pillai, D.]	Sanitary Inspector, Ootacamund.
90	Venkatarama Aiyar, A. N.	Deputy Tahsildar, Ootacamund Taluk.
NORTH ARCOT.		
91	Abdul Aziz Khan, Sirdar Bahadur ..	Municipal Councillor, Vellore.
92	Anderson, Capt. D. N.	District Medical and Sanitary Officer, North Arcot.
93	Bardswell, H. R.	Divisional Officer, Ranipet.
94	Carr, R. C. C.	Collector of North Arcot.
95	[Campbell, R. H.]	Do. of Vizagapatam.
96	Chamberlain, Rev. J. J.	Chairman, Municipal Council, Vellore.
97	Dutt, A. C.	Divisional Officer, Vellore.
98	Giles, G. W.	Acting District Traffic Superintendent, Madras Railway Company, Arkonam.
99	Gopalakrishna Mudaliyar, V.	Private Practitioner and Municipal Councillor, Vellore.
100	Muhammad Habibullah Sahib	Secretary, Municipal Council, Vellore.
101	Narasimhayya, P.	First-grade Pleader, Chittoor.
102	Raghavayya, R. C.	Government Pleader, Chittoor.
103	Rama Rao, T.	Head-quarters Deputy Collector in charge of Plague Operations.
104	Saiyid Qadir Badsha Sahib	Treasury Deputy Collector, North Arcot.
104	Venkatavaradachari	Supervisor, Vellore.
SALEM.		
105	Birdwood, Major G. C.	Remount Depôt, Mattigiri.
106	Clegg, R. B.	Collector of Salem.
107	Dughard, J.	Station Master, Jalarpet.
108	Gilby, C. H.	Supervisor, Hosúr.
109	Lubeck, Dr. W. J.	Medical Officer, Jalarpet Inspection Station.
110	Narayana Aiyar, R.	Divisional Officer, Hosúr.
111	Nilakanta Mudaliyar, V.	Vice-President, Hosúr Taluk Board.
112	Ramachandra Rao, T. N.	Tahsildar, Hosúr?
113	Ranganadha Mudaliyar, C.	Chairman, Municipal Council, Tiruppattúr.
114	Richards, F. J.	Special Settlement Officer, Salem, and late Special Plague Officer, Tiruppattúr.
115	Tucker, Capt. W. H.	Acting District Medical and Sanitary Officer, Salem.
116	Vasudeva Rao, S.	Special Plague Officer, Tiruppattúr.
117	Venkatasubba Aiyar, E.	Late Tahsildar, Hosúr.
SOUTH ARCOT.		
118	Tyler, H. H. F. M.	Divisional Officer, Tindivanam.
SOUTH CANARA.		
119	Anantayya, D.	Retired Deputy Collector, Mangalore.
120	Couchman, M. E.	Special Settlement Officer, South Canara.
121	Father Müller	Superintendent, Plague Hospital, Konkani, Mangalore.
122	Krishnamachari, V. T.	Probationary Deputy Collector, South Canara.
123	Lobo, A. J.	Vice-Chairman, Municipal Council, Mangalore.
124	Muhammad Bazulla Sahib Bahadur.	Head-quarters Deputy Collector, South Canara.
125	Robertson, J. H.	Acting Collector of South Canara.
126	Saldanha, J. L.	Chairman, Municipal Council, Mangalore.
127	Wright, Major E. H.	District Medical and Sanitary Officer, South Canara.

No.	Names.	Designation.
TRICHINOPOLY.		
128	Annaswami Mudaliyar, T. V.	Late Chairman of the Trichinopoly Municipality.
	[Ffrench, Major T.]	Late Special Plague Officer, Hosúr.
129	McCaully Hayes, Dr. H. W.	District Medical Officer, South Indian Railway.
130	McCloughin, T. J.	General Traffic Manager, Trichinopoly.
131	Oliver, Dr. F. J.	Superintending Physician.
132	Smith, F. F.	Agent, South Indian Railway.
133	Spencer, C. G.	Collector of Trichinopoly.
134	Thomas, Col. W. F.	District Medical and Sanitary Officer, Trichinopoly.
VIZAGAPATAM.		
135	Campbell, R. H.	Collector of Vizagapatam.

APPENDIX III-B.

WITNESSES CLASSIFIED BY PROFESSIONS.

No.	Names.	Designation.
OFFICIALS.		
<i>Officers who are or have been Collectors.</i>		
1	Andrew, Hon'ble Mr. J.	Fourth Member of the Board of Revenue.
2	Brodie, N. S.	Late Collector of Coimbatore.
3	Campbell, R. H.	Collector of Vizagapatam.
4	Carr, R. C. C.	Do. North Arcot.
5	Clegg, R. B.	Do. Salem.
6	Coleridge, F. A.	Acting Collector of Cuddapah.
7	Cowie, D. W. G.	Collector of Bellary.
8	Dance, G. W.	Do. Chingleput.
9	Knapp, A. R.	Do. Madura.
10	Macleod, B.	Do. Cuddapah.
11	Mullaly, C. M.	Do. the Nilgiris.
12	Pinhey, A. F.	Do. Malabar.
13	Ramachandra Rao, R.	Do. Kurnool.
14	Robertson, J. H.	Do. South Canara.
15	Scott, E.	Do. Anantapur.
16	Slight, A. M.	District Judge, Kurnool.
17	Spencer, C. G.	Collector of Trichinopoly.
<i>Other Members of the Indian Civil Service.</i>		
18	Bardswell, H. R.	Head Assistant Collector, Ranipet.
19	Couchman, M. E.	Special Settlement Officer, South Canara.
20	Dutt, A. C.	Sub-Collector, Vellore.
21	Fotheringham, A.	Assistant Collector, on Plague Duty in Coimbatore Town and Taluk.
22	Graham, J. F.	Assistant Collector, Gódvári.
23	Lancashire, J. K.	Divisional Officer, Palghat.
24	MacIver, S. W. G. I.	Do. Tellicherry.
25	Narayana Aiyar, R.	Do. Hosúr.
26	Noyce, F.	Head Assistant Collector, Hospet.
27	Reilly, H. T.	Late Assistant Collector, Bellary.
28	Rice, P. S. P.	On deputation as Revenue Officer in connection with the investigation of the Tungabhadra Project.
29	Richards, F. J.	Late Special Plague Officer, Tirupattúr and Hosúr.
30	Tyler, H. H. F. M.	Divisional Officer, Tindivanam.
31	Walsh, E. P.	Head Assistant Collector, Penukonda.

No.	Names.	Designation.
<i>Members of the Indian Medical Service.</i>		
32	Anderson, Capt. D. N.	District Medical and Sanitary Officer, North Arcot.
33	Atal, Capt. Pundit, P.	Do. do. Nellore.
34	Benson, Lt.-Col. P. H.	Principal Medical Officer, Madras Command.
35	Bose, Lt. S.	Acting District Medical and Sanitary Officer, Cuddapah.
36	Cornwall, Capt. J. W.	Deputy Sanitary Commissioner, Madras.
37	Crawford, Major F. J.	Civil Surgeon, Ootacamund.
38	Gabbet, Capt. F. C.	District Medical and Sanitary Officer, the Nilgiris.
39	Niblock, Capt. J. W.	Professor, Medical College, Madras.
40	Palk, Major C. H. L.	District Medical and Sanitary Officer, Malabar.
41	Pemberton, Lt.-Col. R.	Do. do. Bellary.
42	Robb, Capt. J. J.	Do. do. Coimbatore.
43	Ross, Capt. T. S.	Health Officer, Madras Municipality.
44	Smyth, Major J.	Sanitary Commissioner, Mysore.
45	Standage, Capt. R. F.	Health Officer, Civil and Military Station, Bangalore.
46	Thomas, Col. W. F.	District Medical and Sanitary Officer, Trichinopoly.
47	Tucker, Capt. W. H.	Do. do. Salem.
48	Wright, Major E. H.	Do. do. South Canara.
<i>Members of other Imperial Departments.</i>		
49	Birdwood, Major G. C.	Remount Depôt, Mattigiri, Salem.
50	Ffrench, Major T.	Commander of the Depôt, Pallavaram.
<i>Deputy Collectors.</i>		
51	Anantayya, D.	Retired Deputy Collector, Mangalore.
52	Blake, C. J. M.	Head-quarters Deputy Collector, Bellary.
53	Krishnamachari, V. T.	Probationary Deputy Collector, South Canara.
54	Muhammad Bazlulla Sahib Bahadur.	Head-quarters Deputy Collector, South Canara.
55	Narayanaswami Pillai, M. V.	Do. do. Anantapur.
56	Qadir Navaz Khan Sahib	Deputy Collector, Kurnool.
57	Rama Rao, T.	Head-quarters Deputy Collector in charge of Plague Operations, North Arcot.
58	Saiyid Qadir Badsha	Treasury Deputy Collector, Chittoor.
59	Vasudeva Rao, S.	Special Plague Officer, Tirupattúr and Krishnagiri Taluks.
<i>Tahsildars and Deputy Tahsildars.</i>		
60	Chennapati Rao Nayudu, V.	Deputy Tahsildar, Uravakonda.
61	Jagannayukulu Nayudu, J.	Tahsildar, Hindupur.
62	Krishnayya, V. K.	Deputy Tahsildar, Coonoor Taluk.
63	Ponnuswami Aiyar, A. S.	Tahsildar, Gooty.
64	Ramachandra Aiyar, A.	Do. Bellary.
65	Ramachandra Rao, T. N.	Do. Hosúr.
66	Rama Rao, T.	Do. Adóni.
67	Sriramulu, P.	Sub-Magistrate, Bellary Town.
68	Venkatasubba Aiyar	Late Tahsildar, Hosúr.
69	Venkatarama Aiyar, A. N.	Deputy Tahsildar, Ootacamund Taluk.
<i>Members of the Subordinate Plague Staff.</i>		
70	Balasubrahmaniya Aiyar, M. R.	Supervisor, Ootacamund Taluk.
71	Bhashyam Mudaliyar	Superintendent of Passports, Madras.
72	Dharmalingham Pillai, T.	Supervisor, Coonoor Taluk.
73	D'Souza, G. O.	Plague Supervisor, Bellary Taluk.
74	Gilby, C. H.	Supervisor, Hosúr.
75	Saldanha, C. T.	Special Plague Officer, Ootacamund.
76	Sequeira, Miss F. G.	Nurse on plague duty, Guntakal Railway Station.
77	Subrahmaniam, N. S.	Plague Supervisor, Coimbatore Taluk.
78	Sulanayakam Pillai, D.	Do. Pattikonda Taluk.
79	Venkatavaradachari	Supervisor, Veilore.
80	Wait, R.	Special Plague Officer, Adóni and Alúr Taluks.

No.	Names.	Designation.
<i>Members of the Subordinate Medical Staff.</i>		
81	Amirtasawmi Pillai, P. D. S.	Assistant Surgeon in charge of the District Medical and Sanitary Officer's Office, Anantapur.
82	Chalke, Asst. Surg. E. L.	Civil Surgeon, Guntur.
83	D'Cruz, E. A.	Civil Apothecary, Hospet.
84	Deeks, F.	Assistant Surgeon, Bangalore.
85	Evers, J. S.	Do. in charge of District Medical and Sanitary Officer's Office, Kurnool.
86	Gibson, J. F.	Do. in charge of the Guntakal Inspection Station.
87	Krishnaswami Aiyar, Dr.	Civil Surgeon, Champion.
88	Xavier, A.	Civil Apothecary, Adoni.

Other Officials.

89	Atkinson, C.	Assistant Superintendent of Police, Bellary.
90	Pears, S. D.	President, Municipal Commission, Madras.
91	Raghavayya, B. C.	Government Pleader, Chittoor.
92	Swire, B.	Assistant Superintendent of Police, Cuddapah.

NON-OFFICIALS.

Qualified Medical Practitioners.

93	Elliott, Dr. A. M.	Assistant to the Chief Medical Officer, Kolar.
	[Gibson, Dr. W. R.]	Medical Officer, Madras Railway Company.
	[McCaully Hayes, Dr. H. W.]	District Medical Officer, South Indian Railway.
94	Lubeck, Dr. W. J.	Medical Officer, Jalarpet Inspection Station.
95	O'Donnell, Dr. T. J.	Chief Medical Officer, Kolar Gold Fields.
96	Oliver, Dr. F. J.	Superintending Physician, Trichinopoly.
97	Palpu, Dr. P.	Health Officer, Bangalore.

Unqualified Medical Practitioners.

98	Gopalakrishna Mudaliyar, V.	Medical Practitioner, Vellore.
	[Krishnamacharlu, D.]	Do. Bellary

Railway Officials.

99	Bonham Carter, Major H.	Agent, Madras Railway Company.
100	Dughard, J.	Station Master, Jalarpet.
101	French, G. A. F.	District Engineer, Madras Railway, Podanur.
102	Gale, A. E.	Acting District Engineer, Madras Railway, Gooty.
103	Gibson, Dr. W. R.	Medical Officer, Madras Railway Company.
104	Giles, G. W.	Acting District Traffic Superintendent, Madras Railway, Arkonam.
105	McCaully Hayes, Dr. H. W.	District Medical Officer, South Indian Railway.
106	McCloughin, T. J.	General Traffic Manager, Trichinopoly.
107	Pawley, F. A.	District Engineer, Madras Railway, Bangalore Cantonment.
108	Smith, F. F.	Agent, South Indian Railway, Trichinopoly.

Missionaries.

109	Chamberlain, Rev. J. I.	Chairman, Municipal Council, Vellore.
110	Father Biolly, Rev.	Missionary, Ootacamund.
111	Father Müller, Rev.	Superintendent, Plague Hospital, Konkanadi, Mangalore.
112	Houbaer, Rev. J. J.	Do. do. Bellary.
113	Lucas, Rev. B.	London Mission, Bellary.
114	Rondy, Very Rev. N.	Vicar-General, Coimbatore.

No.	Names.	Designation.
<i>Municipal Chairmen, Councillors and Secretaries.</i>		
115	Abdul Aziz Khan, Sirdar Bahadur	Municipal Councillor, Vellore.
116	Adimurti Rao, P.	Chairman, Municipal Council, Anantapur.
117	Annaswami Mudaliyar, T. V.	Late Chairman, Municipal Council, Trichinopoly.
	[Chamberlain, Rev. J. I.]	Chairman, Municipal Council, Vellore.
118	Chengal Rao, M.	Do. Gooty Union.
119	Coleman, G. H.	Do. Municipal Council, Coonoor.
120	Dhanapala Mudaliyar, R. N.	Secretary, Adoni Municipal Council.
121	Giri Rao, R.	Vice-President, Madanapalle Taluk Board.
	[Gopalakrishna Mudaliyar, V.]	Municipal Councillor, Vellore.
122	Handcock, E. F.	Chairman, Municipal Council, Ootacamund.
	[Krishnamacharlu, D.]	Late Chairman, Municipal Council, Bellary.
123	Lobo, A. J.	Vice-Chairman, Municipal Council, Mangalore.
124	Muhammad Habibullah Sahib	Secretary, Municipal Council, Vellore.
125	Narasimhayya, P.	First-grade Pleader and Chairman of Chittoor Union.
126	Nilakanta Mudaliyar	Vice-President, Hosur Taluk Board.
	[Pears, S. D.]	President, Madras Municipal Commission, Madras.
127	Ranganadha Mudaliyar, C.	Chairman, Municipal Council, Tiruppattur.
128	Salapati, K.	Do. Uravakonda Union.
129	Saldanha, J. C.	Do. Municipal Council, Mangalore.
130	Subrahmaniya Aiyar, C. S.	Do. Municipal Council, Bellary.

Other Non-Officials.

	[Adimurti Rao]	First-grade Pleader, Anantapur.
	[Chengal Rao]	Do. do.
	[Giri Rao, R.]	Head Master, High School, and Vice-President, Taluk Board, Madanapalle.
131	Gopalachari, B.	First-grade Pleader, Hospet.
132	Krishnamacharlu, D.	Do. Bellary.
133	Mari Siddappa, Sindigi	Merchant, Bellary.
	[Narasimhayya, P.]	First-grade Pleader, Chittoor.
	[Ranganadha Mudaliyar, C.]	Do. Tiruppattur.
	[Salapati, K.]	Merchant, Uravakonda.
134	Srinivasa Aiyangar, K. V.	High Court Vakil, Coimbatore.
	[Subrahmaniya Aiyar, C. S.]	Do. Bellary.
135	Warren, H. K.	Messrs. Best & Co.

APPENDIX III-C.

WITNESSES CLASSIFIED BY RACE.

No.	Names.	Designation.
<i>EUROPEANS AND EURASIANS.</i>		
1	Anderson, Capt. D. N.	District Medical and Sanitary Officer, North Arcot.
2	Andrew, Hon'ble Mr. J.	Fourth Member, Board of Revenue.
3	Atal, Capt. Pundit P.	District Medical and Sanitary Officer, Nellore.
4	Atkinson, C.	Assistant Superintendent of Police, Bellary.
5	Bardswell, H. R.	Head Assistant Collector, Ranipet.
6	Beeson, Lt.-Col. P. H.	Principal Medical Officer, Madras Command.
7	Birdwood, Major G. C.	Remount Depot, Mattigiri.
8	Blake, C. J. M.	Head-quarters Deputy Collector, Bellary.
9	Bonham Carter, Major H.	Agent, Madras Railway Company.
10	Bose, Lieut. S.	Acting District Medical and Sanitary Officer, Cuddapah.
11	Brodie, N. S.	Late Collector of Coimbatore.
12	Campbell, R. H.	Collector of Vizagapatam.
13	Carr, R. C. C.	Do. North Arcot.

No.	Names.	Designation.
EUROPEANS AND EURASIANS—cont.		
14	Chalke, Asst. Surg. E. L.	Civil Surgeon, Guntur.
15	Chamberlain, Rev. J. J.	Chairman, Municipal Council, Vellore.
16	Clegg, R. B.	Collector of Salem.
17	Coleman, G. H.	Chairman, Municipal Council, Coonoor.
18	Coleridge, F. A.	Acting Collector of Cuddapah.
19	Cornwall, Capt. J. W.	Deputy Sanitary Commissioner, Madras.
20	Couchman, M. E.	Special Settlement Officer, South Canara.
21	Cowie, D. W. G.	Collector of Bellary.
22	Crawford, Major F. J.	Civil Surgeon, Ootacamund.
23	Dance, G. W.	Collector of Chingleput.
24	D'Cruz, E. A.	Civil Apothecary, Hospet.
25	Deeks, F.	Assistant Surgeon, Mysore.
26	D'Souza, G. O.	Supervisor, Bellary Taluk.
27	Dughard, J.	Station Master, Jalarpet.
28	Elliott, Dr. A. M.	Assistant to the Chief Medical Officer, Kolar Gold Fields.
29	Evers, J. S.	Assistant Surgeon in charge of District Medical and Sanitary Officer's Office, Kurnool.
30	Father Biolly, Rev.	Missionary, Ootacamund.
31	Father Müller, Rev.	Superintendent, Plague Hospital, Konkanadi, Mangalore.
32	French, Major T.	Commander of the Depot, Pallavaram.
33	Fotheringham, A.	Assistant Collector, Coimbatore.
34	French, G. A. F.	District Engineer, Madras Railway, Podanur.
35	Gabbett, Capt. P. C.	District Medical and Sanitary Officer, the Nilgiris.
36	Gale, A. C.	Acting District Engineer, Madras Railway, Gooty.
37	Gibson, J. F.	Assistant Surgeon in charge of Guntakal Inspection Station.
38	Gibson, Dr. W. R.	Medical Officer, Madras Railway Company.
39	Gilby, C. H.	Supervisor, Hosur.
40	Giles, G. W.	Assistant District Traffic Superintendent, Madras Railway, Arkonam.
41	Graham, J. F.	Assistant Collector, Gódvári.
42	Handcock, E. F.	Chairman, Municipal Council, Ootacamund.
43	Houbaer, Rev. J. I.	Missionary, Bellary.
44	Kuapp, A. R.	Collector of Madura.
45	Lancashire, J. K.	Divisional Officer, Palghat.
46	Lubeck, Dr. W. J.	Medical Officer, Jalarpet Inspection Station.
47	Lucas, Rev. B.	London Mission, Bellary.
48	MacIver, S. W. G. I.	Divisional Officer, Tellicherry.
49	Macleod, B.	Collector of Cuddapah.
50	McCauly Hayes, Dr. H. W.	District Medical Officer, South Indian Railway.
51	McCloughin, T. J.	General Traffic Manager, Trichinopoly.
52	Mullaly, C. M.	Collector of the Nilgiris.
53	Niblock, Capt. J. W.	Professor, Medical College, Madras.
54	Noyce, F.	Head Assistant Collector, Hospet.
55	O'Donnell, Dr. T. J.	Chief Medical Officer, Champion Gold Fields.
56	Oliver, Dr. F. J.	Superintending Physician, Trichinopoly.
57	Palk, Major C. H. L.	District Medical and Sanitary Officer, Malabar.
58	Pawley, F. A.	District Engineer, Madras Railway, Bangalore Cantonment.
59	Pears, S. D.	President, Municipal Commission, Madras.
60	Pemberton, Lt.-Col. R.	District Medical and Sanitary Officer, Bellary.
61	Pinhey, A. F.	Collector of Malabar.
62	Reilly, H. T.	Late Assistant Collector, Bellary.
63	Rice, P. S. P.	On Deputation as Revenue Officer in connection with the investigation of the Tungabhadra Project.
64	Richards, F. J.	Late Special Plague Officer, Tirupattur and Hosur Taluks.
65	Robb, Capt. J. J.	District Medical and Sanitary Officer, Coimbatore.
66	Robertson, J. H.	Collector of South Canara.
67	Rondy, Very Rev. N.	Vicar-General, Coimbatore.
68	Ross, Capt. T. S.	Health Officer, Madras Municipal Commission.
69	Saldanha, C. T.	Special Plague Officer, Ootacamund.
70	Scott, E.	Collector of Anantapur.
71	Sequeira, Miss F. C.	Nurse on Plague Duty, Guntakal.
72	Slight, A. M.	District Judge, Kurnool.
73	Smith, F. F.	Agent, South Indian Railway.
74	Smyth, Major J.	Sanitary Commissioner, Mysore.

No.	Names.	Designation.
EUROPEANS AND EURASIANS—cont.		
75	Spencer, C. G.	Collector of Trichinopoly.
76	Standage, Capt. R. F.	Health Officer, Civil and Military Station, Bangalore.
77	Swire, B.	Assistant Superintendent of Police, Cuddapah.
78	Thomas, Col. W. F.	District Medical and Sanitary Officer, Trichinopoly.
79	Tucker, Capt. W. H.	Do. do. Salem.
80	Tyler, H. H. F. M.	Divisional Officer, Tindivanam.
81	Wait, R.	Special Plague Officer, Adóni and Alur Taluks.
82	Walsh, E. P.	Head Assistant Collector, Penukonda.
83	Warren, H. K.	Messrs. Best & Co.
84	Wright, Major E. H.	District Medical and Sanitary Officer, South Canara.
85	Xavier, A.	Civil Apothecary, Adóni.
HINDUS.		
86	Adimurti Rao, P.	First-grade Pleader and Chairman, Municipal Council, Anantapur.
87	Amirtaswami Pillai, P. D. S.	Assistant Surgeon in charge of District Medical and Sanitary Officer's Office, Anantapur.
88	Anantayya, D.	Retired Deputy Collector, Mangalore.
89	Annaswami Mudaliyar, T. V.	Late Chairman, Municipal Council, Trichinopoly.
90	Balasubrahmaniya Aiyar, M. R.	Supervisor, Ootacamund Taluk.
91	Bhashyam Mudaliyar, V.	Superintendent of Passports, Madras.
92	Chengal Rao, M.	First-grade Pleader and Chairman, Gooty Union.
93	Chennapati Rao Nayudu, V.	Deputy Tahsildar, Uravakonda.
94	Dhanapala Mudaliyar, R. N.	Secretary, Adóni Municipal Council.
95	Dharmalingam Pillai, T.	Supervisor, Coonoor Taluk.
96	Datt, A. C.	Sub-Collector, Vellore.
97	Giri Rao, R.	Headmaster, High School, and Vice-President, Taluk Board, Madanapalle.
98	Gopalachari, B.	First-grade Pleader, Hospet.
99	Gopalakrishna Mudaliyar, V.	Private Practitioner and Municipal Councillor, Vellore.
100	Jagannayakulu Nayudu, J.	Tahsildar, Hindapur.
101	Krishnamachari, V. T.	Probationary Deputy Collector, South Canara.
102	Krishnamachari, D.	First-grade Pleader, Bellary.
103	Krishnaswami Aiyar, Dr.	Civil Surgeon, Champion.
104	Krishnayya, V. K.	Deputy Tahsildar, Coonoor Taluk.
105	Lobo, A. J.	Vice-Chairman, Municipal Council, Mangalore.
106	Mari Siddappa, Sindigi	Merchant, Bellary.
107	Narasimhayya, P.	First-grade Pleader, Chittoor.
108	Narayana Aiyar, R.	Divisional Officer, Hosur.
109	Narayanawami Pillai, M. V.	Head-quarters Deputy Collector, Anantapur.
110	Nilakanta Mudaliyar, V.	Vice-President, Hosur Taluk Board.
111	Palpu, Dr. P.	Health Officer, Bangalore City.
112	Ponnuswami Aiyar, A. S.	Tahsildar, Gooty.
113	Raghavayya, B. C.	Government Pleader, Chittoor.
114	Ramachandra Aiyar, A.	Tahsildar, Bellary.
115	Ramachandra Rao, R.	Collector of Kurnool.
116	Ramachandra Rao, T. N.	Tahsildar, Hosur.
117	Rama Rao, T.	Tahsildar, Adóni.
118	Rama Rao, T.	Head-quarters Deputy Collector in charge of Plague Operations, North Arcot.
119	Ranganadha Mudaliyar, C.	Chairman, Municipal Council, Tirupattur.
120	Salapati, K.	Merchant and Chairman of Uravakonda Union.
121	Saldanha, J. C.	Chairman, Municipal Council, Mangalore.
122	Srinivasa Aiyangar, K. V.	High Court Vakil, Coimbatore.
123	Sriramulu, P.	Sub-Magistrate, Bellary Town.
124	Subrahmaniya Aiyar, C. S.	Chairman, Municipal Council, Bellary.
125	Subrahmaniyam, N. S.	Supervisor, Coimbatore Taluk.
126	Sulanayakam Pillai, D.	Supervisor, Pattikonda Taluk.
127	Vasudeva Rao, S.	Special Plague Officer, Tirupattur.
128	Venkatarama Aiyar, A. N.	Deputy Tahsildar, Ootacamund Taluk.
129	Venkatasubba Aiyar, E.	Late Tahsildar, Hosur.
130	Venkatavaradachari, R.	Supervisor, Vellore.
MUHAMMADANS.		
131	Abdul Aziz Khan Sirdar Bahadur	Municipal Councillor, Vellore.
132	Muhammad Bazlulla Sahib Bahadur	Head-quarters Deputy Collector, South Canara.
133	Muhammad Habibulla Sahib	Secretary, Municipal Council, Vellore.
134	Qadir Navaz Khan Sahib	Deputy Collector, Kurnool.
135	Saiyid Qadir Badsha	Treasury Deputy Collector, North Arcot.

APPENDIX III-D.

WITNESSES CLASSIFIED BY THE METHOD OF TAKING EVIDENCE.

No.	Names.	Designation.
WITNESSES WHO WERE PERSONALLY EXAMINED.		
1	Adimurti Rao, P.	First-grade Pleader and Chairman, Municipal Council, Anantapur.
2	Amirtaswami Pillai, P. D. S.	Assistant Surgeon in charge of District Medical and Sanitary Officer's Office, Anantapur.
3	Anderson, Capt. D. N.	District Medical and Sanitary Officer, North Arcot.
4	Andrew, Hon'ble Mr. J.	Fourth Member, Board of Revenue.
5	Annaswami Mudaliyar, T. V.	Late Chairman, Municipal Council, Trichinopoly.
6	Atkinson, C.	Assistant Superintendent of Police, Bellary.
7	Balasubrahmaniya Aiyar, M. R.	Supervisor, Ootacamund Taluk.
8	Bardswell, H. R.	Head Assistant Collector, Ranipet.
9	Bhashyam Mudaliyar, V.	Superintendent of Passports, Madras.
10	Blake, C. J. M.	Head-Quarters Deputy Collector, Bellary.
11	Brodie, N. S.	Late Collector of Coimbatore.
12	Carr, R. C. C.	Collector of North Arcot.
13	Chamberlain, Rev. J. J.	Chairman, Municipal Council, Vellore.
14	Chengal Rao, M.	First-grade Pleader and Chairman, Gooty Union.
15	Chennapati Rao Nayudu, V.	Deputy Tahsildar, Uravakonda.
16	Clegg, R. B.	Collector of Salem.
17	Coleman, G. H.	Chairman, Municipal Council, Coonoor.
18	Cornwall, Capt. J. W.	Deputy Sanitary Commissioner, Madras.
19	Cowie, D. W. G.	Collector of Bellary.
20	Crawford, Major F. J.	Civil Surgeon, Ootacamund.
21	Dance, G. W.	Collector of Chingleput.
22	D'Cruz, E. A.	Civil Apothecary, Hospet.
23	Deeks, F.	Assistant Surgeon, Mysore.
24	Dharmalingam Pillai, T.	Supervisor, Coonoor Taluk.
25	D'Souza, G. O.	Supervisor, Bellary Taluk.
26	Dutt, A. C.	Sub-Collector, Vellore.
27	Elliott, Dr. A. M.	Assistant to the Chief Medical Officer, Kolar Gold Fields.
28	Evers, J. S.	Assistant Surgeon in charge of District Medical and Sanitary Officer's Office, Kurnool.
29	Father Biolly, Rev.	Missionary, Ootacamund.
30	Ffrench, Major T.	Commander of the Depot, Pallavaram.
31	Fotheringham, A.	Assistant Collector, Coimbatore.
32	Gabbett, Capt. P. C.	District Medical and Sanitary Officer, the Nilgiris.
33	Gibson, Dr. J. F.	Assistant Surgeon in charge of the Guntakal Inspection Station.
34	Gilby, C. H.	Supervisor, Hosur.
35	Gopalachari, B.	First-grade Pleader, Hospet.
36	Gopalakrishna Mudaliyar, V.	Private Practitioner and Municipal Commissioner, Vellore.
37	Handcock, E. F.	Chairman, Municipal Council, Ootacamund.
38	Houbaer, Rev. J. J.	Missionary, Bellary.
39	Jagannayakulu Nayudu, J.	Tahsildar, Hindupur.
40	Krishnayya, V. K.	Deputy Tahsildar, Coonoor Taluk.
41	Krishnamacharlu, D.	First-grade Pleader, Bellary.
42	Lubeck, Dr. W. J.	Medical Officer, Jalarpet Inspection Station.
43	Lucas, Rev. B.	London Mission, Bellary.
44	McCauly Hayes, Dr. H. W.	District Medical Officer, South Indian Railway.
45	Marisiddappa Sindigi	Merchant, Bellary.
46	McCloughin, T. J.	General Traffic Manager, Trichinopoly.
47	Muhammad Habibullah Sahib	Secretary, Municipal Council, Vellore.
48	Mullaly, C. M.	Collector of the Nilgiris.
49	Narasimhayya, P.	First-grade Pleader, Chittoor.
50	Narayana Aiyar, R.	Divisional Officer, Hosur.
51	Narayanawami Pillai, M. V.	Head-quarters Deputy Collector, Anantapur.
52	Niblock, Capt. J. W.	Professor, Medical College, Madras.
53	Nilakanta Mudaliyar, V.	Vice-President, Hosur Taluk Board.
54	Noyce, F.	Head Assistant Collector, Hospet.
55	O'Donnell, Dr. T. J.	Chief Medical Officer, Champion Gold Fields.
56	Oliver, F. J.	Superintending Physician, Trichinopoly.
57	Palpu, Dr. P.	Health Officer, Bangalore City.
58	Pears, S. D.	President, Municipal Commission, Madras.

No.	Names.	Designation.
WITNESSES WHO WERE PERSONALLY EXAMINED—cont.		
59	Pemberton, Col. R.	District Medical and Sanitary Officer, Bellary.
60	Ponnuswami Aiyar, A. S.	Tahsildar, Gooty.
61	Qadir Navaz Khan Sahib	Deputy Collector, Kurnool.
62	Raghavayya, B. C.	Government Pleader, Chittoor.
63	Ramachandra Aiyar, A.	Tahsildar, Bellary Taluk.
64	Ramachandra Rao, R.	Collector of Kurnool.
65	Ramachandra Rao, T. N.	Tahsildar, Hosur.
66	Rama Rao, T.	Tahsildar, Adoni.
67	Rama Rao, T.	Head-quarters Deputy Collector in charge of Plague Operations, North Arcot.
68	Ranganadha Mudaliyar, C.	Chairman, Municipal Council, Tiruppattur.
69	Richards, F. J.	Late Special Plague Officer, Tiruppattur and Hosur Taluks.
70	Robb, Capt. J. J.	District Medical and Sanitary Officer, Coimbatore.
71	Rondy, Very Rev. N.	Vicar-General, Coimbatore.
72	Ross, Capt. T. S.	Health Officer, Madras Municipality.
73	Saiyid Qadir Badsha	Treasury Deputy Collector, North Arcot.
74	Salapati, K.	Merchant and Chairman, Uravakonda Union.
75	Saldanha, C. T.	Special Plague Officer, Ootacamund.
76	Scott, E.	Collector of Anantapur.
77	Sequeira, Miss F. C.	Nurse on Plague Duty, Guntakal.
78	Slight, A. M.	District Judge, Kurnool.
79	Smith, F. F.	Agent, South Indian Railway, Trichinopoly.
80	Smyth, Major J.	Sanitary Commissioner, Mysore.
81	Spencer, C. G.	Collector of Trichinopoly.
82	Sriramulu, P.	Sub-Magistrate, Bellary Town.
83	Standage, Capt. R. F.	Health Officer, Civil and Military Station, Bangalore.
84	Subrahmaniya Aiyar, C. S.	Chairman, Municipal Council, Bellary.
85	Subrahmaniyam, N. S.	Plague Supervisor, Coimbatore Taluk.
86	Sulanayakam Pillai, D.	Supervisor, Pattikonda Taluk.
87	Tucker, Capt. W. H.	District Medical and Sanitary Officer, Salem.
88	Vasudeva Rao, S.	Special Plague Officer, Tiruppattur.
89	Venkatarama Aiyar, A. N.	Deputy Tahsildar, Ootacamund Taluk.
90	Venkatasubba Aiyar, E.	Late Tahsildar, Hosur.
91	Venkatavaradachari	Supervisor, Vellore.
92	Wait, R.	Special Plague Officer for Adoni and Alur Taluks.
93	Walsh, E. P.	Head Assistant Collector, Penukonda.
94	Warren, H. K.	Messrs. Best & Co.
95	Xavier, A.	Civil Apothecary, Adoni.
WITNESSES WHO SENT WRITTEN ANSWERS.		
96	Abdul Aziz Khan Sirdar Bahadur	Municipal Councillor, Vellore.
97	Anantarya, D.	Retired Deputy Collector, Mangalore.
98	Atal, Capt. Pundit P.	Acting District Medical and Sanitary Officer, Nellore.
99	Benson, Col. P. H.	Principal Medical Officer, Madras Command.
100	Birdwood, Major G. C.	Remount Depot, Mattigiri.
101	Bonham Carter, Major H.	Agent, Madras Railway Company.
102	Bose, Lieut. S.	Acting District Medical and Sanitary Officer, Cuddapah.
103	Campbell, R. H.	Collector of Vizagapatam.
104	Chalke, Asst. Surg. E. L.	Civil Surgeon, Guntur.
105	Coleridge, F. A.	Acting Collector, Cuddapah.
106	Couchman, M. E.	Special Settlement Officer, South Canara.
107	Dhanapala Mudaliyar, R. N.	Secretary, Adoni Municipal Council.
108	Dughard, J.	Station Master, Jalarpet.
109	Father Müller, Rev.	Superintendent, Plague Hospital, Konkarnadi, Mangalore.
110	French, G. A. F.	District Engineer, Madras Railway, Pódnur.
111	Gale, A. C.	Acting District Engineer, Madras Railway, Gooty.
112	Gibson, Dr. W. R.	Medical Officer, Madras Railway Company.
113	Giles, G. W.	Acting District Traffic Superintendent, Madras Railway, Arkonam.
114	Giri Rao, R.	Headmaster, High School, and Vice-President, Taluk Board, Madanapalle.
115	Graham, J. F.	Assistant Collector, Gódvári.
116	Knapp, A. R.	Collector of Madura.
117	Krishnaswami Aiyar, Dr.	Civil Surgeon, Champion.

No.	Names.	Designation.
WITNESSES WHO SENT WRITTEN ANSWERS— <i>cont.</i>		
118	Krishnamachari, V. T.	Probationary Deputy Collector, South Canara.
119	Lancashire, J. K.	Divisional Officer, Palghat.
120	Lobo, A. J.	Vice-Chairman, Municipal Council, Mangalore.
121	MacIver, S. W. G. I.	Divisional Officer, Tellicherry.
122	Macleod, B.	Collector of Cuddapah.
123	Muhammad Bazlulla Sahib Bahadur.	Head-quarters Deputy Collector, South Canara.
124	Palk, Major C. H. L.	District Medical and Sanitary Officer, Malabar.
125	Pawley, F. A.	District Engineer, Madras Railway, Bangalore Cantonment.
126	Pinhey, A. F.	Collector of Malabar.
127	Reilly, H. T.	Late Assistant Collector, Bellary.
128	Rice, P. S. P.	On deputation as Revenue Officer in connection with the investigation of the Tungabhadra Project.
129	Robertson, J. H.	Collector of South Canara.
130	Saldanha, J. L.	Chairman, Municipal Council, Mangalore.
131	Srinivasa Aiyangar, K. V.	High Court Vakil, Coimbatore.
132	Swire, B.	Assistant Superintendent of Police, Cuddapah.
133	Thomas, Col. W. F.	District Medical and Sanitary Officer, Trichinopoly.
134	Tyler, H. H. F. M.	Divisional Officer, Tindivanam.
135	Wright, Major E. H.	District Medical and Sanitary Officer, South Canara.

APPENDIX IV.

NOTES OF INSPECTION OF PASSPORT OFFICES, ETC.

Inspection of Ootacamund Town, 31st May 1904.

2. Meanwhile, I may note the result of my personal inspection this morning. I was handed over the last "list of persons who failed to appear" (B). I observe the following defects.

3. The list is evidently not prepared daily. It contains entries ranging from 29th April 1904 to 3rd May 1904, *i.e.*, it ranges over a period of five days. This is undesirable. *Daily* lists should be sent.

4. Again, there is evidently great delay somewhere. There is no date of despatch and no date of receipt (these should both have been noted), so that it is impossible to say who is responsible: but nearly a month has elapsed in all cases and more than a month in most cases, and no action whatever has been taken, except in three cases, which are reported as untraced (*vide* the endorsement on B). It is noted on the paper that it should be returned *within a week*. Allowing two days more for transmission, it is clear that this paper should have been returned, with notes on all the cases, by the 12th of May. Considering that this is almost all that the Circle Inspectors have to do and considering the local knowledge which they have (or should have) acquired in their respective circles, this would be by no means too much to ask of them. If, on the other hand, the delay arises in transmission to them from the Hospital, the system is in a rotten state and needs enquiry.

5. The result of it all is that enquiries are not going to be made at all or are going to be made a month after the event

6. I am also given a "list of arrivals" (C). This document also calls for one or two comments.

7. In the first place, it includes all arrivals, whether they come from infected or uninfected localities. It is a question whether these cases should be lumped together. The presumption is that the arrivals from uninfected localities require no surveillance, and certainly that is the principle accepted in the Plague Regulations. Moreover, the inclusion of *all* arrivals may tend to make the observation staff regard the whole matter as one of routine.

8. On the other hand, considering the probability of false addresses being given and the fact that the Coonoor Passport Officer cannot possibly check such false addresses, it may be best to treat every arrival as suspicious, unless vouched for by an European or other respectable person. I should not like to give a definite opinion on this point, though I am inclined to favour the existing practice, for the reason just given.

9. Again, this list is *circulated* among the Inspectors, so that it must take a long time to get round the whole six. I think it would be better that extracts should be sent by Mr. Saldanha to each Inspector, as regards his own circle—if such a course would not involve undue trouble. Mr. Saldanha has one clerk on Rs. 20. I am going to inspect a passport station, the day after to-morrow.

10. I checked some cases in the Bazaar circle. J. Paramasivam Pillai, Temporary Sanitary Inspector, was in charge. I took up case No. 15 in the arrivals list (C). The Inspector said that it was a Gosha woman, so he had not examined her. The address was "care of Govinda Rao." I asked the Inspector to find this Govinda Rao. He made one or two enquiries and said that he (Govinda Rao) was not in his range and he would forward the case on to the Kandal Inspector. I again asked him if he did not know any Govinda Rao in his circle, of which he had been in charge for six months. He said "You heard me make enquiries yourself." His manner at this time and throughout my inspection was insolent. He could hardly be got to understand or answer questions, and his manner and appearance were those of an habitual drunkard.

11. Just then, a cry was raised to the effect that Govinda Rao's house was close by. So it was—20 yards off—and there were No. 16 and No. 15 wife of No. 16 (the supposed Gosha female), standing in front of me and a crowd.

12. I pointed out that No. 16 was a man and No. 15 not Gosha and asked how it was that the Inspector had not examined them. He became very excited and said that he had examined them and that the whole street could testify to it.

13. He keeps a census book, in which he has to note new arrivals. I made him turn up this house and found that No. 15 and No. 16 were not noted. I asked him how this was. He could not explain.

14. I further asked him how it was that, if he had so recently examined these persons, he did not know their house and was going to send the case on to Kandal (*vide* paragraph 10 above). This also he could not explain.

16. At this stage, Mr. Saldanha told the man not to lie and to say whether he had checked any case at all in the arrivals list. He then said he had not, having been engaged in checking the defaulter's list. He had received the arrivals list, he admitted, two days back, and therefore had at any rate had yesterday to work at it.

17. As the defaulter's list had only got cases up to 3rd May 1904, it seems strange that he should only have received it and begun to work on it yesterday. Apart from this, the result of his work on the defaulter's list had been to say that three persons were not traceable: *vide* the foot of the defaulter's list (B).

18. I pointed this out: he said he had made exhaustive enquiries into these three cases. What this Inspector considers an exhaustive enquiry may be inferred from paragraph 10 above. The Inspector is not likely to make more careful enquiries behind Mr. Saldanha's back than in his and my presence.

19. It would be tedious and unnecessary to analyse the complicated system of falsehood and inconsistency, by which this wretched man had tried to shield his misdeeds. They are described in paragraphs 10 to 18. I would only note, as illustrating the corrupting influence of a bad Inspector on public opinion, that this man confidently called the whole neighbourhood as his witnesses of an inspection, which he afterwards admitted he had never made (compare paragraphs 12 and 16).

20. Mr. Saldanha has about 30 or 40 police constables, but, beyond the fact that six are with the Circle Inspector, four on grain exposure duty and an indefinite number at the passport offices, I could get no information as to what they were doing. Again, he informed me that every Circle Inspector visited every house in his circle daily. It is quite obvious that, in the Bazaar circle, this is not done or, at any rate, that the inspection is not of the smallest use.

B

List of persons who failed to appear for observation in the Bazaar and Agraharam circles.

No.	Name.	Address.	Passport number.	Period of absence.	Whence coming.
1	Chinnappan ...	Bandy stand, Ooty ...	$\frac{5559}{29-4-04}$	Never appeared.	Méttupálaiyam.
2	Papayya ...	Care of Narayana Rao, Main bazaar, Ootacamund.	$\frac{5573}{29-4-04}$	Do.	Coonoor.
3	Rangan ...	Bandy stand, Ooty ...	$\frac{5572}{29-4-04}$	Do.	Méttupálaiyam.
4	Dhasan ...	Choultry, Ooty ...	$\frac{5571}{29-4-04}$	Do.	Do.
5	Palani ...	Do. ...	$\frac{5570}{29-4-04}$	Do.	Do.
6	Venkataswami ...	Bandy stand Ooty ...	$\frac{5569}{29-4-04}$	Do.	Do.
7	Sukram Doss ...	Choultry, Ooty ...	$\frac{5568}{29-4-04}$	Do.	Do.
8	Thailammal ...	Care of Subbarao, Main bazaar, Ooty.	$\frac{5578}{29-4-04}$	Do.	Do.
9	Janaga ...	Shandy choultry, Ooty ...	$\frac{2035}{29-4-04}$	Do.	Coonoor.
10	Gopal Doss ...	Do. ...	$\frac{2034}{29-4-04}$	Do.	Do.
11	Karappan ...	Choultry, Ooty ...	$\frac{2040}{29-4-04}$	Do.	Méttupálaiyam.
12	Appi ...	Do. ...	$\frac{2039}{29-4-04}$	Do.	Do.
13	Krishna Doss ...	Do. ...	$\frac{5567}{29-4-04}$	Do.	Do.

List of persons who failed to appear for observation in the Bazaar and Agraharam circles—cont.

No.	Name.	Address.	Passport number.	Period of absence.	Whence coming.
14	Jakanari Doss ...	Choultry, Ooty ...	$\frac{5566}{29-4-04}$	Never appeared.	Méttupálaiyam.
15	Baganan ...	Do. ...	$\frac{5565}{29-4-04}$	Do.	Do.
16	Rajibar Doss ...	Do. ...	$\frac{5564}{29-4-04}$	Do.	Do.
17	Subraya Chetti ...	Bandy stand ...	$\frac{5563}{29-4-04}$	Do.	Do.
18	Arunachalam ...	Do. ...	$\frac{5562}{29-4-04}$	Do.	Do.
19	Muttan Chetti ...	Do. ...	$\frac{5561}{29-4-04}$	Do.	Do.
20	Karuppan ...	Do. ...	$\frac{5560}{29-4-04}$	Do.	Do.
21	Shase Raj ...	Care of S.N.S. and Co., Main bazaar, Ooty.	$\frac{2843}{3-5-04}$	Do.	Coonoor.
22	Parasuram ...	Sugar Machine Co., Upper Bazaar street, Ooty.	$\frac{4503}{2-5-04}$	3 days ...	Coimbatore.
23	Adam Sahib ...	Do. do.	$\frac{4502}{2-5-04}$	Do. ...	Do.
24	Rangappa Nayakkan.	Ooty Market ...	$\frac{4501}{2-5-04}$	Never appeared.	Do.
25	Kunan ...	Do. ...	$\frac{4505}{2-5-04}$	Do.	Do.
26	Nanjan ...	Mango Merchant, Market, Ooty ...	$\frac{4507}{2-5-04}$	Do.	Do.
27	Chickappa ...	Do. ...	$\frac{4458/2}{2-5-04}$	Do.	Do.
28	Attappa Gaunden ...	Do. ...	$\frac{4456/2}{2-5-04}$	Do.	Do.
29	Mathar Sahib ...	Do. ...	$\frac{4451/2}{2-5-94}$	Do.	Do.
30	Allauddin ...	Do. ...	$\frac{4447/2}{2-5-04}$	Do.	Do.
31	Chinnappan ...	Bandy stand, Ooty ...	$\frac{5595}{29-4-04}$	Do.	Méttupálaiyam.
32	Nagapati Ammal ...	Care of Rama Pillai, Bricklayer, Big Mosque, Ooty.	$\frac{5569}{3-5-04}$	Do.	Marapallam.
33	S. Raju Mudali ...	Shandy purchaser, Ooty ...	$\frac{5670}{3-5-04}$	Do.	Wellington.
34	Nanjunda Nayakkan.	Market, Ooty ...	$\frac{4410/2}{2-5-04}$	Do.	Coimbatore.

Note.—This list is to be returned within a week.

Forwarded to the Circle Inspector of Bazaar and Agraharam circle for report.

(By Order.)

(Signed) BASTION,
Clerk to the Spl. Pl. Medl. Officer.

26/30. The parties could not be traced out.
32. The party is said to have returned to Modachur.
33/34. The parties could not be traced out in my circle.

C

Intimation of arrivals.

No.	Names.	Whence coming.	Address.	Passport No.
1	Deva Raju	Madras	New Agraharam, care of Manu Pillai, Ootacamund.	...
2	Yesu Nassan	Do.	Do. do.	...
3	Rajaiyar	Do.	Do. do.	...
4	Kamalam	Do.	Do. do.	...
5	Tayammami	Do.	Do. do.	...
6	Tallammal	Coonoor	Care of Chinnaswami near Post office, Kandal.	1484
7	Palani	Do.	Do. do.	1493
8	Mr. Krishnan	Madras	N.H.T. Company, Charing Cross	...
9	Miram Beo	Mangalam	Care of Muhammad Sahib Fakir Muhammad Sait's Lane.	420
10	Pathimuttu	Do.	Do. do.	420
11	Muhammad Sultan	Do.	Do. do.	420
12	Kurupan	M. Palayam	Care of Richter & Co., Ootacamund	83
13	Rangan	Do.	Do. do.	84
14	Hussain Sahib	Do.	Sagar Bazaar Market, Ootacamund	441
15	Mular Bai	Do.	Care of Govinda Rao, Main Bazaar Street	433
16	Sesha Rao	Do.	Do. do.	432
17	Saiyid Sah	Do.	Care of Bademolly Muhammad Sahib, Main Bazaar Street.	449
18	Venkatan	Trippattur	Market Chutram, one night, and then proceeds to Sea-forth estate O'Valley.	7042
19	Gavaran	Do.	Do. do.	7043
20	Muniyan	Do.	Do. do.	7041
21	Rushu	Do.	Do. do.	7040
22	Chowrie Maistri	Do.	Do. do.	7039
23	Rev. C. H. Malden	Madras	Fox Ho., Ootacamund	...
24	Mrs. Bolderson	Do.	Lock End., Ootacamund	...
25	Miss Sherideen	Do.	Do. do.	...
26	Rev. J. Doyle	Do.	Grace Cottage do.	...
27	Rev. A. M. Teixeira	Do.	Burnside do.	...
28	Hussain Sahib	Bagatur	Market Chetti's Cloth Shop	29
29	Ranga Gaunden	Coimbatore	Shandy Condiments Stall	7842
30	Mathar Sahib	Mangalam	One or two days in Qadir Sahib's house near Bandy stand, and thence to Neduvattam.	455
31	Mullan	Do.	Do. do.	454
32	Subba Rao	Mysore	Fern Hill, Ootacamund	452
33	Abdul Qadir	Mangalam	S. M. & Co., Main Bazaar	453
34	Pir Khan	Madras	Care of Mr. Mekanam Westward Ho.	...
35	Thiyagaraja Aiyar	Trichinopoly	Fern Hill, Ootacamund	...
36	Ramanatha Aiyar	Do.	Do. do.	...
37	Dr. and Mrs. Harley with two children.	Coonoor	Grace Cottage Hotel	...
38	Chaboo Meran	Mangalam	Muhammad Sahib's Bungalow near Walthamstew.	451
39	Nunoo Mean	Coimbatore	Care of Passport Holder, No. 451	7051
40	Muthasami Pillai	Coonoor	Care of Kandaswami, Thalayattimund	3155
41	Muhammad	Do.	Chutram	3156
42	Santiago	Madras	Fern Hill, Ootacamund	6113
43	Michel	Do.	Do. do.	6112
44	Ponnuswami	Do.	Gray's Cottage, Ootacamund	6111
45	Peter Rayappan	Do.	Fern Hill do.	6110
46	Appavoo	Do.	Do. do.	6109
47	Thunbuswami	Coonoor	Glendower Hall do.	3148
48	Mariasusai	Wellington	Care of Chinnathambi, Bandy Shola	3150
49	Santojee	Do.	Care of Michael, Potseller's Street, Main Bazaar.	3151
50	Mottai	Erode	Care of Muthuvira Pillai, Vannarpet	3153
51	Chinnapillai	Do.	Own house, Vannarpet	3154
52	Subbuchar	Madapur	Mercy Chambers, Ootacamund	3155
53	Kunnuswami	Coonoor	Care of Muthu, Lower Bazaar Road	3156
54	Bhai Khan	Cannanore	Big Mosque, Ootacamund	3157
55	Muzaphir	Do.	Do. do.	3158
56	Chinnapillai (Female)	Trichinopoly	Care of Pitchai Valor, Potter's Street, Kandal.	3159
57	Elizabeth	Madras	Lock End., Ootacamund	3162
58	Duraiswami	Erode	Finger Post Joshi Maistri's house, one day, and thence proceeds to Kalhatti.	3164
59	Qadir Mohi-ud-din Rowther.	Coimbatore	Care of Ebrahim Sahib, Main Bazaar, Ootacamund.	3163
60	Siddik Sait	Bangalore	Gool Muhammad Sait's house, L. Bazaar Road.	3165
61	Ramaswami Chetti	Madras	Care of Ku. Ram & Co., Commercial Road	3166
62	Muhammad Ahmedulla Sahib.	Do.	Care of Police Inspector, Main Bazaar Street.	3167
63	Thanga Muthu	Tinnevely	Longwood Hotel, Ootacamund, servant to Philips, Esq., I.C.S.	3168
64	Nunnu Mean	Coimbatore	Care of Chattoo Mean, Passport No. 451, near Craigmere.	3169

Intimation of arrivals—continued.

No.	Names.	Whence coming.	Address.	Passport No.
65	Munal Mari and two children.	Madras	Road side House, Kandal	3170
66	Savariyammal	Do.	Do. do.	3171
67	Munuswami	Do.	Carass Cottage, Ootacamund	3172
68	Ramalingam	Do.	Care of Mr. Graham, Erne Cottage, Ootacamund.	3173
69	Cheluva Aiyar	Erode	"Satimanthram", old Ootacamund	3174
70	C. V. Venkatrama Aiyar...	Do.	Do. do.	3175
71	M. J. Lascelles, La Personne.	Coonoor	Charing Cross Hotel	3176

(True Copy.)

CRAIGMORE,
24th May 1904.(Signed) P. J. ELIAZER,
Plague Inspecting Officer.*Demi-official from the Collector of the Nilgiris, dated Ootacamund, 19th August 1904.*

With reference to paragraph 20 of your notes of inspection of Ootacamund town, dated 31st May 1904, I send you the duty roster of the plague police men at Ootacamund for to-day, from which you will see that there are no constables on duty as orderlies to Circle Inspectors.

DUTY ROSTER FOR 19TH AUGUST 1904.

Ootacamund Plague Police.

Twenty-four constables and one head constable (Round officer).

	Constables.
Craigmore Toll Gate	4
Kandal Cross road	2
Pykara Finger Post	2
Plague Camp	2
Grain Disinfection shed, Bandypet	3
Lovedale Passport station	2
To watch Kerahada, Kengundu, Lawrence Asylum	7
Sick in Hospital	1
Vacant	1 (just filled up).
	24 first-class constables.
Inspection station, Pykara	2

(Signed) MUHAMMAD BORAN,
Inspector of Police.*Inspection of the Ootacamund Passport Office on 3rd June 1904.*

I inspected the Ootacamund Passport Station this morning. Lists of arrivals are sent daily to Mr. Saldanha. Very few of the passers-by have general passports. The stock of general passports is exhausted and an indent was submitted for new books, a fortnight ago, but they have not been received. It may be unnecessary to issue general passports at all, but, if it is done, it should, I think, be done systematically. Even a shop-keeper, whose bazaar is 100 yards off, has not been given a general passport.

2. I have advised Mr. Saldanha not to insist on issuing passports to the servants of Europeans coming from non-infected areas, if the servants arrive on the same day as their masters. As regards the general system of passport-issuing, I noted before and have nothing to add. (Circular D appended.)

3. There are complaints of roughness, etc., on the part of Europeans, when asked for addresses or told that they must take out passports.

4. It is impossible to pronounce an opinion on the Temporary Sanitary Inspector, as he has only been in charge 15 days, but I found the usual difficulty in getting a plain answer to a plain question. These men think of the proper thing to say, not of the correct statement of what has happened.

D

CIRCULAR.

The passporting staff at Craigmore is under the immediate control of the Hospital Assistant, who is responsible to the Special Plague Medical Officer for the correct carrying out of all the work there.

2. Although, as a rule, every one coming in must be passported, discretion may be exercised in exceptional cases; for instance, when respectable persons over them are coming *direct* from non-infected areas to the satisfaction of plague passport issuing officer, they need not be passported.

(Signed) C. T. SALDANHA,
Special Plague Medical Officer.

31st March 1904.

Note on Case of Plague which occurred at Ilitorai on 4th June 1904.

Visited this case with Captain Gabbett, I.M.S., District Medical and Sanitary officer of the Nilgiri District, on afternoon of 5th June 1904.

2. Two cases of plague—one woman already dead; the other very ill and not considered likely to survive.

3. The women lived in different parts of the town. Neither of their houses showed or had shown marks of plague. Both Badagars, but no other connection between them could be discovered.

4. Both had been sick for four days, immediately after return from a hut, in which they had been segregated (according to custom) during their monthly periods.

5. Eighteen days before, a dead rat had been seen in this hut. The women had talked of this, and (apparently on this account) no women had used the hut since, up to the time when the two patients died it. The women had not told the men about the dead rat.

6. The hut stands by itself, on the side of the village remote from the public road. It is not near the houses of either of the patients.

7. Clearly, the infection came from the hut. How did it get there? It is not a case of recrudescence in any shape or form, as there had never been a case of plague in the village before.

8. I may note that it was a hut, in which a rat, who was a stranger to the village, would be likely to take shelter (1) because it was slightly isolated from the other huts, (2) because it would be frequently unoccupied, (3) because it contained quantities of filthy rags. Captain Gabbett remarked that he had never seen a worse collection.

9. One Adjan returned from the plains, five days back, a passportee and in good health: not intimate with the families of the patient: his house is 150 yards away. In any case, his advent to the village five days before could not explain the dead rat 13 days before.

10. Prior to that, a goldsmith woman and her husband had come from the plains on 27th April 1904. They would have had no intercourse with Badagars, and moreover they live in a different hamlet. They had brought nothing with them from the plains and had been perfectly well ever since. The husband had gone to Hulikot; there was no plague in that village, before or since.

11. Clearly, there is no connection between the goldsmith and the present case. There had been no other passportees or arrivals from infected parts, in May or June. This therefore seems a conclusive example of the conveyance of infection by a rat.

12. Where did the rat come from? Coonoor (4 miles off) had been free of infection for months. Wellington (6 miles off) had been more recently infected. Other villages, 4 and 5 miles off, had been infected; but there is no intercourse between these villages and Ilitorai. Bandyshola (a village 2 miles off) had been infected the year before. [Note by Captain Gabbett.—Communication has been since proved, in at least one instance, with Jagatala, a village, though never itself actually infected, yet quite close to other villages infected in April. It is also impossible to state that there is never communication between any two Badaga villages, as there is much intermarriage. There is of course a big gap to be covered between April and June—at least six weeks.]

13. The villagers get their grain from Coonoor. They say it always comes to them, carried by villagers on their backs—not in carts. Captain Gabbett suspects that a cart *must* have come with grain containing an infected rat, and asked the supervisor to make enquiries.

14. The only alternative supposition is that a chain of infected rats must have been gradually spread from one of the villages mentioned in paragraph 12 above. I cannot reject this theory wholly. The position of the hut—remote from the road, slightly isolated, and near the fields—would seem to suggest the fields rather than the road as the channel of infection. [Note by Captain Gabbett.—Ilitorai is separated by a very sparsely inhabited hill-country from the last village infected (Kotahatti)—a distance of 4 or 5 miles.]

15. At the same time, it must be supposed that the chain of infection ran remote from villages and houses. Otherwise, why are there no dead rats and outbreaks of plague to mark the course of rat infection? I don't think there are sufficient data to decide whether Captain Gabbett's theory or the alternative theory should be accepted.

In any case, this case seems to afford an almost conclusive proof of the importance of rats in retaining plague for weeks together and in spreading it from village to village at distances of at least 4 or 5 miles. [Note by Captain Gabbett.—A fair conclusion also that, if rats had been exterminated, there would have been no human infection.]

Letter from Captain Gabbett, I.M.S.

It must be remembered that there is also the possibility of infected material, such as rags, having been introduced from another Badaga village. The last infected village was Kotahatti on 1st April. It is known that there was communication with Jagatala, a village adjacent to Kotahatti.

Since you left, a good many dead rats were found during disinfection, and four cases have occurred subsequently.

There has also been an interesting indigenous case at Bikatti—a Badaga village, just the other side of the Cordite Factory. Here again, no history of importation could be obtained, but, on digging up rat-holes, several decomposed rats were found, although no dead rats were noticed by the villagers. They reported the case themselves. It throws a light upon villages, which are said to have had plague, without the occurrence of dead rats.

Mettupalaiyam, I see, has had two indigenous cases. It would be interesting to enquire into the recurrence there.

Referring again to the possibility of infection from Kotahatti, it will be seen that, though unlikely, it is not impossible—assuming that infection was present on April 1st in Kotahatti and that a dead rat was found in Ilitorai on May 15th, there is only a gap of six weeks to be bridged—possibly by an undiscovered case of plague in Kotahatti or its adjacent villages or by the undiscovered death of rats in Ilitorai.

Inspection of the Coonoor Passport Office on 5th June 1904.

Plague Police.—Two at each of three passport-issuing offices and two at the railway station. This is the minimum required.

Passport examining office.—Inspector Dash and the ordinary sanitary staff do the work of hunting up defaulters and seem to do it very well: the lists of defaulters should be made out daily, instead of once in four days. The notes, showing the results of Inspector Dash's enquiries, are made in the passport-register itself and are well up to date.

Inspector Dash was advised by me to point out to people the advantages of killing rats for themselves. Captain Gabbett has had notices on the subject tom-tom'd. [Vide Appendix VII.]

Inspection of Mettupalaiyam Plague Camp on 12th June 1904.

EXAMPLE OF PLAGUE CONSTABLES PROPERLY USED.

22 constables on plague duty—

- 2 on leave.
- 4 guarding the plague camp.
- 3 on duty at the Bhavani Bridge Passport station.
- 2 guarding the health camp.
- 2 } at two other passport stations.
- 1 }
- 4 railway station duty.
- 4 at Karamadai (infected village 5 miles off).

No general passports issued at the Méttupálaiyam passport station: only 10 days' passports and the daily passports. The Civil Apothecary sends the defaulters' lists every other day, instead of daily. Temporary Sanitary Inspector (A. N. Krishnaswami) has been keeping all these lists with him for the last fortnight and only forwarding such passports as he chooses to verify. He had only verified 17 out of 33 passports sent him on 26th May 1904 (more than a fortnight before the date of inspection).

The Deputy Tahsildar did not know of the existence of these lists and had evidently been trusting completely to the Temporary Sanitary Inspector in this matter. I may add that the Temporary Sanitary Inspector at first told me that he only received the passports and not the lists from the Civil Apothecary. It was only when he was confronted with the Civil Apothecary that he had to admit receiving the lists and then tried to shuffle out of it by saying that he had meant a different kind of list altogether.

Inspection of Periya Chettipálaiyam Village with Mr. Fotheringham.

Temporary Sanitary Inspector, Tolasi Singh, evidently very ignorant of measurements required for disinfection: did not know whether a chatty of ordinary size in which he was mixing disinfectants contained one gallon or two gallons: finally thought $1\frac{1}{2}$ gallons. Supervisor said it would be 3 gallons. The man's manner was confused and excited. Mr. Fotheringham said he was a better man than most of the other Temporary Sanitary Inspectors under his charge. The Supervisor seems to do his work well and carefully.

Inspection of Erode Municipality on 17th June 1904.

This town affords an instance of waste of Government money, through mechanical and unintelligent working of the rules.

The Hospital Assistant on passport duty (one Shaikh Hussain) has, both on his own admission and on that of the Chief Sanitary Inspector on plague duty, not sent the sanitary staff a single passport for at least a fortnight. In the case of every passport-holder who has not attended for the full ten days, a note is entered to the effect that he is going to Madras or Coimbatore or some other place, and intimation is said to be sent in due form to the Collector of the district concerned. Admittedly, no attempt is made to verify these statements.

Thus, the main duty of the plague-staff becomes a sinecure. The Chief Sanitary Inspector admits that he on his side never looks at the passport register. He says that he attempts to trace out defaulting passport-holders *independently*. This cannot, for a moment, be believed; but, if it were true, it would show almost incredible folly.

The Chief Sanitary Inspector informs me that great attention is paid to sick people. He says that a girl, whose people had come from Trichengode (Salem district), developed high fever and died yesterday at 2 P.M. Whether he got to the house at 4 or 6-30 P.M. he seems doubtful: in any case, the corpse had been removed and cremated without inspection. This shows pretty well that no attempt is ever made to see the sick people or the dead bodies. So that, from this point of view also, the action of the staff is doing little or no good to the town. The Chief Sanitary Inspector says he is *watching* the case. If the case was one of plague, the disease may be incubating and the infection spreading. An inspection of the corpse might have determined this at once.

The Municipality is not getting its full advantage out of the plague police. Eleven are at Erode railway station (the Station House Officer in charge of them at first said 10 or 12, which shows the extent of *his* knowledge), and 6 more are in reserve. Subsequently, the Station House Officer explained that they were on ordinary duty in the town. This is not the purpose for which they are paid from Plague funds.

There is a plague hospital, which two or four of these men might properly be employed to guard, and, as a matter of fact, part of the hospital was burnt down a little time ago—a catastrophe, which might have been prevented by a police guard.

Again, there are three passport-issuing stations at three toll-gates. A constable or two would be useful to preserve order and support the clerk at each of these stations.

No one seems to consider himself to have any responsibility for or power over these six men, except the Station House Officer, who calmly uses them to help him in his ordinary police work.

Inspection of Railway Inspection Station, Observation Camp and Plague Camp at Jalarpet Station on 19th June 1904.

Was conducted over the camps, etc., by Dr. Lubeck, the officer in charge. It may be noted that my visit was an entirely unexpected one and that I only determined on it half an hour before the train left Tirupattūr.

The arrangements are like clock-work, and the exact circumstances under which each passenger is detained in the various camps perfectly understood by all concerned and applied intelligently and strictly.

I devoted special care to the attitude of the people, having regard to the fact that one or two respectable natives had spoken of the Jalarpet plague arrangements, as involving great hardship.

I asked everybody I found in the camp whether they had any representations to make. One and all said they were kindly treated and well fed and had no complaints whatever, except that some—and especially the contacts—complained of the inconvenience of being detained.

The reasons for detention in all cases are that the passengers are either in a suspicious state of health (evidenced by high temperature) or have travelled in the same compartment with such persons. All such persons are examined twice a day (many were examined before me) and, when the suspicious symptoms have abated or the incubation period is over, are allowed to depart without delay.

There were two cases of plague in the camp, both detected at the railway (passengers from Bangalore), one of them only three days ago. Tables are appended—*vide* appendix VII—which show the number of cases detected in the course of the last four years. They are carefully arranged and show with irresistible force the important services which this camp has done to the Madras Presidency by stopping cases of plague.

The camps are models of neatness, cleanliness, and airiness and present a very attractive appearance. The arrangements for feeding the inmates are the most satisfactory that can be devised in the circumstances.

Dr. Lubeck informs me that, far from there being any complaints of the treatment of patients in the camp, he has many patients brought to him from Tirupattūr and other places in the neighbourhood.

It may be pointed out that the disinfection of the railway carriage, as well as the segregation of the contacts, is the accompaniment of the discovery of every suspicious case in any train.

Other points will appear from Dr. Lubeck's evidence, which is separately recorded.

Inspection of the Tirupattūr Passport-examining Office on 20th June 1904.

Inspected with the Special Plague officer Mr. S. Vásudéva Rao. The Hospital Assistant (a Mussalman) does not seem to understand his work well. Out of 2,000 persons entered in the course of the last 16 days, only 12 have been reported to the circle staff as defaulters. The enormous bulk of the absentees (as in Erode) are simply noted as having gone to other places, and no local enquiry is attempted, in verification of the statements of the passportees as to their intentions.

In the course of the current month, two lists of defaulters have been sent by the Hospital Assistant to the circle staff (marked A and B). List A is said to have been despatched on 9th June 1904 to the Chief Sanitary Inspector and the Plague Office Clerk (one Viswanátha Sing) has entered it as received on that date. Judging by the ink, it is clear that this register was only written up yesterday or the day before at earliest, so far as A and a variety of subsequent communications are concerned; and, indeed, the Chief Sanitary Inspector's register shows that A was only received on 18th June 1904. It is plain that there has been a delay of nine days in the transmission of A and that the office hands have had recourse to fudging in order to conceal the fact. None of the cases in A have been verified as yet.

I wished to check the passport entries in A with the passport register. They stretched back to the time of the next oldest register. After half an hour's search, it was found impossible to discover this register. All the old registers and passports were heaped together in indescribable confusion in a corner of the office, so that it took eventually nearly two hours' search to discover the register I wanted, which (I may note) contained entries as to many recent cases of defaulters still under enquiry.

How far there had been *additional* delay (*i.e.*, before 9th June 1904) in communicating defaulters' lists to the sanitary staff, I could not see, owing to the confusion described above. It is, however, plain that the Chief Inspector (N. Subramaniya Aiyar, a temporary man) had not gone to the hospital, since 9th June 1904, to find out why he was getting no defaulters' lists, though ordered by Mr. Vásudéva Rao always to do this: otherwise, he would have discovered that the defaulters' list, A, though said to be despatched, had never reached him. Hence, no defaulters (except defaulters of May) appear to have been checked at all in June, up to this date (20th June 1904).

Thus, the sanitary staff is clearly neglecting its chief duty. There seems here, as elsewhere, to be a kind of vague idea that the circle staff have to go round to every house in the town and keep up the census register. This is an obviously impossible (and practically useless) task and diverts them from the work which they *could* do thoroughly, namely looking up passportees who fail to attend and (I consider) also passportees who allege change of residence. If the allegation of change of residence is really *bona fide*, it can be verified at once.

The Plague Officer says that this can be done by the officers at the alleged places of destination; but there is considerable delay in the transmission of the intimations of departure (which is effected through the Tahsildar, etc.), and, by the time the enquiries have been made in the alleged place of destination and the passport returned, the scent is sure to be cold.

One case (serial number 4782 in the register) illustrates the apathy of the Hospital Assistant in the matter. I find an entry of attendance on 16th June 1904 and an entry (of the same date and in the same ink) "gone to Durgapet." In a different ink, I find an entry of attendance on 17th June 1904, but the entry "gone on 16th June 1904" remains as it was. After 17th June 1904, there are no further entries of attendance. Where is this passportee? No enquiries have been made about him, nor does his name appear as a defaulter.

A

List of Defaulters of 9th June 1904.

Passport No. and date.	Name.	Father's name.	Age.	Whence coming.	Address.	Remarks.
5350 1-6-04	Ramaswami Chetti ...	Venataswami Chetti.	45	Kallavi ...	Vaniya Street, own house.	
11311 21-6-04	Krishnappa ...	Not known ...	...	Tiruppattūr ...	.....	
11208 30-5-04	Govindaswami ...	Venataswami ...	...	Do. ...	(Illegible), Barber's Street, own house.	
7673 1-6-04	Duraiswami Aiyar ...	.....	...	Do. ...	.....	
11878 6-6-04	Muhammad Ghouse Sahib.	Abdul Qadir ...	12	Morappur ...	(Illegible), Street, own house.	
11820 6	Yakub Sahib ...	Ahmed Sahib ...	40	Kallavi ...	Vaythagar Street, own house.	
7942 5/6	Shaikh Jhor Sahib ...	.....	35	Tiruppattūr ...	Chetty Street, own house.	

(Signed) R. VENKATESWARAN,
Hospital Assistant.

B

List of Defaulters of 19th June 1904.

Passport No. and date.	Name.	Father's name.	Age.	Whence coming.	Address.	Remarks.
8583 A 13-6-04	Chaloopceeran ...	Bachapeeran ...	50	Tiruppattūr ...	Alangayam Road, own house.	
8850 17-6-04 Vani- yambadi. 2319	Venataswami Nayudu	Narayanaswami Nayudu.	30	Jalarpet ...	In-patient, Municipal hospital.	
16-6-04	Sivaprakasam ...	(Illegible) ...	16	Do. ...	Kaikal Street, own house.	
8529 12-6-04	Gauze Bok ...	(Illegible) ...	35	Morappur ...	Care of Executive Engineer, Feeder line.	
12232 12-6-04	Nannuncis Sahib ...	Shaikh Nath Sahib ...	30	Oorigam ...	Ismailpet, own house.	

(Signed) ABDUL RAZZAK,
Hospital Assistant.

Inspection of the Vellore Passport Work on 29th June 1904.

Twenty-two Plague Police are on the budget. Of these, 9 are stationed at the three more important toll-gates (passport-issuing offices) and 6 at the three less important toll-gates, 2 at the passport-examining office (I rather doubt whether these are of any particular use), 2 at a spot near one of the toll-gates, where carts are likely to go to evade rules and 2 at the railway station (I should doubt whether this was enough).

Neither the passport-examining officer nor his clerk prepare any lists of total absentees or of persons who fail to appear after putting in an appearance for a certain number of days.

The observation staff are said to meet daily at the examining office, take notes of such absentees, make enquiries and inform the clerk of the result. As regards those who have partly failed to attend and in regard to whom enquiries have been of no avail, the clerk first said that he informed the Secretary personally. This the Secretary was unable to confirm.

The clerk then changed his story and said that there were no such cases. This the Circle Inspector promptly contradicted. Then the clerk admitted that in such cases he simply filed the papers.

The clerk is a ten-rupee man, without a permanent appointment. The Hospital Assistant knew nothing about the system and admitted to me that he left the working of it entirely to the clerk and did not consider that he had any responsibility in the matter.

As regards absentees, who have not attended the examining office from the very beginning, some steps are taken. Lists are eventually submitted to the Secretary, showing the result of the checking of the circle staff, and orders are passed thereon by the Secretary: but there is an entire lack of system in the matter, with the result that it is impossible for the Secretary (or for me) to tell whether the staff have checked all the cases of default.

If a daily list of the absentees and defaulters of the previous day (whether the default be partial or complete) were invariably made out by the clerk under the direct supervision of the Hospital Assistant (who would, I fancy, have to be a brighter man than the present incumbent), and if it were the rule that such lists should be invariably submitted to the Secretary after prompt check, with a note of the action taken and the result in regard to each case, the Secretary would be in a position to see that every case was enquired into and disposed of.

Fudging of the lists or omission of the names might still occur, but the parties would make these false records at their peril, as casual and occasional comparison of the registers with the lists would reveal any such discrepancies. As there would have to be a list for every day, it would be difficult for the circle staff to suppress any one list. At present, suppression could occur at any stage and at the instance of anybody concerned and it would be difficult to discover it and impossible to tell who was responsible for it.

The system of taking notes on scraps of paper and the exchange of verbal directions and reports between the examining staff and the circle staff might have advantages, if the staff were a highly-paid, trustworthy and responsible series of persons, who could be trusted to do their work unchecked.

Here, as in Tiruppattūr, the bulk of the absentees are entered in the register as proceeding to other places, the statements of the parties being accepted as conclusive on these points and the passports being sent to the local authority concerned. The Secretary informs me that he has himself come across cases, in which the village munsifs of the villages, to which the passportee says he is going, have checked the passport, as if the passportee had arrived and had been examined, though, in point of fact, he never went to the village at all. The Secretary adds that the Sub-Collector has punished the village officers in such cases.

It seems to me that it should be part of the duty of the observation staff to check cases of alleged departure and to see whether the passportee has really left the town or whether he has simply given false information, in order to escape the trouble of daily appearance at the examining office. The failure to check such statements at present (which is common to most districts) offers a serious loop-hole for evasion and one which is clearly being taken advantage of.

The Secretary seems to devote a good deal of personal care and attention to the very important work of enquiry into cases of sickness. The Hospital Assistant is called on to examine all cases of a suspicious nature.

Neither the observation staff nor the passport-issuing officer, at present, expose any grain to the sun: this was apparently done to some extent, in the case of grain coming from infected areas, when the town of Vellore was infected, but has not been done since. The only passport-issuing clerk, whose office I examined, had been on duty for a year, and he told me that, so far as his toll-gate was concerned, no grain had ever been examined at all, even during the time of plague and even if it had come from an infected area.

Miscellaneous Notes of Inspection.

Chittoor (2nd July 1904).

The tracing out of defaulters is done by the Revenue subordinates. The proportion of persons examined for the 10 days is fairly high. A very large number of persons stated to have changed their residences (about 50 per cent.). Neither Mr. Carr nor I could satisfactorily explain this (*vide* also my notes on Erode, Tiruppattūr and Vellore). Otherwise, no remarks.

Arkonam (4th July 1904).

The Hospital Assistant, as usual, leaves everything to his clerk, who (in this instance) can hardly be expected to make out the defaulter's list daily, as he works the station office, as well as the passport-examining office.

The circle staff is told to visit the hospital and look out the passport registers, two or three times a week, but the Hospital Assistant cannot say what they do.

The relative number of passportes examined is unusually large. Those who leave, after partial examination, are mostly travellers by railway. It is said that the clerk keeps their tickets till they go away and thus has a check on them.

The village munsif has not opened a fever register. Up to about a fortnight ago, the Circle Inspector was in charge of the town only, but now he has some villages also. The village munsif was called and warned by the Sub-Magistrate that he should open a fever register without delay.

The Circle Inspector and the village munsif say that, at this moment, there is not a single case in the town (about 5,000 inhabitants) to be entered in the register. This seems almost impossible.

The Deputy Tahsildar says he sees all dead bodies before burial, so far as the town is concerned, and that the people have no objection to this.

Note on Kapagallu Plague Case (Bellary District).

Inspected Kapagallu, on the morning of 7th July 1904, with Mr. Cowie. Kapagallu lies about 5 miles north-east of Bellary and about 1½ miles off the main road.

There had been three cases of plague on 29th March 1904, all of which had ended fatally. The houses were then disinfected. On 29th June 1904, several cases of plague occurred in the same village, though not in any of the houses formerly infected.

Neither the sanitary staff nor Mr. Cowie nor myself could discover any source of possible re-infection from outside.

There are, at present, 7 passportes in the village, 5 from a village 7 miles east of Bellary and 2 from Bellary itself. There has been no plague in either place, within the last few months.

The nearest case of recent plague occurred in a village 18 miles north-west of Bellary: there appears to be no intercourse between that village and Kapagallu.

Poor people in Kapagallu get their grain from Bellary: the others have their own grain.

The Sanitary Inspector (P. V. Subbayya) at first told us there had been a history of dead rats: but, when the Supervisor (Mr. d'Souza) arrived and the villagers were examined, it appeared that there had been nothing of the kind, and the Inspector then admitted that he had merely said so, because he had supposed that it must be so.

The case would seem to be one of recrudescence, i.e., the infection would seem to have been latent in the village between 29th March 1904 and 29th June 1904. It seems curious, however, that the infection should have been transferred from the house originally infected to other houses in the village. How this was effected there seems nothing to show.

It may be noted that, in August 1902, a somewhat similar case of an outbreak of plague occurred in Adóni, after an interval of five months. There was no history of re-importation or of re-infection from outside or even of dead rats, and the case would appear to be not attributable with any degree of probability to any source but recrudescence.

Colonel King, the Sanitary Commissioner, at first believed this case to be one of recrudescence, but afterwards suggested that there were probably dropping cases to bridge over the interval. I am not aware what evidence there is in support of this view. The Municipal Chairman and the District Medical and Sanitary officer appear to have found none, though they were called on to submit (and did submit) special reports as to the cause of the outbreak in August 1902.

Inspection of the Bellary Passport-examining Office on 8th July 1904.

A separate register is written up daily by the circle staff, containing the names of all defaulters (either partial or complete), as also of all persons who have notified change of residence at the passport-examining office. Notes are made by the circle staff as to the results of their enquiries into all cases of default. When necessary, notes are also made as regards those who announce a change of residence. These registers are excellently maintained and are up to date. They are checked twice a week by Colonel Pemberton, who is in charge of the plague work of Bellary town, in addition to his other duties. The system is as near perfection as any system can be and, when coupled (as here) with close supervision, ensures prompt work on the part of the circle staff and makes fudging and concealment almost impossible.

Inspection of the Hospet Passport-examining Office on 10th July 1904.

A large number of passportes are, as usual, registered as going to other places. The Temporary Inspector was wholly incapable of answering any question or giving any information as to what system of check he adopted, either in their case or in the case of defaulters.

The rule was that the Temporary Inspector should keep a book and note in it the names of the defaulters, etc., about whom he had to make enquiries, but the Inspector says he makes his notes now on loose sheets of paper, none of which he was able to produce.

Further, the rule was that, in the case of names sent up to the Tahsildar for necessary action, the number of the passports should be entered in the office register. The temporary Inspector has discontinued this practice.

Mr. Noyce and I accordingly found it impossible to check the work of this Inspector in any way or to judge whether he is taking any steps whatever to enquire into the whereabouts of defaulters, etc. Mr. Noyce proposes to put another man on this work, as the present man is obviously incapable.

Inspection of the Guntakal Railway Passport-examining Office on 11th July 1904.

Examined the passport registers. The entries are made partly in pencil and partly in ink. I think that the use of pencil may facilitate fraud and mistakes. The reason is said to be that trains sometimes come in late and that the copying pencil is used in order to save time.

2. The Circle Inspector does not come to the station and the station staff is said to work independently of him.

3. Defaulters are reported to the Tahsildar of Gooty on a prescribed form. The office copy (A) of the last form sent to the Tahsildar contains the names of passportes Nos. 755/315 and 3294/333 (amongst others), both of whom defaulted on 4th July 1904. The report is dated to-day (11th).

4. The staff explain that they waited till the expiry of the full period of 10 days fixed and then reported; nor did they at first, judging by their answers, appear to consider it any part of their duty to attempt to trace out the whereabouts of these defaulters.

5. Subsequently, they changed their story and produced a rough list B, said to have been handed over to some constables. They explain that the Circle Inspector at Guntakal village has no concern with the station work (I am not clear why this should be so) and that they therefore employ a constable to trace out defaulters.

6. There are three Hospital Assistants here and it is not clear why one of them should not endeavour to trace out defaulting passportes. It is certainly not the duty of the police constables, and to let them do such irregular work seems to place considerable power of oppression in their hands.

7. The rough list B contains no notes of the results of the enquiries made by the constable. A pencil-mark is ticked against some names, and this is said to signify that the persons thus ticked off have been duly traced out.

8. The rough list is dated the 10th, so that, so far as passportes Nos. 315 and 333 (*vide* paragraph 3 above) are concerned, it is still clear that no attempt was made to trace them out for six days.

9. In the rough list, passportee No. 295/2928a is marked as being a defaulter on 6th July 1904: as the rough list is dated 10th July 1904, it follows that on that date he was so regarded: yet, in the passport register, he is entered as present on 6th July 1904, an entry which must be presumed to have been made on the 6th itself.

10. The explanation given is that this passportee was examined on 6th July 1904 and the fact of examination noted on his passport, but that the register happened to be locked up at the time and therefore no entry was made therein. The rough list B was subsequently made out, by comparison with the register, and therefore his name was wrongly included in B. The constable brought the man and his passport to the station, and the mistake was then found out and the passport register duly filled in.

11. I confess that this story seems to me somewhat suspicious. It may be noted that this is one of the pencil entries alluded to in paragraph 1 above. The explanation given in that paragraph for making some entries in pencil will not hold good as regards this entry, for it is not said to have been made in a hurry but in the course of an examination into the correctness of the defaulter's list B. If, on the other hand, the whole affair were a fraud, there might be good reasons for making a pencil entry, which could be erased at leisure. Again, I do not see why the

passport book should have been kept under lock and key, while examination of passportes was proceeding. However, I will assume the explanation to be correct and proceed accordingly.

12. I take another entry in B, namely passport No. 1206/323. In the passport register, he entered as having appeared on the 9th, but in B (dated the 10th, as already observed) he appears as a defaulter for the 9th.

13. The Hospital Assistant first explained that the passportee came for examination on the 10th. On my pointing out that this was inconsistent with the entry (9th) in the register, he changed his story and said that it was a case similar to the previous one. The passport had been initialled on the evening of the 9th, but not the register. The passportee and his passport had been brought to the railway station by the constable on the evening of the 10th and the mistake was then discovered and the entry made in the passport register.

14. The same explanation is given as regards passports Nos. 329 and 348 (serial numbers). Thus (1) the entries in the passport registers were not made on the date on which they purport to have been made, but were all made on the 10th, (2) passports are examined, in the absence of the passport register, (3) passportes are brought by the Police, after the expiry of the period of examination and in spite of their having been examined throughout the 10 days' period prescribed, (4) the police constables have been improperly sent to trace out and arrest passportes, though their business is simply the protection of person and property or the maintenance of order, (5) their main duty, so far as B is concerned, has been, by this laborious and vexatious process, to correct the errors of the passporting staff. These conclusions are of course based on the assumption of the correctness of the explanation given me (*vide* paragraph 11 above).

Intimation Form.

[Regulation 1 (10).]

Date of arrival.	Number of passport.	Name of traveller (in full, including house-name and caste title).	Father's name.	Caste.	Age and sex.	Whence coming.	Destination and residence during the next ten days.					Since when.
							District.	Taluk.	Village (or ansam or dosam).	Street.	Number or name of the owner of the house.	
1	2	2 (a)	3	4	5	6	7	8	9	10	11	12
1st July 1904 ...	755 315	Shaikh Sait ...	Mahaud Husain ...	Muhom- madan.	11, male.	Bellary ...	Anantapur.	Gooty.	Guntakal.	Bazaar ... Porter line: Do. ...	Care of Akbar Sait, Bazaar-man. Care of Shaikh Husain, Firman. Care of Arokiam, Watchman. Cooly Porter ...	4th to 10th July 1904. Do. 9th July 1904 to 11th July 1904. Do.
1st July 1904 ...	3294 333	Hussain Bee ...	Hussain Sahib ...	Do.	45, female.	Do. ...						
7th July 1904 ...	526/c. 404	Manual ...	Francis ...	Native Christian.	70, male.	Do. ...						
.....	...	Khaja Husain ...	Jamal Sahib ...	Muhom- madan.	45, male.	Do. ...						

GUNTAKAL,
11th July 1904.

(Signed) C. NARASAYYA,
for Hospital Assistant.

B
Intimation Form.
[Regulation 1 (10).]

Date of arrival.	Number of passport.	Name of traveller (in full, including house-name and caste title).	Father's name.	Caste.	Age and sex.	Whence coming.	Destination and residence during the next ten days.					Since when.
							District.	Taluk.	Village (or amsam or desam).	Street.	Number or name of the owner of the house.	
1	2	2 (a)	3	4	5	6	7	8	9	10	11	12
.....	295 2028/a.	Devendrappa	...	Hinda	23, male.	Bellary	Anantapur.	Gooly.	Guntakal.	Bazaar.	Own honso	0th July 1904 absent.
.....	297	Audiappa	...	Do.	25, male.	Do.					Do.	Do.
.....	315 755	Shaikh Sahib	...	Muham- madan.	11, male.	Bellary Canton- ment. Bangalore.					Care of Akber Sait, Bazaar- man.	4th to 9th, absent 8th July 1904.
.....	323 1206	Abdul Satar	...	Do.	8, male.	Bellary					Care of Abdul Rahim.	9th July 1904.
.....	329 5278	Madurai	...	Native Christian.	30, male.	Bellary					Care of Mr. Fox, Driver.	8th and 9th.
.....	333	Husain Bee	...	Muham- madan.	45, female.	Do.					Care of Shaikh Hussain, Fire- man.	.....
.....	348	Sultan Bee	...	Do.	38, female	Do.	Anantapur.	Gooly.	Guntakal.	Bazaar.	Care of Sudan Khan.	7th, 8th and 9th.
.....	354	Shaikh Abdul	...	Do.	58, male.	Do.					Care of Hafiz- khan, Contrac- tor.	6th, 7th, 8th and 9th.

GUNTAKAL,
10th July 1904.

(Signed) K. GOVINDA MENON,
Hospital Assistant.

Inspection of Passport-examining Office at Salem on 20th July 1904.

Cases of default in this office are entered on a daily list, which is sent to the Municipal Chairman direct. This seems unnecessary, as the Chairman has not got the control of the passport work.

No such list is sent to the circle staff. They come to the office daily and note the cases which relate to their division in a book kept in their custody and called the "Intimation Register." The result of the enquiries made by the circle staff is noted in this register, but not the action taken thereon.

The Divisional Inspector notes the result of his check in a book of his own called the diary. Whether he has checked all the cases entered in the "Intimation Register" could only be discovered with extreme difficulty, as his notes purport to follow the order of his actual check and bear no relation to the order of the entries in the Intimation Register. Here again, no orders are passed on the individual cases of default, though general remarks are made by the District Medical officer. Doubtless, the book serves an useful purpose for checking the general work of the Divisional Inspector: but the entry of every instance in which a case of default is examined seems to serve no purpose that might not be better served in the manner indicated lower down.

The orders finally passed in cases of default are apparently to be found on the backs of the triplicate passport forms, on which separate notes are written by the circle staff and orders finally obtained.

It is clear that this method gives a good deal of unnecessary work to the circle staff, four separate entries being made in regard to each case of default, and the complication of registers obscures and hinders every species of check.

If the list sent to the Chairman (a specimen A is appended) were enlarged, by the addition of a column for the Circle Inspector's remarks (at present it has only a column for the Divisional Inspector's remarks, which is not used) and, if this form were sent to the circle staff (or written up by the circle staff) daily and sent through the Divisional Inspector to the District Medical officer after enquiry (the results of the enquiry of the Circle and Divisional Inspectors being noted in the appropriate columns), no other register would be necessary, scriptory work would be saved and it would be very easy to see, at a moment's notice, whether the work of hunting up defaulters, etc., was being completely and promptly done. I may note that it seems desirable to make similar enquiries in the case of all persons notifying change of residence.

Captain Tucker informs me that these matters are engaging his personal attention.

A
SALEM MUNICIPALITY.
Plague passport absentee list on 16th July 1904.

Passport number, date and station of issue.	Name of passportee.	Father's name.	Age.	Whence coming.	Address in Salem Municipality.	Remarks of the Divisional Plague Inspector.	Disposal in the Municipal office.	Remarks.
10523 14-7-04 Tirupattūr	Fathsha	Allasa	50	Tirupattūr	Fort Masjid.			
10521 14-7-04 do.	Sundesa	Amir Sahib	40	Do.	Do.			
10522 14-7-04 do.	Aradeha	Eathsa	25	Do.	Do.			
13056 13-7-04 do.	Narayana Nair P.C. 106.	Varada Nair	...	Do.	Mettu Street.			
327 12-7-04 Tiruchengode.	Narasimha Aiyangar.	Appaji Aiyangar	35	Tiruchengode	Second Agraharam, Care of Desika Aiyangar, Assistant Inspector, Salem.	Proceeds to Malloor on circuit.		
						(Signed) V. J. KRISHNA RAO, Assistant Sanitary Inspector.		
						(Signed) (ILLEGIBLE), Hospital Assistant.		
STATION, Date				Passport Observing Officer.	STATION, Date	Divisional Plague Inspector.	Date	Plague Clerk, Municipal office.

Inspection of the Passport-examining Office at Trichinopoly.

EXTRACT FROM THE NOTES OF FIRST CONFERENCE AT TRICHINOPOLY ON 20TH JULY 1904.

* * * * *

I may note, in this connection, that I examined the passport-examining office at Trichinopoly. Defaulters' lists and lists of persons alleging change of residence are made out daily and promptly dealt with by the circle staff and higher authorities. Mr. Spencer has kindly let me have a copy of his own notes of inspection of the Srirangam passport-examining office.

Notes of Inspection of the Passport Register of the Srirangam Municipality on the 7th July 1904.

The passport work is entrusted to the Junior Hospital Assistant attached to the Municipal Hospital at Srirangam and the register is maintained by him. No register is maintained in the Municipal office.

2. The register is a locally purchased ruled note-book of foolscap size and the headings of columns are those prescribed by rule 8 of the Plague Regulations with an additional column for serial number. But column 6 (how long kept under observation) is not opened with ten sub-columns so that each date of attendance can be entered. The total number of days observed is simply filled in at the end of ten days instead of the dates of actual attendance being entered at once. A separate register which the Hospital Assistant calls his own private register is maintained with the following headings:—

- | | |
|------------------------------|---|
| (1) Number. | (7) Residence. |
| (2) Name of passport-holder. | (8) Date of passport. |
| (3) Father's name. | (9) Dates of attendance with ten sub-divisions. |
| (4) Caste. | (10) Destination. |
| (5) Age. | |
| (6) Occupation. | |

In this register are entered only those persons who present themselves for observation. Thus, if a passport-holder presents himself for observation with a duplicate copy of passport, an entry is made in the passport register as well as in the private register. If column 6 of the passport register is sufficiently expanded, there will be no necessity for the maintenance of a second register. The Chairman may be requested to supply the Hospital Assistant with printed passport registers, sold by the Superintendent, Government Press—vide G.O., No. 261/P., dated 5th February 1904.

3. *Column 1—Date of receipt of triplicate or other intimation.*—The dates are not chronologically entered. It is explained that passport-holders arrive a day or two previous to the date of receipt of the triplicate or other intimation. In such cases, it is stated that, all except the first column, are filled up with the information available in the duplicate passports and that when the corresponding triplicates or intimations are received, their dates of receipt are entered in column 1. It is for this reason that in several cases the dates of receipt of the triplicate or intimation (column 1) are a few days after the date of arrival of the passport-holder (column 4). This is conspicuous in some cases. In the case of serial No. 1600 of the passport register, the passport was issued at Tiruvannamalai on 11th June 1904 and the triplicate has been received by the Hospital Assistant on 21st June 1904. In the case of serial No. 1781, the date of passport is 27th June 1904, while the triplicate is received on 6th July 1904, viz., on the tenth day of observation. In some cases also, intimations have not at all been received. It may happen that the passport-holders give one destination at the place where the passport is issued and then change their mind to break their journey or to go to another place. In such cases, the intimations and triplicates are sent to the place originally intimated. This is usually the case with pilgrims. The Hospital Assistant ascribes the delay in the transmission of the triplicate or intimation, also to the fact that some of the forwarding authorities do not know to whom they have to address the triplicate or intimation; some send it to the Village Munsif of Srirangam taking Srirangam to be a village; some to the Tahsildar, the District Medical and Sanitary officer, or the Collector who sends it on to the Hospital Assistant, for Chairman of the Srirangam Municipality. The Chairman at times sends the triplicate to the Ward Inspectors direct for search and at other times to the Hospital Assistant. If this were to continue, there would be no end of evasions. Before the Hospital Assistant at Srirangam gets the triplicate or intimations, the passport-holder comes and leaves the place.

4. A circular may be issued to the Collectors of other districts specifying the officer in this district to whom the various local authorities in their districts should address their intimations or triplicates. In Kurnool, Cuddapah and Tinnevely these are received in the Collector's office. A register must be maintained of all of them and distributed to the several officers concerned—vide D. Dis. No. 160/P. of 1904, dated 4th July 1904, and No. 72/P. of 1904, dated 18th March 1904, and D. Dis. No. 165/P. of 1903, dated 9th November 1903, put up.

5. *Column 10.*—The dates of despatch of intimation of change of address to the authority concerned are not exhibited in many cases. Further, the practice of ascertaining whether or not a passport-holder intimating his change of address, has really departed from the town, is not followed.

6. *Column 11.*—In cases of observation for the full period this column is left blank. In cases of partial observation and change of residence, the dates of despatch of the intimation or triplicate to the local authority of the new place of residence are entered. In cases of evasion, no information is available as to when the triplicates or intimations have been referred to the Sanitary Inspector, the date of receipt of the report, etc., and how the case was finally disposed of. The remark "Not found referred to Chairman on" alone is entered.

Serial Nos. 1780, 1782, 1783, 1784 of the passport register.—The first passport-holder has appeared for one day only, viz., 27th June 1904, and the rest have appeared for three days, viz., on the 27th, 28th and 29th. No further action appears to have been taken. The remaining columns are left blank without remarks.

7. In some cases, fresh passports are stated to be issued at the Trichinopoly Fort Station to those who already hold passports and who have also undergone observation elsewhere. Such passport-holders are observed here for ten days from the date of issue of the passport at the Trichinopoly Fort Station.

8. The Hospital Assistant states that some passport-holders appear for observation without duplicates and intimate their change of residence the next day. In such cases, he signs the triplicate passports and hands them over to the traveller, sending at the same time an intimation to the local authority of the new place of destination. It is not known how far this procedure is correct. A copy of the triplicate may be issued.

9. The letter of the Sanitary Commissioner drawing the attention of the Chairman, Municipal Council, Trichinopoly, to the correct working of the passport system is put up for perusal. A copy of the letter was also communicated to the Chairman, Srirangam.

(Initialled) C. G. S.

PROCEEDINGS OF THE COLLECTOR OF TRICHINOPOLY.

Dated the 17th day of July 1904.

1. The register is a locally purchased ruled note-book of foolscap size and the headings of the columns are those prescribed by rule 8 of the Plague Regulations with an additional column for serial number. The column for "How long kept under observation" is not opened with ten sub-columns so that each date of attendance can be entered. The total number of days observed is simply filled in at the end of ten days instead of the dates of actual attendance being entered at once. This should be amended. A separate register which the Hospital Assistant calls his own private register is maintained for entering certain particulars about passport-holders who present themselves for observation. If column 6 of the passport register is sufficiently expanded, there will be no necessity for the maintenance of a second register. The Chairman, Municipal Council, Srirangam, is requested to supply the Hospital Assistant with printed passport registers, which may be obtained from the Superintendent, Government Press—*vide* G.O., No. 261 P., dated the 5th February 1904.

2. *Column 1—Date of receipt of triplicate or other intimation.*—The dates are not chronologically entered. It is explained that passport-holders arrive a day or two previous to the date of receipt of the triplicate or other intimation. Intimations or triplicates received after much delay, should be sent to the Collector so that the delay may be pointed out to the Collectors concerned. There are cases in which intimations have not at all been received. This omission may be due to the fact that certain travellers, especially pilgrims, give one destination at the place where the passport is issued and then arrive at a different place. Such cases should be promptly reported to the Collector on arrivals of the travellers at a place other than the destination given in the triplicate or intimation in order that those who give false addresses at railway inspection stations, may be prosecuted.

3. *Column 10—Date of despatch of triplicate passport to the local authority of the destination, and the intimation to the Tahsildar, etc.*—The dates are not exhibited in many cases. This should be done in future. The practice of ascertaining whether or not a passport-holder intimating his change of address, has really departed from the town, is not followed.

4. *Column 11—Date of despatch of the duplicate passport to the Tahsildar, etc.*—In cases of observation for the complete period, this column is left blank. The date of sending the passports to the District Medical and Sanitary officer or Collector should be entered. In cases of partial observation and change of residence, the date of despatch of the triplicate to the local authority of the new place of residence is entered. This is wrong. This date should be entered

in column 10. In cases of evasion, no information is available as to when the triplicate or intimations were referred to the Sanitary Inspectors, when their replies were received, etc., and how the case was finally disposed of. In the case of serial Nos. 1780, 1782, 1783, 1784 of the passport register, where the passport-holders have failed to appear for observation the first after one day's and the rest after three days' observation, no further action appears to have been taken. The Chairman is requested to report what action he took in these cases.

5. The attention of the Chairman is, in this connection, drawn to the instructions given by the Sanitary Commissioner in his letter No. 3812/S., dated 30th September 1903, communicated to him with this office No. Ref. (e) on Current No. 423/03-P., dated 3rd October 1903, regarding the correct maintenance of the passport register. The precautions therein recommended of immediately sending the names and addresses of defaulters to Sanitary Inspectors, the moment the hours of examination for the day have ended, should be followed.

(Signed) C. G. SPENCER,
Ag. Collector.

Inspection of Passport Work at Kurnool on 27th and 28th July 1904.

Inspected passport-examining office, with the District Medical Officer. It is noted that no check is exercised, in regard to passportes announcing their intention of proceeding to other places.

2. As far as defaulters are concerned, the circle staff work under the Chairman, to whom the name of each defaulter is sent on a foil, the counterfoils being retained by the passport-examining officer. The staff also send their reports to the Chairman, who disposes of them.

3. I think that, if the number of absentees, defaulters, etc., grows large, the authorities will find the system of *daily* defaulters' lists easier to check and manage.

4. The District Medical officer has a general supervision over the circle staff, but the system in vogue makes it difficult for him to check their work, so far as defaulting passportes are concerned.

5. I visited the Municipal office, on 27th July 1904, with the District Medical officer and again on 28th July 1904 with the Collector and Official Chairman (Treasury Deputy Collector). The Assistant Sanitary Inspector, Chengal Rao (a temporary man), first said the records in connection with passports were in the Municipal office and afterwards said they were in his house.

6. The Head Clerk of the Municipal office said that the records had, for the last month or so, been kept in the house first of one Nágayya and then of Chengal Rao. Next morning, both Nágayya and Chengal Rao denied this, but the Head Clerk stuck to his story.

7. The Head Clerk was wholly unable to give me the smallest information, in regard to the disposal of the defaulters' lists or as regards what happened finally to any of the papers. The Chairman explains that, owing to the inefficiency of his municipal staff, the sanitary staff have done the entire scriptory work, in connection with defaulters' lists.

8. This system has the effect of making the sanitary staff practically independent of any checking authority, inasmuch as they perform the work of the Chairman's office, in addition to their own. The Chairman informs me that he is going to entrust the duties to a clerk independent of the sanitary staff for the future.

9. Up to about a month ago, there was no register opened for the systematic check of these cases of default, but the Chairman has maintained, since 18th June 1904, a register corresponding with the foils received from the passport examining office. With a few alterations in detail (explained in person to the Collector and Chairman), this system of check will be found sufficient, so long as the system of foils and counterfoils continues to be used (*vide* paragraph 3 above).

10. The form has not been carefully written up by Nágayya and Chengal Rao. Disposals of over a month old have not been entered, reminders have not been sent, in the case of old references, and, in one or two cases, notes have been written a month ago and no orders obtained on them (*vide* cases Nos. 126, 132, etc.). As noted above, the Chairman is going to alter the system, under which this record is kept by Chengal Rao.

11. Apart from the lack of system displayed, I observe that work appears to be done fairly well. A large proportion of the passportes are fully examined, the number who allege change of residence is, after all, not very large and notes have been made by the circle staff, in the case of all absentees and defaulters, though (as noted above) more care would seem to be desirable in securing and noting the final disposal of the cases. All these matters are engaging the personal attention of the Collector.

Note on an Experiment made with Hydrocarbon at Guntakal on 3rd August 1904.

Dr. E. S. Chenai performed a series of experiments, in the presence of Mr. Scott and myself. Repeated showers of hydrocarbon were poured on a lizard. After five minutes, it seemed very weak, but had not absolutely succumbed. A mouse was similarly treated. After over ten minutes (during which time its movements were convulsive), it appeared to be recovering. When put on its legs, it attempted to crawl away and seemed hindered mainly by the fact that one of its hind-legs was hopelessly injured (this injury had been present before the commencement of the experiment). The mouse was destroyed on the spot, at our request.

The interior of a railway hut was treated with hydrocarbon and ignited. The resultant phenomena were the same as those described by Colonel Bannerman, in paragraph 3 of his letter printed in G.O., No. 735/P., dated 14th May 1904. A thermometer placed half way up the wall near a closed window frame registered 220° F. about a quarter of a minute after removal from the room. Dr. Chenai is of opinion that the plague bacillus could not survive a temperature of 120° F. I may note that, where there were rat-holes, the flames lingered much longer.

After the door had been opened, I felt a part of the floor which had been blazing half a minute before. It did not then feel hot. I may add that I had noticed the same thing in the case of the floor of a hut, in which bratties were being burnt, though the part I felt on that occasion was not the part on which the bratties had been heaped but the intervening space over which the bratties were afterwards raked.

Two rats, hung in a cage just below the ceiling (about 12 feet above the floor), were killed, and some of the metal of the cage melted.

A bucket was half filled with water and hydrocarbon poured thereon and ignited. It burnt for two minutes with great vigour. When it had burnt itself out, the temperature of the water was tested. It was about 100° F. in the upper portion, with a cooler layer (about 80° F.) below. This seems to suggest that the heat generated by the hydrocarbon *ascends* for the most part.

The process, unless very carefully done, would be extremely dangerous. The material is very easily ignited and anybody within range of the flames (and possibly of the smoke) would meet his death. The flames stretched out for several feet from the door of the hut.

APPENDIX V.

EXTRACTS FROM JOURNALS.

THE BRITISH MEDICAL JOURNAL.

Vol. I, p. 39.] THE INOCULATION DISASTER IN THE PUNJAB. [3rd Jan. 1903.

Lamentable accidents from the use of contaminated serum have in the last few years been recorded at Milan and elsewhere, and the report of a similar disaster in India has been received with great regret. The facts, as given by the *Times of India*, are as follows:—After a series of inoculations against plague conducted by a European Doctor in the small village of Malkowal, near Gujrat, where the people came forward freely, headed by their local officials, several cases of illness occurred and rapidly became grave. Suspicion was quickly directed to one particular phial of the fluid used, and our contemporary believes that subsequent examination has proved that it must have been contaminated. It is said that the whole of the persons inoculated from that phial became dangerously ill, and that nineteen in all have died from the effects. According to another account, of twenty five men inoculated all have died.

Vol. I, pp. 47 and 48.]

INDIA.

[3rd Jan. 1903.

THE CAMPAIGN AGAINST PLAGUE.

As so many of the mill hands belong to low and ignorant castes who are very difficult to deal with, Cawnpore was a particularly dangerous place in which to try to introduce inoculation, or, to use a more correct and safer term, vaccination against plague. The difficulties have, however, been overcome in a very satisfactory and ingenious manner, if the following story be true, as I have good reason to believe it to be. The officer in charge began by treating only Europeans, who were injected in the presence of the natives. When, after a time, some of the lower class natives began to enquire about the process, they were informed that the vaccine was only for the "sahibs," and was much too valuable to be wasted on them. This aroused great interest and, after still more inquiries for the prophylactic had been received, the doctor said that, as he had a few doses over, which he did not want to throw away, he could do just two or three of them, and proceeded accordingly. When the people found that no serious harm resulted, they came forward in increasing numbers, until after a short time several hundred were being protected weekly, with most gratifying results up to date. The people are now beginning to return to work, and the outbreak is on the decline. Thus, by the display of timely tact and by avoiding the common mistake of making things so cheap as to rouse suspicion as to their beneficial nature, all fears were overcome in the case of an extremely ignorant and fanatical people. The weekly plague figures have risen rapidly, as is usual at this time of the year, and unfortunately there are now over 10,000 deaths a week against just under 8,000 at the same time last year.

Vol. I, p. 206.]

THE FIRST EGYPTIAN MEDICAL CONGRESS.

[24th Jan. 1903.

PLAGUE IN EGYPT.

Dr. Gottschlich (Alexandria) next read an extremely original paper on the plague in Egypt. He distinguished two types, a commoner or summer form, bubonic in character, and relatively benign, and a much rarer and more severe winter form, which took on the features of a malignant epidemic, beginning with pneumonic cases. Dr. Gottschlich stated that he had discovered that the revival of the disease in the spring was due to the multiplication of rats, which attained its maximum at that time of year. Both types of disease were, according to him, due to rats, but he held that thorough isolation and disinfection of every case of plague would nearly always prevent the outbreak of a pneumonic epidemic; a general system of disinfection was, in fact, the sole means of effecting the definite extermination of plague in any particular locality.

SYDNEY.

Vol. I, p. 822.]

THE BUBONIC PLAGUE.

[4th April 1903.]

Although several cases of bubonic plague have occurred in the other States, so far none has been reported in New South Wales for several months. But, in view of the danger of the disease being imported afresh, the Board of Health are taking every precaution to enforce all the regulations bearing on this disease which have been in force in the previous epidemics. Bacteriological examination of rats from different parts of the city has failed to reveal any trace of the disease in them. Several plague-infected rats have been found in seaport towns in Queensland and West Australia, and the regulations affecting the mooring of vessels arriving from these ports are strictly enforced.

Vol. I, pp. 1101 and 1102.]

RECRUDESCENCE OF PLAGUE.

[9th May 1903.]

The reports on the prevalence of plague, which we notify week by week in our columns, have during the past few weeks indicated rather a serious state of affairs in several quarters. India has during the past winter suffered from the most serious epidemic experienced since the disease appeared in Bombay in 1896. As reported in our columns, over 32,000 deaths from plague occurred in India during the week ending March 28th, and, during the succeeding week, the deaths from the disease reached the enormous total of 34,000 or about 5,000 deaths daily. At the present moment, it is not so much that any one city or district in India is seriously affected, as that the disease is very widely spread. Central India and Hyderabad remained for a long time free from the disease, whilst the provinces around them were being severely scourged; but these two previously immune areas have lately been added to the list of districts affected. It is satisfactory to note that, although several parts of the Madras Presidency have been visited by plague, the city of Madras itself has remained free, and the medical and sanitary authorities of the city are to be congratulated upon the fact. We would warn them, however, that continued vigilance is necessary, if they are to maintain their immunity; but we are willing, from what we know of the inroads of plague, to free them of blame, should plague unfortunately invade the densely populated city. It has occurred over and over again that, in districts in which plague seemed to be staved off by the vigilance of the authorities, the epidemic has appeared, while yet all known channels of entrance have been carefully guarded, and it would appear that our knowledge of how this disease gains access is as yet quite imperfect.

We have been rendered familiar by events in many quarters with the fact that rats contract plague, but Professor W. J. Simpson has recently shown that many of our domestic animals are subject to the disease and are in all probability capable of transmitting it to man. If this is the case, an outbreak of plague is a calamity which may well terrify any community, for a disease which becomes endemic by virtue of a general infection of animals, of which the rat is only one and, it may be, an insignificant factor in the spread of plague, is an infection which is likely to remain indefinitely in any place in which it attains a hold. In Hong Kong, plague is again recrudescing, and, after some six weeks of immunity, the disease is once more in evidence in Mauritius. In Cape Colony, the plague report is far from reassuring, and, in such widely-separated towns as Port Elizabeth, King Williamstown, and Graaff-Reinet, the rats are found to be infected, and cases of plague in human beings are reported from time to time. Recent telegrams also seem to point to a possible infection of Johannesburg. The Cape would appear to be becoming saturated with plague, and we should not be surprised to hear that the disease has become widely prevalent, as there can be no doubt that it has become endemic.

The arrival of a ship at Plymouth from Sydney, from which a case of plague was landed at Suez, last week, shows that plague continues in Australia, and, although apparently neither very widely spread nor virulent, yet the infection remains, and is capable of being carried by ships to distant ports. It is satisfactory to note that at the present moment Egypt is free from plague and that both North and South America have got rid of the disease.

Strict vigilance at our ports is the only safeguard against the importation of plague into this country, visited as it is by ships from several infected areas. A vigilant watch is, we know, being maintained, and rightly so, for, so long as plague remains in India, so long does it behove the authorities in all European ports to be watchful of ships arriving from the east.

What is to be done in India to check the ravages of plague is a difficult question, but it is one to which both the India Office and the Government of India must give early attention. The authorities and natives of India seem to have accepted the inevitable. The difficulty of setting aside the prejudices and religious observances of the natives of India is an ever-present obstacle, when any new sanitary measures are undertaken. We sympathise with the authorities in their struggle. At the same time, it is possible to make too much of native prejudices and to give way to them to an extent not quite justifiable. One of the most glaring instances of this kind occurred lately, when the authorities, to humour the natives, refrained from killing rats, although they were known to be infected. Certain sects of India forbid the taking of animal life, but, when the animal in question is a danger to the community, to India, and to the world generally, we question the wisdom of giving way to such prejudices.

It is asserted that, were the authorities to insist upon the destruction of the rats, there would in all probability be a riot, perhaps bloodshed. Blood has been shed for less commendable reasons than the protection of humanity from one of the most terrible diseases known, and, even at the risk of creating a local riot, it is doubtful whether the continued giving way on almost all points of sanitation to antiquated prejudices is wise in the long run. There is no doubt that the state of India owing to plague at the present moment is pregnant with extreme danger to the whole world, and it is possible, in fact more than probable, that the European Powers may request Great Britain to take stringent measures that this focus of danger be summarily dealt with. So accustomed have we become to the presence of plague in India that, even whilst people are dying at the rate of almost 5,000 daily, no single British paper thinks it worth while to give telegraphic accounts of the course of the epidemic. There are no grounds for panic, but, to save our fellow-subjects from a loathsome disease and to maintain the sanitary pre-eminence which belongs to us by our exertions in the cause of hygiene, it is time the condition to which India has been brought by plague should receive the serious attention of the imperial authorities.

Vol. I, p. 1491.]

THE EPIDEMIOLOGY OF PLAGUE.

[27th June 1903.]

NOTE ON THE FLEAS OF RATS

FRANK TIDSWELL, M.B., CH.M., SYD., D.P.H., CAMB.,
Principal Assistant Medical Officer to the Government of New South Wales.

In opposition to Simond's hypothesis that bubonic plague is disseminated by fleas from infected rats, it has been urged that the fleas of rats will not bite human beings. Simond himself, whilst admitting his inability to pronounce upon the species of the fleas found by him upon rats, nevertheless clearly states that they bit human beings upon whom they were placed. Professor Galli Valerio, of Lausanne, has reported that the species of fleas found by him upon rats are *Typhlopsylla musculi* and *Pulex fasciatus*, and that neither of them will bite man. Simond's observations were made in India and Galli Valerio's in Europe, and it seemed by no means improbable that their conflicting results were due to the fleas found by them being of different species.

It does not follow that the fleas harboured by the rats in two widely different places would be exclusively of the same species. With a view to determine these points, a collection of fleas was made from the rats coming under my examination during the recent epidemic of plague at Sydney. Of 100 fleas obtained, 10 were identified as *Pulex fasciatus*, 8 as *Typhlopsylla musculi*, 1 as *Pulex serraticeps* and 81 as *Pulex pallidus*. It will be seen that no less than four species were represented and most abundantly one (*pallidus*) not hitherto mentioned, as far as I am aware, as occurring on ordinary rats. Its stated hosts are *Mus latipes* of Socotra and *Herpestes ichneumon* of Egypt. This species bit us in laboratory trials, as did also *Pulex fasciatus* upon one occasion. *Pulex serraticeps* is well known to attack man. The remaining species, *Typhlopsylla musculi*, did not bite us. The details of the observations form part of a forthcoming official report, but in the meantime it may be noted that they tend to remove an otherwise fatal objection to Simond's views.

Vol. II, p. 49.]

QUEENSLAND NOTES.

[4th July 1903.]

The following interesting statement regarding the plague in Queensland has been kindly furnished to your correspondent by the Commissioner of Public Health, Dr. B. B. Ham: "Since the present outbreak—the fourth, so far as Brisbane is concerned—there have been 13 cases of the disease, eight having occurred within the city of Brisbane, three at Townsville and two at Rockhampton. The number of deaths has been seven, or a mortality of nearly 54 per cent. During the past three months, 3,274 rats were received for bacteriological examination, but only 25 of them were found to be plague-infected. 2,769 rats were also destroyed without examination. An interesting fact is that three mice were found to be plague-infected. 'Contacts' of bubonic are kept under supervision of the Health Officer for a period of six days. They are neither quarantined nor deprived of their liberty, and in no instance has any case of plague arisen among them. Some 120 men have been employed by the Health Department during the past month (March) in the work of rat destruction—laying poisoned baits, setting traps, digging out rat-runs and burrows, removing carcasses, taking up rat-eaten floors, removing waste food materials and disinfecting the soil beneath floors where rats were found. Systematic and frequent inspection of the districts by the various local authorities, with a view to the destruction and abatement of nuisances, has also been insisted upon, and the occupiers of a number of dirty premises have been dealt with. Vessels in the plague-infected ports of Queensland have been required to fend 4 feet off from the wharves and to have rat guards of an approved pattern attaching to all moorings.

The holds of vessels continue to be fumigated at the port of departure and again on arrival at the terminal port. A large number of rats have been collected from various centres of Queensland, where plague has existed, and from other places in the State, for the purpose of classification. The majority of the rats examined would appear to be a rufous tropical variety of the *mus rattus*. The fleas from infected and non-infected rats are under investigation, and a number of a *Pulex* (species undetermined) are included in a collection of *Pulicidae* embracing the *Pulex irritans* (Linn.) and the *Typhlopsylla musculi* (Dugas), etc.

Vol. II, pp. 387 and 388.]

HONG KONG.

[15th Aug. 1903.]

REPORT OF THE GOVERNMENT BACTERIOLOGIST FOR THE YEAR 1902.

The *Hong Kong Government Gazette* of June 5th contains the first annual report by Dr. William Hunter, Government Bacteriologist. For many years, local Medical Practitioners have felt the urgent need for a bacteriologist to whom they could refer in cases of difficulty requiring special bacteriological skill; it is a matter of the greatest satisfaction, therefore, to know that there is now a special department in Hong Kong, where all kinds of bacteriological examinations can be carried through. The report is of the highest interest and of the greatest value to those interested in tropical diseases. The work has been greatly hindered, through the loss by shipwreck of the whole of Dr. Hunter's bacteriological apparatus and also by the fact that no special building has yet been erected for this department, though a site has now been fixed upon and a building will soon be erected. In March, the pathological work at the Government Public Mortuary was, at the request of the Principal Civil Medical Officer, taken over by Dr. Hunter, and the report deals largely with the cases there examined. At the public mortuary a regular system of *post-mortem* and the bacteriological examination of rats was instituted; assistants in this work were at first Japanese, then later Chinese trained in Western Medicine at the Hong Kong College of Medicine for Chinese. "During the year," Dr. Hunter reports, "2,816 human bodies were examined at the Public Mortuary. These figures, I understand, represent a number of necropsies larger than in any previous year since the institution was established. Further, I am sure that these figures are probably unique. I know of no institution where, given suitable accommodation, apparatus and assistance, greater scope would be afforded for pathological and bacteriological research." In addition to the routine *post-mortem* work, there have been 1,17,839 rats examined bacteriologically, approximately 400 rats examined daily during the year. Of these 2,015 were found to be infected with plague.

Of a total of 1,17,839 rats examined, 2,015 were found infected with plague. The paths of infection in the rat are numerous. The skin: the mere rubbing of plague material on the shaved abdomen of the rat is sufficient. The mouth, the throat and the nose are frequently sources of infection. In these cases, one frequently has evidence of infection of the nearest lymphatic glands—for example, those of the neck. In other cases, it is not difficult to trace the infection by way of the alimentary canal. The stomach and small intestine show marked swelling, oedema and hæmorrhagic infiltration. The intestinal follicles and mesenteric glands are the seat of great oedema and blood extravasation. The glands may even reach the size of a pea and they contain enormous masses of plague bacilli.

Further, infection may take place by way of the lungs, setting up what is called an "aspiration pneumonia." This may either be patchy or affect the whole lobe of a lung, and the consolidated patches always show great hæmorrhagic infiltration. The parts are always choked with plague bacilli. The method of infection in these cases is certainly from direct contact with other rats dead from plague or plague-infected material. It is a well-known fact that the dead body of a rat is usually devoured as food by other rats. Examination of fowls and dogs gave negative results, but, in mice and cats, several were found to have the plague infection. The circumstances under which the cats became infected were carefully gone into, with the result that Dr. Hunter has no doubt that they were infected by plague-infected rats.

Vol. II, p. 614.]

[12th Sept. 1903.]

THE INTERNATIONAL CONGRESS OF HYGIENE AND DEMOGRAPHY.

PLAGUE.

The sixth and seventh sections discussed measures for combating plague. It was agreed that the quarantine imposed on persons coming from countries infected with bubonic plague should be freed of its vexatious character and that the evil could be combated more efficaciously by the institution of suitable sanitary services on board ships and by general international measures against the means by which plague was spread, including the extermination of rats likely to be infected.

Vol. II, p. 715.]

PLAGUE IN DOMESTIC ANIMALS

[26th Sept. 1903.]

BY

JAMES CANTLIE, M.B., F.R.C.S., ENG.,
Surgeon, Seamen's Hospital Society.

The report that has recently reached this country that several fowls, a duck, and a quail, exposed for sale in the Hong Kong Market, were found to be infected with plague is one which is calculated to create alarm, or, at any rate, to open up a wild field of enquiry. The fact that domestic animals and animals exposed for sale as food are subject to plague helps, perhaps, to explain the endemicity of the disease and the persistency with which it clings to a town or district where it has once prevailed. It is an old belief amongst the Chinese in Yunnan that almost all domestic animals are liable to plague, and they actually formulate a scale of relative infectivity amongst animals. The Chinese believe that the animals which by their stature are nearest the ground, such as mice, rats, cats, etc., contract the disease first and that the taller animals—pigs, sheep, cattle and horses—are less liable and are always attacked subsequently to the smaller animals. Whatever truth there may be in this observation, there is no doubt that the statement that domestic animals are readily liable to plague is correct.

The experiments carried on in 1902 by Professor W. R. Simpson and Dr. Hunter in Hong Kong have taught us new facts in connexion with the infectivity of domestic animals. By vaccinating, inoculating and, more especially, by feeding animals on plague cultures or on the blood or organs of plague-infected animals, Professor Simpson showed that monkeys, sheep, calves, pigs, fowls, geese, ducks, pigeons, turkeys, etc., readily contracted plague, and one of the most telling results of his observations has brought home to us the fact that they more readily became infected when fed upon plague bacilli in any environment than by any other known means of causing infection. He proved also that the bacilli were found in the flesh, in the organs and in the excretions of these animals, and the fact that the skin parasites readily acquired the bacillus when fed on plague-infected animals has long been known to us.

How far the flesh of these animals is concerned in communicating plague would seem to depend upon the degree to which it is cooked. The flesh of thoroughly cooked plague infected animals can perhaps be consumed with impunity, but in China thorough cooking is regarded by some classes of the community as calculated to destroy the flavour of the food, and they not infrequently partake of entrails after merely washing them. In connection with this subject, it may be of interest to know that the Chinese use the duck—one of the animals which readily contract plague—in various ways in cases of illness. In attacks of fever, from whatever cause, duck's blood is liberally smeared over the face, neck, trunk and limbs, and the duck is used as we use a poultice. In abdominal pains, a live duck is split open along its ventral aspect and then immediately, whilst warm, applied to the abdomen of the sufferer, as we would a hot fomentation or a linseed meal poultice.

In China and in many Oriental countries, the domestic animals, such as fowls and pigs, live in close proximity to human beings, so close in fact that they are often under the same roof and housed or allowed to wander about in the same apartment. The consequence is that, whether the human beings or the animals contract plague first, either may infect the other, for each is liable to the disease. In this way, the disease becomes endemic in a particular house or apartment, whilst other houses or apartments close by are free from plague.

Our attention has perhaps been too closely bestowed upon rats as the carriers of plague; for, whilst pursuing that theory, we have neglected the facts now brought to our notice that many or probably all domestic animals suffer from the disease and that a multitude of other *foci* of infection are at hand.

Of acute and chronic forms of plague in animals, the latter is the more interesting from an epidemiological point of view. Professor Simpson finds that pigs may suffer from plague for weeks, without betraying any symptoms of illness. He tells us that pigs with plague remain in apparently good health, even when their temperature is 103° F., or more; and it is only by carefully recording their temperatures that we have any evidence that they have departed from the normal. For three or four or more weeks, the pig may suffer from high fever, after contracting plague, but, until a few hours before death, it gives no sign or symptom of illness.

Turkeys may live after being infected as long as 44 days, ducks for 54 days, geese for 35 days, sheep for 34 days and so on. During all this time, however, the animals are giving off plague bacilli in their faeces and urine and infecting the parasites which inhabit their skin and its coverings. Men and animals which are brought into intimate contact with them are thus exposed to infection.

These new facts in connexion with plague help us to understand its persistency, its endemicity and the difficulty of its eradication, for it would appear that every living thing in proximity with the plague focus may contract the disease. The transmission of plague by ships is, in the light thrown on the subject by recent facts, keenly brought home to us. At plague-infected seaports, every kind of device has been practised to prevent rats getting from the infected shore to the ship or from the infected ship to the shore. But, whilst guarding against rats, the fowls, geese, ducks, turkeys, sheep and pigs may have been brought on board for purposes of consumption by the crew or passengers, or for transmission from port to port. Each and all of these animals, however, may be infected, suffering from chronic plague and yet giving no sign

or symptom of illness. The rats in the ship may be free from plague until the fowl came on board, yet it is only when these rodents die that plague is suspected. The acrimonious discussion as to whether the rats are infected first and man afterwards, or *vice versa*, has raged for several years, but the varying evidence brought forward may find its solution in the fact that it was some other animal that infected both and that the rat and man developed the disease almost contemporaneously. Plague has frequently occurred, whilst the rat remained free, as proved by the most careful bacteriological enquiry, and epidemiologists have, in their conviction that the rat and rat only is the carrier of the disease, been led astray in their investigations. Plague appeared in Glasgow, but no rats were found infected until 12 months afterwards, and there can be no doubt that some other animal from on board a ship sailing from a plague-infected port was the conveyer of the disease.

The prophylaxis of plague therefore assumes a much wider proportion than has hitherto been bestowed upon it. Any and every animal received on board ship may possibly convey plague; it may be suffering from plague and yet show no signs of illness. The fowl will readily eat its food and the pig's appetite will continue as voracious as ever, even when the temperature of the former may be 107° F. and that of the latter 104° to 105°.

These are problems which the Sanitary Officer of the Port must at once take in hand, if plague is to be controlled. The one evidence of plague in animals, short of examining the blood or excretions of the animal for plague bacilli, is that of temperature; so that it comes to this, that the temperature of every animal, previous to being received on board from a plague-infected port, should be tested and steps taken to weed out the apyrexia from the pyrexia—a laborious process, no doubt, but it is the only means known to us at present how to separate the infected from the healthy. Not only, however, is it domestic animals that are known to be infected. The marmot in Mongolia was proved by Clemow to suffer from plague; bats were found to be infected in Naples; pigeons, which were until recently held to be immune, are now known to succumb readily to the disease, and the story of the crow flying over Rome, falling dead in the street and infecting children with plague who picked it up, is readily explainable in the light of modern research.

What is wanted is a ready means of diagnosing plague in animals, for to take the temperature of each pig of a large consignment or to examine the blood for plague bacilli is an ordeal the best equipped port officers could not possibly do. Could we tell by inspection that an animal had plague, we might hope to be able to control plague in some measure, but, until we discover a rapid method of diagnosing plague in animals, I fear we have little hopes of combating the spread of the disease.

Vol. II, p. 1668.]

[26th Dec. 1903.]

REPORT ON THE SECOND PLAGUE EPIDEMIC IN SYDNEY.

Dr. Ashburton Thompson, President of the Board of Health, has published an elaborate report on the second plague epidemic in Sydney. The observations of 1900 that the epidemic was not caused by direct communication with the sick, nor by diffusion of infected articles, nor by place infection have been confirmed and amplified. The epidemic declared itself with the third case in January, 1902, and ended on June 8th of the same year. There were 132 cases among whites, 34 proving fatal, and 7 among the Chinese, of which 5 ended fatally. The onset of the disease was marked by extreme deliberateness at first and by an almost regular acceleration in its later stages, while its end was abrupt and decisive. Only two of the persons attacked asserted that they had been inoculated; one patient who died had been inoculated with the Haffkine serum at Rockhampton two years previously. Dealing with the origin of the epidemic, Dr. Thompson states that the only hypotheses worth considering were the following: either the epidemic depended upon a recrudescence of the epizootic of 1900 or upon a second epizootic set going by newly-imported plague rats. As to the former, the Health Department had reason to believe that the epizootic of 1900 died out in the course of that year, but the evidence was insufficient to establish the fact. Still, the recurrence was apparently too long delayed to have been a recrudescence and the balance of evidence at Sydney appears to tell in favour of reimportation. The Board of Health has decided that, while there is no pathological evidence that man is infected by feeding, there is abundant testimony that he is usually infected by inoculation and that the agent between the rat and the man is the flea. It was found that, although commonly the flea which infests the rat has no special predilection for man, it yet appears to have no repugnance to him, but will feed freely upon his blood, if it be hungry. Hence, it is plain that there are at least two chances against man's being bitten by any of the species of fleas which infest rats. One is that fleas which have left a plague rat may never come within reach of man, though on the same premises with him; the other is that, if they reach him, they may do so at a time when they are not so urged by hunger as to bite an unaccustomed host. These chances account for the fact that persons who inhabit premises infected with plague rats frequently escape infection.

P. 114.]

INDIA AND THE COLONIES.

[9th Mar. 1904.]

QUEENSLAND.

During the year under review, there was an outbreak of plague, the fourth in Queensland; 26 cases with 14 deaths occurred; 19 of the cases occurred in Brisbane. Some 17,000 rats were caught, 9,530 being bacteriologically examined and 91 found infected with the *B. pestis*. Plague regulations were put into operation and effectively carried out.

Pp. 617, 618.]

INDIAN SANITARY REPORTS.

[12th Mar. 1904.]

THE PUNJAB.

The cause of this very high mortality, in a year when a low rate might reasonably have been expected, was plague, which carried off 1,71,302 persons, or 8.52 per 1,000 of the population of the province. The disease prevailed most in the central and most populous provinces—in Ludhiana, Umballa, Sialkot, Jullundur, Gurdaspur, Hoshiarpur and Lahore. The death-rates caused by plague varied between 71 and 10 per cent., and in some localities rates of from 20 to 40 per cent. were reached. The disease attacked small towns and villages rather than cities, and the rural mortality exceeded the urban. Dead rats were observed in villages before the outbreak and, when, under these circumstances, houses were promptly evacuated, the inmates escaped. Females suffered in higher proportion than males. The disease, commencing in October 1901, rapidly rose to a maximum in March and April and then fell to a minimum in August. The facts relating to the disease and the measures adopted to control it have been specially reported by a special officer.

BOMBAY.

The plague mortality was higher than ever and accounts for the high death-rate. The number of deaths registered was 1,84,752, giving a rate of 10 per 1,000. The disease extended its area of prevalence and was very virulent. No mention is made of preventive measures.

P. 624.]

THE PLAGUE OF RATS.

[12th Mar. 1904.]

Dr. Harrison, Medical Officer of Braintree, has recently, it is stated, called attention to the large rats which infest the town. He has suggested the formation of a rat club, the members to pledge themselves to catch a certain number of rats or be fined. He says that he has done his best to keep the rodents down, but has not been supported. He may perhaps get a useful hint from a campaign with scientific weapons, which has recently been carried out with success in France. In the Chamber of Deputies, complaint was made by the representatives of rural constituencies in certain departments of the immense damage to crops done by rats, and the Minister of Agriculture (M. Mougeot) promised to see what could be done for the extermination of these vermin. In fulfilment of this promise, he applied to the Pasteur Institute. It was decided to try a virus prepared by Dr. Danysz and tested successfully, on a small scale, in Paris and in Hamburg some years ago, when an account of the experiments was given in the 'British Medical Journal.' Accordingly, on January 28th, some members of the staff of the Institute, under the direction of Dr. Roux, left Paris to conduct a campaign in the Charante departments, where the rats were causing great ravages. On February 24th, Dr. Roux reported to the Minister of Agriculture that the campaign had been completely successful. The ground chosen for the experiment was an area of 1,200 hectares, extending over the communes of Aigre, Oradour and Mons, which had been devastated by the rodents. Small pieces of bread and crushed oats soaked with the virus were placed on the ground near the innumerable rat-holes. The materiel of war consisted of 1,190 bottles of virus, 4,200 kilograms of bread and 9,300 kilograms of oats. By means of this ammunition, 95 per cent. of the rats were slain. Their dead bodies were found in the holes in heaps of 15 or 20. The following was the method adopted to estimate the havoc wrought among the rodents. In a field of one hectare in area, the number of holes was found to be 12,484. All these were carefully stopped. Two days later, the number of fresh holes was counted and found to be 1,304. The field was then treated with poisoned oats, the bait being laid down close to the holes. A week later, the holes were again stopped and the fresh ones afterwards counted, when only 37 were found. This is taken to show the extent to which the rat

population had been decreased. With the object of ascertaining whether the appearance of fresh vegetation would be followed by a fresh invasion of rats, M. Metchnikoff is about to visit the scene of carnage. In reply to an inquiry by M. Mongeot, M. Roux said that the virus is absolutely harmless to those who handle it and to all animals other than rodents. In recognition of M. Roux's services, the Minister conferred on M. Roux the Commandership of the Order of Agricultural Merit.

Supplement, p. 28.]

[19th Mar. 1904.]

GRAHAMSTOWN AND EASTERN PROVINCE, SOUTH AFRICA, BRANCH.

SPECIAL MEETING.

Retiring President's Address.—The Hon'ble Dr. J. M. Atkinson, in a valedictory address, briefly reviewed the work of last session and stated that there were more meetings than formerly and all were well attended. He elected to address the members of the Branch on the "Annual Recurrent Attacks of Plague in the Colony," and referred to the recent researches of Professor Simpson and Dr. William Hunter, who proved how easily chickens, ducks, etc. contracted the disease, when inoculated with a culture of the bacillus pestis or fed on plague material. In one case at his own house where a fowl died from plague, the bacillus was found by the Government Bacteriologist in scrapings from the fowl-house. Attention was drawn some time ago to numbers of fowls dying in the public market, fowls imported from Canton and Chinese villages. All the bodies were sent to the Government bacteriologist, who found that nearly all had died from plague. On June 4th, one fowl, five ducks and one quail were examined *post mortem*, and three were found to have died from plague. In his (Dr. Atkinson's) opinion, it was very probable that infection was from the food. The fact of fowls, pigs and such like domestic animals being able to contract the disease might well explain the annual recurrence of plague in Hong Kong.

P. 744.]

PLAGUE IN JOHANNESBURG.

[26th Mar. 1904.]

How plague reached Johannesburg is not known; it is unlikely to have been carried by human beings, seeing that at the moment no plague in men is known to exist in adjacent districts. In all probability, the infection has been conveyed by animals. So long as rats are infected, not only the immediate neighbourhood but any place in communication with the rat-infected area is in danger. Rats travel in grain or other merchandise conveyed by railways and they become ready sources of infection. We would wish, however, to draw attention to the fact that, although rats are especially liable to contract plague, almost all, if not all, of the domestic animals are subject to plague. Pigs, fowls, ducks, turkeys, cats and dogs, for instance, contract plague and, unlike the rat, pigs and fowls show no signs or symptoms of the disease until quite a late period of infection. Professor W. R. Simpson showed that pigs and fowls may be suffering from plague for weeks and yet continue to eat their food and go about as in health. They are, however, by their excretions, contaminating the soil over which they walk or the places in which they are housed and become foci of infection to other animals and possibly to man. In South Africa, as elsewhere, great attention has been paid to rat infection, but the inquiry into the infection of other animals seems to have been neglected, and it is necessary, before giving an opinion in regard to the possible duration of plague in Johannesburg, to ascertain if the domestic animals are infected with plague or not. If they are, plague will continue; if they are not, plague can be eradicated with something like certainty.

P. 848.]

PLAGUE IN JOHANNESBURG.

[9th April 1904.]

Sir Walter Foster finds, in the report of the Medical Officer of Health for Johannesburg, as we found last week, evidence to support the belief that plague had existed in Johannesburg for some time. We have already given some particulars from this report, but Sir Walter adds that the "recent outbreak gives the strongest grounds for believing that rats have been dying of plague in the city for many months, and that Johannesburg is, and for sometime has been,

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"contaminated with the disease. How long it may remain so it is impossible to say. In Bombay, plague began in August 1896, and, with scientific aid not likely to be less than that at the command of the authorities of the Transvaal, there were 6,741 deaths in the Bombay districts in the week ended February 27th last, while in India the deaths in the same week reached the terrible total of 27,358." Not only is it probable that rats were dying of plague in Johannesburg during the last twelve months, but it is now pretty certain that plague prevailed amongst human beings, before its presence was admitted on March 20th. To whom to attribute the hesitation in announcing the presence of plague, until it had attained a serious hold, we do not know, and perhaps it would serve no good purpose to probe the matter too deeply; but we agree with Sir Walter, when he says: "With this lesson of our impotence to stamp out the malady (in India) it is folly to minimize the danger." While he praises the authorities in the Transvaal for supplying themselves with able medical officers and a well-equipped laboratory for bacteriological investigation, he points to the example of Capetown, which is said to be the only place in South Africa, which has really got rid of plague, after it had once become established. This success has been attributed, on high authority, to the extermination of rats by the use of Danysz's virus.

[23rd April 1904.]

A MICROBE PATHOGENIC TO RATS AND ITS USE IN THE DESTRUCTION OF THESE ANIMALS.

THE DESTRUCTION OF RATS.

[TRANSLATION.]

Ever since Loeffler¹ first published his discovery of the bacillus typhi murium, which he isolated during an epidemic of spontaneous disease among white mice and successfully employed in the destruction of field mice (*M. agricola*), many other bacteriologists have had occasion to study epidemics of a corresponding character and have isolated microbes morphologically identical with that of Loeffler but exhibiting considerable variety in their effect on different species of small rodents.

Thus, the *B. typhi murium* proved to be absolutely pathogenic only towards ordinary mice (*M. musculus*) and field mice (*M. agricola*), that of Laser² towards the *mus agrarius*, that of Merechkozzski³ in the case of ground squirrels and, finally, that of Hatchesko⁴ towards white rats. In addition, each of these different bacilli was found to vary so considerably in virulence that much difficulty was experienced in turning the powers of any of them to any practical purpose.

It was obvious that it would be exceedingly useful, if any means could be discovered (1) of extending the field of action of any one of these microbes and of thus rendering it capable of attacking rodents other than those towards which it was normally inimical; (2) of maintaining its virulence, after having thus raised it to the desired pitch. This is the problem which I set to work to solve, and the following is an account of how far I have succeeded up to the present date.

A coccobacillus, which I isolated during an outbreak of spontaneous disease amongst field mice, presented the general characteristics of the *B. coli* and to that extent resembled the bacillus of Loeffler and also from the beginning exhibited some pathogenicity towards grey rats (*M. decumanus*). Out of ten such rats fed upon a culture of this microbe, I found that there died as a rule two or three, while others fell sick but recovered and the rest remained perfectly healthy. The fact that a certain number of rats fed upon these cultures invariably died seemed to offer some hope that it would be possible to increase the virulence of the microbe by ordinary methods, that is to say, by passing the microbe a certain number of times from rat to rat. On the contrary, however, after making a great number of experiments of this character, it was found that the passage of the microbe from rat to rat, so far from exalting its virulence, always weakened it, whether the animal was inoculated with the culture hypodermically or simply fed upon it. Thus, in any series of passages of the microbe from rat to rat, it was observed that the first culture killed the animals in from seven to twelve days, though the virulence might become sufficiently increased after one or two passages to cause death in from five to ten days; nevertheless, subsequent passages resulted in constantly-decreasing virulence, so that finally no rats died at all. For example, after the tenth or twelfth passage, or even sooner, most or all of the rats invariably survived. The result was exactly the same, even if in any series the animals were not fed simply on cultures derived from the bodies of their predecessors but allowed to feed on the dead bodies themselves. It was obvious, therefore, that, when tracing the natural evolution of the disease caused by this microbe, it was necessary, in considering its cessation, to take into account not only the natural resistance of the survivors but also the progressive diminution of the virulence of the microbe itself. The following is a case in point. Thirty healthy mice were placed in a large cage with two sick ones, while another lot of thirty were divided and placed in six different cages and fed upon the same culture as the two sick ones which had been placed in the cage of the thirty healthy animals. The result was that, in each of the six small cages, all the mice died

in from four to six days, while, in the large cage of thirty rats, disease did not begin until three days after the death of the two first mice and the consumption of their bodies by their companions.

This epidemic lasted twenty-three days, during which 27 mice died; the 3 which survived nevertheless died a month later, after being fed on a culture of average virulence.

Messrs. T. Kirter and P. Kottien,³ working in the laboratory of Professor Dunbar, obtained much the same results in experimenting on rats with a culture sent from my laboratory. Their results are sufficiently interesting to be worth citing in detail.

The original culture killed the rats in 8 days.		
The second passage	"	10 "
The third	"	7 "
The fourth	"	8 "
The fifth	"	8 "
The sixth	"	9 "
The seventh	"	13 "
The eighth	"	9 "
The ninth	"	13 "
The tenth resulted in no deaths at all.		

It is to be remembered, in my experiment with mice, that the 3 mice who survived owed their immunity, not to natural resistance, but to the fact that the initial pathogenicity of the microbes had been lost; for these same 3 mice, when fed a month later on a culture of average virulence, died at the same time as those used as controls.

There can therefore be no doubt whatever that the virulence of this microbe diminishes progressively and constantly in the course of its passage from rat to rat and, since in this case we are dealing with a microbe which from time to time gives rise to outbreaks of spontaneous disease amongst animals, this fact would seem to throw considerable light upon the natural evolution of epizootic and epidemic disease in general, at least so far as the general group of hæmorrhagic septicæmias is concerned. It may be said in short that an epidemic commences, increases in virulence and then disappears, not only because it meets with individuals who are naturally refractory to its action, but also and in all probability mainly because the virulence of the microbes becomes attenuated and finally disappears altogether, after passage through a certain number of bodies.

I hope soon to be able to throw full light upon this interesting point, but for the moment confine myself to stating it as a fact which has been demonstrated in indisputable fashion. The same result of diminished virulence may be obtained *in vitro* by inoculating a series of cultures one from the other or simply by leaving any individual culture untouched for a longer or shorter period of time.

The general result, therefore, is that it is difficult to maintain the virulence of the *cocco-bacillus* of the rat or to increase it when it is found to be small. It can only be effected by constantly making a large number of experiments and frequently testing the virulence of the cultures. When making experiments on a series of twenty or thirty rats at a time, it is always found that, from the bodies of one or two of these animals, a culture can be obtained more virulent than that from the others and that in this case the virulence of the culture may be maintained for two or three months; it is thus possible, while continuing to use this culture for current work, to gain time to produce another of equal or even superior virulence. It is by working in this fashion that I have succeeded in keeping up a supply of cultures of sufficient virulence for eight years.

During this time cultures of a sufficient degree of virulence to kill rats fed upon them in cages in my laboratory in from five to twelve days have been used for a large number of practical experiments on farms, warehouses, hospitals, workhouses, etc.

A summary of the reports which I have received and which number several thousands shows that, in 60 per cent. of the operations undertaken, the rats completely disappeared, in 15 per cent. the results were entirely negative and, in the rest, or 25 per cent., of the experiments, though dead and sick rats were found and a large diminution in the number of rodents in the places in which the experiments were conducted was simultaneously observed, complete destruction was not obtained.

In certain but not numerous cases, it was observed that the epidemic extended from the locality in which it had been brought about to other localities where nothing had been done and that sometimes the epidemic lasted for nearly a year. As an example may be quoted Odessa, where my cultures were used to destroy rats during the outbreak of plague in that city in 1902. There, the rats completely disappeared, after my cultures had been employed, and in 1903—or eight months after the experiment—rats brought back to the port on ships were found to be suffering from the disease which the culture causes. This extensive experiment, or rather this application of the treatment to the whole of a great town like Odessa, which with its suburbs has a radius of 10 or 15 kilometres, may well serve as a model for the use of the treatment in other places. Doubtless, errors were committed, which should be noted in order that they may be avoided in future, but, in general, the operations organized by the sanitary authorities and directed by M. Diatropoff, Director of the Pasteur Institute of Odessa, were very well conducted indeed. It was divided into two parts—one in September and the other in October. In September, the proprietors

of all houses were ordered to conduct matters themselves, but, in October, the sanitary authorities enlisted the services of the medical men and medical students of the town.

In order to prepare the 25,000 litres of virulent bouillon required by the town and its suburbs, a number of large disinfecting boilers were installed in huts usually employed for storing petroleum, and in this way the whole of the infected bouillon required was supplied in the course of about twenty days. The cultures, thus hastily got ready, were invariably distributed for use on the day of their preparation, and crusts of bread dipped in the preparation were used as a bait. The first supply of bouillon was inoculated with a culture brought from my laboratory to Odessa by Professor Wyrokourick, and all the rest of the bouillon prepared from it. To keep check upon the results, the Bacteriological Institute had all rats, dead or alive, which could be found after the eighth day after the first distribution, collected and paid a reward of five kopecks for each of them. Each of these rats was carefully examined, with a view to deciding whether it had died as a result of the virus or otherwise.

It was not deemed necessary to exercise any special control over the way in which the directions given for the use of the virus were carried out, and, reports received showed that, in many cases, the directions had not been sufficiently observed. Thus, in certain quarters of the town, and especially in the poor ones, either the infected bouillon was kept for several days, corked up more or less tightly, or else the inoculated crusts were thrown into streets or courts or other open places in the daytime, with the result that the bread intended to be eaten by rats was devoured by dogs or other domestic animals. In the quarters thus inadequately treated, the proportion of rats found to have been killed by the virus was only from 42 to 45 per cent., while, in quarters where the directions for treatment had been rigorously carried out, the results of the necropsy of the rats found were without exception positive.

In most of the small villages round Odessa, it was observed that rodents completely disappeared and, finally, it is to be remarked that, several weeks after the operations had been carried out, the Bacteriological Institute was only able to procure fourteen rats alive and in good health, although it offered a reward of 15 kopecks a head. In concluding his report, M. Diatropoff stated that the result of the employment of the virus was far superior to that of any other measures used and that, in spite of the freedom with which the virus had been distributed, no illness either amongst human beings or domestic animals could be traced to its use. The general outcome of this report is to lead to the conclusion that, provided a culture of this *cocco-bacillus* is of sufficient virulence, it is possible to count upon the destruction by its use of all the rats in a large city, without causing any danger whatever to its other inhabitants, human or animal, always supposing that the operations are conducted in an orderly and methodical manner.

¹ *Centralbl. f. Bakt.*, 1892, Nos. 1 and 5. ² *Ibid.*, 1892, p. 184. ³ *Ibid.*, Bd. xvii, p. 742. ⁴ *Ibid.*, Bd. xxiii, p. 873. ⁵ *Deut. med. Woch.*, 1901, No. 18.

LEADING ARTICLE.

THE DESTRUCTION OF RATS.

In another part of this issue will be found a paper in which M. Danysz, of the Pasteur Institute at Paris, gives an account of the virus known by his name. It is an interesting and exceedingly modest statement of an excellent piece of bacteriological work, of which the practical utility, both to agriculturists and epidemiologists, has been more widely recognized hitherto on the Continent than in England. It will be observed that the *cocco-bacillus*, upon the life-products of which the utility of the serum depends, is not easy either to procure or preserve in a sufficiently virulent condition and that its passage from susceptible animal to susceptible animal, so far from exalting its virulence rapidly and progressively, decreases it. M. Danysz, however, has found that, by using large numbers of rats, he can always rely on obtaining, from the bodies of one or two out of every twenty or thirty, a strain of microbes sufficiently strong to kill laboratory rats in from seven to twelve days. The virulence of cultures of such strains continues *in vitro* for two or three months, and thus, while the existing culture is available for all current purposes, there is sufficient time to hunt, by other experiments, for another culture to take its place. Working in this way, M. Danysz has for the last eight years been enabled constantly to keep by him a supply of virus of adequate strength, and practical use has been made of it for the destruction of rats in warehouses, on farms and in other places, in some thousands of instances. A summary of these operations shows that the experiments thus conducted have resulted, in some 60 per cent. of all cases, in the complete destruction of the rats, while in 25 the operations have been partially successful and in the remaining 15 entirely negative. M. Danysz's statement includes a brief account of the largest operation hitherto conducted by his method—namely, the campaign against rats in Odessa in 1902; it would appear to have been very successful. On that occasion, the virus was very freely distributed, prepared by very rough-and-ready means and entrusted for use even to persons of the lowest classes. The rats would appear to have been annihilated, without any harm accruing either to human beings or to domestic animals, although there was good reason to suppose that many of the latter ate the infected crusts of bread intended for the rats. Given a culture of suitable strength, the methods of preparing and using the infected

bouillon seem so simple that the virus might well be employed in places in England, where the destruction of rats is deemed desirable, whether from a sanitary or other point of view. We believe that an experiment of a limited character was conducted with this virus at Capetown during the early part of the outbreak of plague in 1901, and, under the existing circumstances in the Transvaal, it seems to be eminently desirable that the sanitary authorities of that country should at once arrange for the transmission from the Pasteur Institute of a sufficient quantity of culture of adequate strength for the initiation of a rat campaign with Danysz virus. The results obtained under corresponding circumstances at Odessa appear to render this most advisable.

SYDNEY.

THE BUBONIC PLAGUE.

After an interval of nearly eight months, bubonic plague has again appeared in Sydney. On March 7th, a mouse taken from the neighbourhood of Darling Harbour was found to be infected with plague bacilli; two days later, a rat found in the same district was also found to be plague-infected. On the next day, a case of plague in a boy employed in a produce store in this district was reported to the Board of Health and the patient was at once removed to the plague wards at the Coast Hospital. It appears that the patient had been employed in removing some dead rats from the premises to a bin, and it is pretty certain that he received the infection directly from these infected rats. The place where the rats were found is close to a wharf, where vessels trading to Queensland ports frequently berth, and large quantities of fodder and produce are handled on this wharf. Dr. Ashburton Thompson is of opinion that the infection has thus been re-introduced from Queensland by rats. As plague has been prevalent for some time past in Queensland, strict precautions have been taken, in the case of vessels arriving with produce from Queensland ports, and a considerable amount of ill-feeling has been aroused in consequence of these restrictions on inter-State trade. The outbreak of plague in Sydney, in spite of all the precautions taken, shows how necessary it was to insist on the plague regulations being observed in the case of vessels arriving from the neighbouring State. So far, no further cases have been reported, and every effort is being made to destroy the rats and mice in all parts of the city and suburbs.

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REPORT ON PLAGUE AND INOCULATION OPERATIONS, AMRITSAR DISTRICT, 1ST OCTOBER 1902 TO 20TH JUNE 1903.

BY

S. BROWNING SMITH, CAPT., I.M.S.,
District Plague Medical Officer.

A.—PLAGUE.

1. *State of infection on 1st October 1902.*—Sixty villages were infected in the spring of 1902, but by the 1st of October they had all been declared free, except Amritsar City itself, which had remained infected since the occurrence of this first case on 16th February 1902.

2. *First village.*—The first village to report a case was that of Bhilowal Mad, where one occurred on 1st October. As soon as it was recognized, the case was removed into the fields about a mile from the village, and, owing to this prompt action, no other case occurred there. I may add that the action taken was spontaneous on the part of the villagers themselves and not due to official advice, and this was encouraging, inasmuch as it seemed to show that, although plague had never visited the village before or indeed any other village near it, still the people themselves were, to a certain extent, alive to the exigencies of the situation.

3. *Gradual spread.*—The 2nd village was Vairka, population 3,709, about 7 miles from Amritsar, where the disease soon obtained a strong hold and caused 175 cases with 113 deaths before the epidemic came to an end.

The third place to become infected was Majitha, a large centre and Municipal Town, population 6,490, about 12 miles to the north of Amritsar.

Kasel and Gandiwind, two large contiguous villages in the west of the Tarn Taran Tehsil, became infected, the former from Vairka and the latter from Amritsar City. These places and,

later, Tarn Taran, population 4,428, 15 miles south of Amritsar, and Jandiala, population 7,877, both Municipal Towns, which became infected on 27th November and 8th January, formed the principal foci from which the infection spread. On January 7th, 100 villages had been declared infected; other outlying points of infection were Bath in the Ajnala Tehsil, infected from Kamalpur in the far north, which had become infected through Bue Nangli near Amritsar.

In Tarpai, a village on the edge of the district near Gurdaspur, the seventh village infected, no history of infection could be traced, but the epidemic was preceded by an unusual mortality among rats.

Uddoke on the same border was infected from Rasulpur near Amritsar.

Jalal Usme, far away to the east of the Amritsar Tehsil, was infected from Dheriwala in the Gurdaspur district.

4. *Rapid increase.*—The number of infected villages rapidly increased in November.

For convenience of reference, the number of villages newly infected in each month is given below:—

October	..	..	..	..	3	February	..	..	..	..	87
November	..	..	..	..	32	March	..	..	..	..	118
December	..	..	..	..	48	April	..	..	..	..	127
January	..	..	..	..	69	May	..	..	..	..	98

to June 20th 17.

April was the worst month in this respect and the first part of May, up to which time there was a steady increase, the decrease beginning from about the middle of May.

5. *Total number of villages infected.*—Out of a total number of 1,047 villages in the district, 566 were infected with plague during the period covered by this report, considerably more than half.

Of this number, thirty-eight suffered a second epidemic from reinfection.

6. *Plague cases and death.*—The number rapidly increased up to the end of November, but, during December and January, the totals every week remained fairly stationary, varying from 550 to 850 weekly, in spite of the daily increasing number of infected villages, showing that, during these months, although there was a multiplication of infected centres, yet in infected places, locally considered, there was a lull or decrease in the severity of the epidemic.

In February, an upward bound took place and, as the weather became warmer, this rise became more rapid, a very marked increase being shown at the beginning of April, in which month and the first fortnight of May the full force of the epidemic culminated.

7. *Decline.*—From the middle of May, the severity of the disease began to rapidly diminish and, in the week ending June 6th, the weekly total of cases had fallen to 882, the first time it had been below four figures since the middle of February. At the date of submitting this report, the number of villages in which the disease was present was only 35.

8. *Freedom of river borders.*—The Amritsar District is, roughly speaking, an irregular square, with angles north, south, east and west; the River Ravi runs along its north-western border and the River Beas along the south-eastern; it is interesting to notice how free from plague those parts of the district that adjoined the rivers kept, until well on into the spring.

Dividing the district into quarters by three lines running from the north-eastern to the south-western border, the two central quarters were very badly infected, while the outer quarters remained comparatively free until late in the epidemic.

9. *Pamphlets.*—As it was found, on visiting villages, that the inhabitants often asked what they could do for themselves in the way of disinfection and there was, although they were not prepared to accept disinfection at the hands of Government servants, a general desire to help themselves, a short pamphlet was written concerning plague and inoculation, simple methods of disinfection that people could carry out for themselves, the necessity of avoiding contact with infected people and their belongings and the danger of entering their houses; they were also told that they could appoint a chowkidar to prevent people from infected villages entering their own; a certain number of villages availed themselves of this privilege.

The two main points to be observed in a pamphlet or rather leaflet were brevity and simple language.

This pamphlet was translated into Urdu and Gurmukhi, and 800 copies of each were distributed, through Tahsildars, to every village.

This, I think, supplied a want, and reports seemed to show that, in many places, villagers were keen about cleaning their houses with fire and their cloths with boiling water. It, also, I think, showed the people that we really desired to help them, without in any way compelling them, and so perhaps made them look on Government assistance with a more favourable eye.

10. *Mode of infection.*—In the great majority of villages, infection could be traced to human intercourse between healthy and infected villages, and this is doubtless the manner in which the disease spreads from village to village, the usual history being that a person went to an infected village to visit relatives attacked with the disease or to be present at the funeral ceremonies of

dead relatives; on return to the healthy village, the person developed plague; the next step was the infection and death of rats in the infected and adjoining houses, followed by a rapid spread of the epidemic, plague occurring in those houses and parts of the village in which rats died.

In 391 villages, in which inquiries were made, 284 reported that unusual mortality among rats preceded the outbreak of plague, in only 71 it followed the outbreak and in a still less number, 36, was there no rat mortality. These observations cannot, however, pretend to any scientific accuracy, and, in the majority of these 284 villages, the infection was certainly imported by man and one or two cases may have occurred, before rats were infected; these cases, however, were probably kept as quiet as possible and, consequently, to the general eye of the village, the death of rats preceded the epidemic. In my opinion, it seems to show that, after the first introduction of infection by man, the main factor in the rapid and wide distribution of the disease throughout the village was the rat.

The disease spread among rats from house to house, plague among the inhabitants of these houses following in from 3 to 14 days, the most usual interval being about 6 or 7 days.

11. *Infection apparently arising spontaneously.*—Although infection can be traced in the majority of villages to the agency of man, in quite a considerable number no history of such importation can be elicited, which induces me to raise the following question: "Can the pathogenic power of the bacillus be of so mild a character that it may remain latent, producing no perceptible disease or disease of such a mild type that it is not recognized as plague, until, by infecting and passing through the rat, its virulence is so intensified that infection from the rat produces a fatal epidemic?"

12. *Pneumonic and bubonic infection.*—Before leaving the subject of infection, I may mention the case of the following village, which seems to suggest that pneumonic plague spreads principally by human intercourse, bubonic by rats.

Munda.—Dina, a jullah, returned from the infected village of Bagrian on 26th January 1903, attacked on 27th January 1903, died same day, and fifteen members of this family died of pneumonic plague; the epidemic was pneumonic and only lasted a short time and did not spread far, the last case occurring on 28th February 1903.

No rats were seen dead during this epidemic.

On 7th March 1903, Mela, a jullah, returned from Nagoke, took ill on 13th March 1903 and died same day of bubonic plague; rats began to die on 10th March 1903 in the houses adjoining, and the first case, after Mela, occurred in them on 14th March 1903. The epidemic lasted till 29th May and caused 174 cases with 144 deaths; the epidemic was of the bubonic type.

This also shows the importance of the rat in spreading the disease, as the first epidemic was quite local in character and did not spread.

13. *Reinfection.*—Sixty villages were infected in the spring of 1902. Of these, 40 were reinfected during the present epidemic. It was found that villages, badly infected in spring, suffered comparatively slightly on reinfection, many escaped infection until quite late in the season and some 20 escaped altogether, although mostly surrounded by badly infected areas.

In the great majority of cases, reinfection was traced to human intercourse, and in only a few did it apparently spontaneously reappear, in which cases the epidemic was preceded by unusual rat mortality. In no case, did it appear that any of these villages infected in the spring and declared free had been a focus of infection during the present epidemic.

The three factors determining the partial or complete escape of villages previously infected are probably:—

1. Protection afforded by previous attacks.
2. Insusceptibility of others.
3. Extermination of rats by plague.

14. *Reports.*—Whether the result of previous years' operations and methods of compulsory evacuation, disinfection, &c., or not, the general idea pervading the whole district, which, even now, is only gradually disappearing, was that the occurrence of a case of plague in a house was but the precursor of other evils to the inhabitants thereof and to the village itself, in the shape of Government interference, which would only be averted, if the case could be successfully concealed; as long as the patient lived, this could often be done, and it was only on death supervening that the case came to light and was reported. The proportion of deaths to cases is certainly therefore too high; in many instances, villages have returned the same number of deaths as cases, making the case mortality 100 per cent. The case mortality in fact in the earlier part of the epidemic depended as much on the ability and energy of the village reporting agent as it did on the severity of type of disease.

As the epidemic progressed and the people found that they were not being interfered with and patwaris, &c., became more impressed with the importance of their duties, this condition of things gradually improved, and, towards the end of the epidemic, reports became much more accurate.

15. *Plague in uninoculated and case mortality.*—The total population of the District is 1,023,828. The number of cases and deaths from plague, during the period under report, was:—

Cases	..	..	..	..	..	..	..	..	..	..	..	41,462
Deaths	..	..	..	..	..	..	..	..	..	..	..	27,879

giving the following rate per thousand of population:—

Cases	..	..	..	..	..	..	..	..	..	..	..	40.5 per thousand.
Deaths	..	..	..	..	..	..	..	..	..	..	..	27.2 " "

For the reasons given in the preceding para., the death-rate is the more accurate index of the severity of the epidemic.

The number of cases and deaths among inoculated was 770, and 238 respectively, which, being subtracted from the above, gives the following totals of cases and deaths among the uninoculated:—

Cases	..	..	..	..	..	..	..	..	..	..	..	40,692
Deaths	..	..	..	..	..	..	..	..	..	..	..	27,611
Giving a case mortality of	..	..	..	..	..	..	..	..	..	..	..	67.85 per cent.

The incidence of plague in inoculated and uninoculated and the comparison between them, and also the case mortality of plague in inoculated persons will be fully discussed in section B.

16. *Type of Disease.*—In the large majority of cases, Bubonic. There were some epidemics, particularly in the Tarn Taran Tehsil, of pneumonic type and a small number of septic.

17. *Other animals than rats affected.*—In the majority of villages, squirrels died in considerable numbers, dropping dead from trees in compounds of or near infected houses; also, when people evacuated their houses and lived under trees near a well, there were frequently many deaths among the squirrels living in these trees. There were instances in some villages of unusual mortality among dogs, for instance, about a fortnight after plague broke out at Waneke, out of 10 dogs attached to one house, 9 died in 2 or 3 days; in a temple outside the village, 7 dogs all died.

Deaths among cats are also reported. In one village, Laukha, after the epidemic was at an end, large numbers of sparrows died, dropping dead from the roofs of the houses.

It was a matter of general remark in most villages that, when an epidemic became at all severe, crows, which usually abound, completely deserted the village, returning after the epidemic had abated; dead crows, however, were not noticed.

No unusual mortality among cattle was reported.

B.—INOCULATION.

Attitude of the people.—At the commencement of operations, the attitude of the people towards, not only inoculation, but to any Government interference whatever, was one of vague fear and distrust, in many places, of distinct hostility; although, before the spring of 1902, there had been no plague in the district, the minds of the people were saturated with rumours, vague and absurd, but, on account of their very vagueness, looming the larger in their imaginations; rumours of being turned out of their houses and villages, with destruction and loss of property, rumours of inoculation needles a yard long, which were pushed in at one side of the body and emerged at the other, rumours of a hundred and one ailments and even death following inoculation. Reports began to come in early in October that not only was the general mass of the people against inoculation but that certain zaildars and other local influential officials were preaching against it; steps were at once taken to meet this, and the majority of zaildars were called in to a meeting at the house of the Deputy Commissioner on October 15th and Risaldar Partab Singh, E.A.C. was telegraphed for by the Commissioner to come in from Gurdaspur and address them, which he did; all the apparatus was shown to the meeting and explained, the Deputy Commissioner, myself and the inoculating officers present were inoculated before the meeting and, eventually, the large majority, including those who were reported to have been most hostile, were inoculated.

While writing of rumours, I will refer here to one, which arose much later and rapidly spread all over the district and was only effaced by the distribution of an official printed denial by the Deputy Commissioner, which was that a fee was to be charged for every person inoculated; inoculating officers had at times to write a certificate that no fee would be charged, before any one would come forward. Said they "if a fee is not going to be collected afterwards, why are you so careful to write every one's name, parentage and address down in that book" referring to the Inoculation Register, and it must be admitted that it was not an easy question to answer, for we could hardly explain that we were writing down their names principally for the sake of verifying cases of plague among the inoculated! The circulation of a printed official denial effectually killed this rumour.

First steps.—On September 30th, a meeting of Native Practitioners, Hakims and Baidis from the city was held at the Civil Surgeon's house. Lt.-Col. McIlroney, I.M.S., gave them a very

excellent address, fully explaining the nature, preparation and action of the inoculating fluid, and some inoculations were performed before the meeting.

On October 1st, a meeting of Editors was called at the Deputy Commissioner's house and inoculation explained to them.

On October 2nd, a similar meeting was held of all the influential men of the city, official and non-official. Many excellent speeches were made in favour of inoculation.

General plan.—It was soon found that it was practically impossible to inoculate, in villages not infected with plague; even if the village, as a whole, was not opposed to inoculation, they would say that, as there was no plague then, they saw no use in undergoing the slight pain and inconvenience caused by it, but that, should plague appear, they would reconsider the question.

Attention was accordingly directed especially to those villages which were infected and where, in consequence, the villagers, much frightened at the mortality occurring, listened more attentively to the proposals for their relief.

What generally happened was this: the personal assistant to the Inoculating Officer having ascertained that one or two lumbar-dars or other officials would come forward with their families, the village was visited and perhaps 50 or 100 inoculations performed, and this was reckoned a good result for a first visit; some days afterwards, when the people were satisfied that no harm had resulted from the operation and the previously inoculated had persuaded their friends to come forward, a second visit would result in perhaps another 100. When this had been done, it usually happened that one or two cases of plague occurred among the inoculated; if these recovered, the third visit usually resulted in a good haul, but, if a death occurred, the desire for inoculation was at once quenched, until the people actually saw for themselves that, although one or more casualties had occurred, still the large majority had escaped, and they saw the thing was good; a petition would then arrive from the village, and a third visit would result in 200 or 300, often more; by this time, the epidemic was probably nearly over, and, once it stopped, the desire for inoculation stopped also, although probably not more than a quarter, or perhaps a third, of the village had been inoculated.

Towards the spring, the fears of the people with regard to the operation were allayed in many parts, and villages would petition for inoculation at the beginning of an outbreak, sometimes on the appearance of an unusual mortality among rats, and occasionally a healthy village would come forward.

The Malkowal incident.—Doubtless, this unfortunate accident had, in the larger towns and centres, a greatly deterring influence and destroyed, at any rate for a time, any faith in inoculation that had been partially aroused, and this influence spread to villages near and in close communication with these towns.

But this was not so in the majority of villages, and I will give an instance. I had done a certain number of inoculations, before the accident occurred, in a village, Vairka, the first in the district to be badly attacked; they had become convinced of the value of the operation and had asked me to go out again; the cessation of operations prevented me doing so for some time. I, however, borrowed from Dr. Browne, C.M.S., a few doses of the original prophylactic of March brew and, when the account of the accident had appeared in the papers and could no longer be considered confidential, I went out to the village and found a large number ready for inoculation. Before I inoculated, I gave them an account of the accident, but all they said was that they had heard of it, but that they had seen for themselves the good effect of inoculation, and that, the sooner I stopped talking and began operating, the better they would be pleased; I had soon finished the few doses I had with me, and the genuineness of their feelings was evidenced by the reproaches of those who had to go away unsatisfied, the reproaches of some of the women taking the form of abuse which was evidently heartfelt. No, in my opinion, the Malkowal accident, bad as it was and severe blow as it was to all those who had the success of the operations at heart, did not make the situation an irretrievable one; lost ground, caused by the unavoidable delay of waiting for new prophylactic to be made, could of course never be made up, but, once the issue of this, which, judging from previous experience in Jullundur and elsewhere, could be absolutely depended on, began, it was hoped that a strenuous effort would be made to redeem the scheme from failure.

It soon became apparent, however, that Malkowal had effectually quenched the enthusiasm with which the operations were started, and native officialdom soon perceived that whether they assisted or stood aloof mattered little, and, instead therefore of a small army of zaildars, lumbar-dars, &c., working for us and opening the gates of villages to the inoculating officer, we had to depend on the efforts of the personal assistant to the Inoculating Officer to worm his way into a village; with the latter, the 2,000 inoculations done in the district up to the middle of December were increased to 60,000, before operations ceased; with the former, I believe, our figures would have been four or five times as large. The unfortunate delay caused by the accident and the cessation of inoculation from November 7th to December 12th was utilized by inoculating officers in visiting villages, treating sick, preaching disinfection and making themselves generally known in that part of the district in which they were to recommence inoculation, as soon as the fluid was received.

A supply of medicines with each officer would have been of great value, but this could not be obtained; the Civil Surgeon, however, kindly allowed them to have their prescriptions made up at the local dispensaries.

That the accident, pending enquiry, had to be kept confidential, while it was undoubtedly known, talked about and exaggerated by the natives, probably helped to destroy confidence and certainly placed officers in contact with the people in an awkward position.

Other influences.—It was seldom that one could inoculate more than a half a village, even after two or three visits; although those inoculated had become firmly convinced of the value of inoculation, they could not convince the remainder and, when asked the reason, they said that the others had temporarily left the village, because they were afraid of the "Punjabi Doctor," a term they seemed to apply to any native armed with a little brief authority and some disinfecting apparatus. Village factions were another difficulty in the way, one lumbar-dar working for and the opposite faction against; a lumbar-dar would report that a hundred or so in a village were ready, and a day would be fixed; the evening before, the opposite faction would concoct and circulate an enormous lie, the more ridiculous the better, which would completely put the applicants off and destroy any chance of inoculation in the village.

Other difficulties, due to incomplete staff, delay in receipt of equipment and removal of staff and equipment to Delhi, will be noticed under section D.

The fact of having to confine one's operations to villages, where plague was rampant, resulted in a large number of cases of plague in inoculated, which doubtless had a certain deterrent effect.

Education did not spread from a favourable village to others near it to the extent that I hoped and, as a rule, every village had to be separately educated.

With few exceptions, which will be noticed under Section E, the attitude of the higher and educated classes, to whom we had a right to look for example and help to their poorer brethren, was one, if not of hostility, of complete apathy.

Number of inoculations.—The total number performed was 62,773, rather more than 6 per cent. of the total population. Of these, 43,619 were males, 19,154 were females.

Only 4,243 were performed with the "new" fluid, before November 7th; of these, 2,335 were done in the city and only 1,908 in the district, the reason for this poor result being that operations could not be started in the district till October 23rd, owing to non-arrival of necessary equipment. The numbers performed by individual inoculating officers are given below. I need hardly say that these figures do not in any way indicate an order of merit, as the totals depend on many circumstances, the ability of their assistants, the part of the district in which they worked, the time for which they were employed, &c.

Name.	From	Males.	Females.	Total.
Lt.-Col. Mulroney, I.M.S.	1st Oct.	1,223	124	1,347
Capt. S. B. Smith, I.M.S.	"	6,934	3,258	10,192
Dr. A. C. DeRenzi	"	4,002	761	4,763
Dr. Mayer	"	12,398	6,011	18,409
Dr. Heron	1st Oct. 15th Dec. 19th Jan.—End.	9,202	3,914	13,116
Dr. Cavanagh	Dec. 23	4,955	2,050	7,005
Dr. Ellis	Feb. 27	2,682	1,171	3,853
Major Haynes, R.A.M.C.	"	533	55	588
Miss Vines, L.R.C.P. & S.	St. Mary's Hospital, Tarn	1,124	1,264	2,388
Miss Gregg, L.R.C.P. & S.	"			
Miss Stuart, M.B.	"			
Dr. A. H. Browne, C.M.S.	Oct. 1	566	546	1,112

The highest number performed by a single officer in one day was 1,380 by Dr. Mayer, the nearest approach to this being 711 by the same officer, 605 by Dr. DeRenzi and 611 by myself.

Inoculation by classes.—The number of inoculated persons divided into classes is given below.

High caste Hindus, Jats and other Hindus came forward readily, both male and female, and one had not to observe the purdah system with them, the higher caste females being simply collected in a separate house or court-yard, the lower coming forward in the open with the men.

Muhammadans were much less ready to accept inoculation and, personally, I only inoculated a considerable number on two occasions and, only on one of these, a large number of females, the only occasion on which I had to observe the purdah system.

Inoculation by Classes.

Europeans	20
Eurasians	1
High caste Hindus	6,317
Other Hindus	34,972
Ramdassias, Chamars and Sweepers	5,071
Musalman	15,779
Native Christians	481
Others	132
Total	62,773

Re-inoculations.—The number of these was only 882, leaving a total number of primary inoculations of 61,891.

Plague in inoculated.—The total number of plague cases and deaths, which occurred in inoculated persons, was :—

Cases	770
Deaths	238

This comparatively large number is due to the fact that inoculation was principally done in villages in which plague was active; many cases occurred within a few days of inoculation and must have been incubating plague at the time of the operation.

A certain number of cases were inoculated, who were afterwards discovered to have been suffering from plague at the time of inoculation. These 33 cases and 27 deaths should therefore be considered as plague in uninoculated, and they are accordingly deducted, which leaves—

Cases	737
Deaths	211

to be considered in the subsequent calculations.

Out of 770 cases reported, 762 cases were verified, and a full list of these with all details is given, in Statement No. VI of the appendix, for reference.

The comparative few, only 8, that were not verified have not been excluded from the returns, as I think that the non-verification was more probably due to loss of certificates and indifferent clerking than to false reports.

In a few cases, it was found that plague cases were brought for treatment to the inoculating officer, on the plea that they were inoculated and with a borrowed certificate, and were accordingly reported as cases of plague in inoculated; still, on referring to patwaris for details of result, these cases were discovered to be false and the returns corrected accordingly.

Case mortality in inoculated.—The case mortality of plague in total numbers of uninoculated and inoculated is given below for comparison.

	Case mortality per cent. cases.	Ratio of attacks to deaths.
Uninoculated	67.85	1.5 to 1
Inoculated	28.63	3.5 to 1

The case mortality in the uninoculated is certainly too high, owing to bad reporting, and this is true also of inoculated, but to a much smaller extent, as inoculating officers have made it a part of their work to inquire into and report cases of plague in inoculated.

Statement No. 2 of the appendix shows the analysis of these cases, separating those inoculated with the new "small dosage" fluid from the others.

"New" prophylactic.—The few inoculations done with the new fluid and consequent small number of cases do not afford data for reliable figures.

The following are the figures :—

Occurred between 8th day and 120th day (first 4 months) ..	{ Cases .. 9 Deaths .. 3
Case mortality	33 per cent.
Ratio of attacks to deaths	3 to 1
Occurred after 120th day	{ Cases .. 5 Deaths .. 5

"Old" prophylactic.—The figures concerning the old prophylactic will now be considered: first the total cases and then the cases according to their type, bubonic, pneumonic and septic, working out the case mortality for every day of the first week, for the first four weeks and the first four months after inoculation.

The total number of cases, of which full details had been received up to 20th June 1903, was 718, with 227 deaths; of these, 33 cases and 27 deaths are those in which symptoms were present before or were exhibited at about the time of inoculation, leaving 685 cases and 200 deaths to calculate case mortality.

Plague, all types.	Cases.	Deaths.	Case mortality per cent.	Ratio of cases to deaths.
Plague at time or before inoculation	33	27	81.8	1.22—1
1st day after	25	15	60.0	1.67—1
2nd do.	18	18	44.4	2.25—1
3rd do.	22	14	63.6	1.57—1
4th do.	25	10	40.0	2.5—1
5th do.	10	4	40.0	2.5—1
6th do.	21	11	52.4	1.91—1
7th do.	12	2	16.6	6—1

First four weeks.

First week, excluding first three days	68	27	39.7	2.52—1
First week, 7 days	133	64	48.1	2.08—1
2nd do.	126	36	28.6	3.5—1
3rd do.	76	16	21.1	4.75—1
4th do.	68	14	20.6	4.86—1

First four months and after.

First month, excluding first three days	338	93	27.5	3.64—1
First month, full	403	130	32.3	3.1—1
29—60 days	182	53	29.1	3.43—1
61—90 do.	71	14	19.7	5.07—1
91—120 do.	26	3	11.5	8.67—1
After	3	...	...	...
Total	685	200	29.2	3.43—1

In those cases which were inoculated and afterwards were reported to have had symptoms of the onset of plague at the time of inoculation, the case mortality, 81.8 per cent., was higher than in uninoculated.

The first three days after inoculation, mortality was much the same as in uninoculated, slightly less.

On the fourth day, a distinct improvement, the mortality falling to 40 per cent. and on the seventh day to 16.6 per cent.

Taking the first four weeks, there was steady improvement as time progressed, the mortality of 48.1 per cent. in the first week gradually dropping to 20.6 per cent. in the fourth week.

Taking the first four months, the mortality, 32.3 per cent. in the first month, fell to 11.5 in the fourth.

Roughly speaking, it seems that the protection afforded by inoculation improved up to the fourth month, the latter period being that in which it was most marked.

It must not be forgotten, however, that the later periods to a certain extent correspond to the period of the epidemic, when plague became milder in character. The case mortality, total, according to these figures, is 29.2 per cent., which is extremely favourable to inoculation, when compared with that among the uninoculated of 67.85 per cent.

No figures are available to show how long protection lasted after the fourth month.

Nine cases occurred in those inoculated with "new" fluid between the 8th and 120th day, which may be compared with those inoculated with the "old."

"New" .. Case mortality	33 per cent.
"Old" .. Do.	24.8 per cent.

After the 120th day, there were :—

"New" .. Cases 5	Deaths 5
"Old" .. Do. 3	Do. 0

Mortality in different types.—The number of cases and deaths and the case mortality per cent., in bubonic, pneumonic and septic plague, are given below :—

	Cases.	Deaths.	Case mortality.
Bubonic	595	145	24.4 per cent.
Pneumonic	17	14	82.4 do.
Septic	73	41	56.2 do.

The bubonic figures are probably fairly accurate; the others cannot be relied on; the village reporting agent and the people themselves probably recognize bubonic plague easily enough, but

anyone but an expert would be very prone to confuse simple pneumonia occurring in an infected village with pneumonic plague, and it is also probably that some of the cases of septic plague reported, especially the mild ones, may have been malarial or other fevers.

The three cases of recoveries in the inoculated from pneumonic plague, that were reported, are likely to be viewed with scepticism by those who are familiar with the fatality of this disease; they occurred, however, in villages suffering from that variety of the disease, and, as I shall presently show, an epidemic of pneumonic plague in a family, some of which have been inoculated, has attacked the uninoculated in preference to the inoculated, so that we may consider that inoculation confers a certain protection against this variety and, if protection, why not in some cases a modification resulting in a mild attack?

The analysis of the figures of cases of bubonic plague follows, and it will be seen that they show the same variation in the protective power of inoculation as the figures relating to the total cases. Of the first four months, the fourth was the most favourable, of the first four weeks, the fourth and, of the first week, the seventh day.

Bubonic plague.	Cases.	Deaths.	Case mortality per cent.	Ratio of cases to deaths.
Before or at time of inoculation (excluded from totals)	23	17	73.9	1.35-1
1st day after	24	14	58.3	1.71-1
2nd do.	17	8	47.1	2.13-1
3rd do.	20	13	65.0	1.54-1
4th do.	20	5	25.0	4-1
5th do.	10	4	40.0	2.5-1
6th do.	17	7	41.2	2.43-1
7th do.	10	1	10.0	10-1
<i>First four weeks.</i>				
First week, excluding first three days	57	17	29.8	3.85-1
First week, including first three days	118	52	44.1	2.27-1
2nd week	104	20	19.2	5.20-1
3rd do.	72	14	19.5	5.14-1
4th do.	61	11	18.0	5.55-1
<i>First four months and after.</i>				
First month, excluding first three days	294	62	21.1	4.74-1
First month, including first three days	355	97	27.3	3.66-1
29-60 days	154	37	24.0	4.16-1
61-90 do.	60	8	13.3	7.5-1
91-120 do.	23	3	13.0	7.67-1
After	3	...	...	...
Total	595	145	24.4	4.10-1

Incidence of plague in uninoculated and inoculated.—As no correct conclusions could possibly be drawn from the total numbers, taking the district as a whole, the following procedure has been followed:—

All villages, in which a considerable percentage of inoculated have been exposed to plague side by side with uninoculated, have been treated separately, to the number of 102.

In each village, the average number of uninoculated and inoculated exposed daily to infection during the length of the epidemic has been worked out practically on the lines adopted by Captain E. Wilkinson, I.M.S., in his report on plague and inoculation in the Jullunder and Hoshiarpur Districts, but the number of plague cases have not been deducted, as they occurred, from the population, because it would make the calculation too complicated to deal with in the time available, and the error is small and is in favour of the uninoculated.

Another point of error, that could not be avoided, which operates very strongly in favour of the uninoculated, giving too low a percentage, was the flight of large numbers of uninoculated at the beginning of the epidemic, so that the total population uninoculated is too high and the percentages too low.

Cases occurring within three days of inoculation have been excluded in calculating percentages among inoculated, on the grounds that they were incubating plague at the time of inoculation or had not come under the influence of the operation; on the other hand, these cases have not been used to swell the totals of cases in uninoculated.

In submitting these figures, therefore, I think I may assert that the calculations greatly favour the uninoculated and that the value of inoculation is computed at the lowest possible figures; it is certainly not less than is shown and probably is much greater.

TOTALS OF STATEMENT No. 4.

Number of villages examined	.. .. .	102
Total population of above	.. .. .	161,763
Total inoculation in above	.. .. .	42,390
Average duration of epidemic	.. .. .	63 days.
Average number exposed to infection daily	{ Uninoculated 130,929 Inoculated 30,834	
Plague in uninoculated	{ Cases 11,233 Deaths 7,888	
Plague in inoculated	{ within 3 days, { Cases 86 Deaths 60 after 3rd day { Cases 572 Deaths 150	
Percentages	{ Cases { Uninoculated 8.58 Inoculated 1.21 Deaths { Uninoculated 6.02 Inoculated .. .. . .49	
Ratio of cases	{ in equal number of uninoculated and inoculated { .. 7 to 1	
Ratio of deaths	{ .. 12 to 1	

Case mortality has already been considered, uninoculated, Section A, para. 15, inoculated, Section B, para. 12, this being preferably calculated from the total figures.

These figures speak for themselves and should convince the most sceptical of the value of inoculation.

The large majority of these inoculations may really be considered to be the expressed opinion of the people themselves that inoculation is good; no pressure was exercised and, once the difficulty of doing 50 or 80 inoculations in a village had been surmounted, the remainder of the inoculations done there is the result of the establishment of conviction in the minds of the villagers that the measure, in spite of its drawbacks, temporary indisposition and, especially, its failure in many instances, is, on the whole, distinctly beneficial. It will be seen that the figures are based on 42,390 inoculations, more than two-thirds of the total performed in the district.

Calculating from the data given and condensing them into popular expression, we may say that, in these 102 villages, 1,706 lives were saved by inoculation.

Below are given a few extracts from statement No. IV for convenience of reference:—

Villages.	Average number exposed to infection.	Plague deaths per 100 of population.	Ratio of deaths in uninoculated and inoculated.
Bhure Popu, 387	{ Uninoculated 187 Inoculated 200	10.16 Nil	{
Begawal Popu, 1,235	{ Uninoculated 796 Inoculated 439	6.16 .23	{ 27 to 1
Mohanpur Popu, 903	{ Uninoculated 455 Inoculated 448	16.26 1.34	{ 12 to 1
Shamnagar Popu, 1,339	{ Uninoculated 422 Inoculated 917	9.24 .98	{ 9 to 1
Makkanwindi Popu, 1,955	{ Uninoculated 990 Inoculated 665	5.25 .15	{ 35 to 1
Munda Popu, 3,129	{ Uninoculated 1,684 Inoculated 1,445	7.66 .83	{ 9 to 1
Phailoke Popu, 1,050	{ Uninoculated 563 Inoculated 487	7.46 .41	{ 18 to 1
Kairon Popu, 2,816	{ Uninoculated 1,450 Inoculated 1,366	8.83 .66	{ 13 to 1
Mucchal Popu, 1,756	{ Uninoculated 1,180 Inoculated 576	7.80 .69	{ 11 to 1
Jethuwal Popu, 1,658	{ Uninoculated 1,064 Inoculated 594	5.36 .34	{ 16 to 1

The above specimens are in no way taken, because they are particularly favourable, but because a large proportion of the inhabitants were inoculated.

The death per 100 of population uninoculated and inoculated is given for comparison, the death-rate being a more accurate index than the case-rate.

Look at *Mohanpur*, which suffered a very severe out-break, in which 16.26 per cent. of uninoculated died and only 1.34 per cent. of inoculated.

At *Sangatpura*, where there were 297 uninoculated and 344 inoculated, there were 22 cases and 20 deaths in the former, not a single case among the latter. At *Kot Mahmed Khan*, a small village, out of 263 uninoculated, 24.71 per cent. died of plague, a quarter of their number, while 71 inoculated escaped without an attack.

At *Lohar*, 13 per cent. of 568 uninoculated died, while there was not a single case among 254 inoculated.

Before leaving the subject of protective value of inoculation, I must mention the case of *Wirana*, a village in the *Tarn Taran Tehsil*, the only village in the district which is supposed to have been totally inoculated; this village, although in the centre of a cluster of villages that were badly attacked, has completely escaped infection.

Infection in separate families.—In statement No. 3 of the appendix, a number of instances are given, showing the protective value of inoculation, both in bubonic and pneumonic plague; a few cases are tabulated below for convenience of reference.

The *Muradpore* case was a very important one; it occurred at the beginning of the operations; the *lumbardar* of the village was inoculated at the first assemblage at *Tarn Taran*, because he thought, as an official, he had better be done; the village was dead against it; when, however, the whole of the *lumbardar's* family died, while he alone escaped, the opinion quickly changed and greatly assisted in bringing home to this portion of the district the value of inoculation.

Village.	Number in family.	Uninoculated.			Inoculated.		Remarks.
		No.	Cases.	Deaths.	No.	Cases. Deaths.	
Thattian	7	3	2	2	4	...	Bubonic.
Kairon	6	2	2	1	4	...	Do.
Kairon	7	3	2	2	4	...	Do.
Kairon	12	1	1	1	11	...	Do.
Dhariwal	6	4	4	3	2	1	Do.
Wanoke	18	1	1	1	17	1	Do.
Dhulka	4	1	1	1	8	...	Do.
Dhulka	9	1	1	1	8	...	Do.
Dhulka	5	1	1	1	4	1	Do.
Mucchal	7	2	2	2*	5	1	* 1 Bubo, 1 Pneu.
Betala	5	3	2	2	2	2	Bubonic.
Khalchian	7	4	3	3†	2	...	† 1 Pneu., 2 Bubo.
Bhindar	8	4	4	4	4	1	Bubonic.
Bhindar	7	3	2	2‡	4	...	‡ Pneu., 1 Bubo.
Mian Wind	29	9	4	3	20	...	Bubo and Pneu.
Mian Wind	5	2	2	2	3	...	Bubonic.
Khadur Sahib	10	5	4	4	5	...	Do.
Jaura	7	3	2	2	4	4	Do.
Phailoke	9	6	5	4	3	3	Do.
Phailoke	7	3	3	2	4	...	Do.
Mohanpur	7	3	2	2	4	...	Do.

For instances of pneumonic plague see below :—

Village.	Number in family.	Uninoculated.			Inoculated.		Remarks.
		No.	Cases.	Deaths.	No.	Cases. Deaths.	
Sheron	5	1	1	1	4	...	Pneumonic.
Sheron	3	2	2	2	1	...	Do.
Muradpore	10	9	9	9	1	...	Do.
Sheron	3	1	1	1	2	...	Do.
Mucchal	8	1	1	1	7	...	Do.
Jawandpur	2	1	1	1	1	...	Do.
Botala	5	1	1	1	4	...	Do.
Bhindar	5	1	1	1	4	...	Do.
Jawandpur	4	1	1	1	3	...	Do.
Jawandpur	3	1	1	1	2	...	Do.

Future prospects.—In a large number of villages in the district, there is now a strong feeling in favour of inoculation, and I hear of many villages which express a wish for re-inoculation in the end of the autumn, as they say that, now they see the value of the measure, they are not going to wait a second time, until the disease is well established, but will all be inoculated before it begins.

Miss Gregg, L.R.C.P. & S., St. Mary's Hospital, Tarn Taran, writes on May 22nd :—"I am sure there will be a tremendous rush for inoculation here next winter in October and I do hope there will be some provision made to meet it. We cannot undertake thousands, and whole villages will turn out for it."

I believe, if inoculation were re-started at the end of the autumn, a large proportion of the district would be inoculated without difficulty. They have had a severe lesson in this epidemic and, in those places where inoculation has been done, they recognize that, in this measure, lies their best chance of escape from another and I consider that it is their right, now we have shown them the advantages, that staff and equipment should be ready to meet their claims.

If Government has any intention of continuing this inoculation scheme in a modified way next cold weather, I should advise an inoculation officer for each tehsil, with an able senior Naib-Tehsildar, having a good knowledge of the tehsil in which he is to work, for each officer, or, better still, the Tehsildar himself to be appointed executive plague officer for his tehsil, his ordinary work to be performed by a substitute.

No preachers would be required. Our figures in this district would have been very much larger, had we not been given junior candidates, new to the work, strangers to the district and without any personal or local influence, as personal assistants to inoculating officers, for, in the absence of preachers, inoculation work depended for its success to a very large extent on the native officials with these officers.

NOTE.—The following were the antiseptic precautions adopted by me in the operation of inoculation :

1. The arm was washed with the carbolic soap obtained from the disinfection dépôt.
 2. A piece of lint, about 2 inches square, wet with carbolic lotion 1 in 20, was put on the arm at the place selected for inoculation; this piece of lint remained on in most cases for some time, until it came to the turn of the person to be inoculated, when it was usually found that the carbolic had shown its action by a slight whitening of the skin.
 3. The needle was sterilized, by dipping it into the hot oil of Dr. Hunt's Sterilization Lamp.
 4. The piece of carbolic lint was lifted off the skin and the skin pinched up with the left hand and the needle inserted with the right.
- No instance of any general or local mischief following this method.
- Any persons arriving before me without the lint on the arm or with a piece that had fallen on the ground and been replaced dirty were sent back for rewashing.
- The piece of lint, after inoculation, was dropped into a bowl containing carbolic lotion 1—20, to be used again; otherwise, the expenditure of lint would have been very large.
- If any blood oozed from the puncture after inoculation, the pad of lint was reapplied and the person sent away with it.
- The lubricating of the needle with the hot oil and the anæsthetic action of the carbolic both helped to lessen the pain of the operation.

C.—DISINFECTION.

1. *General remarks.*—I have very little to say on this subject; the people, at any rate in the villages, do not want it and will not have it, principally I think on account of the trouble they imagine it involves; only two applications were made for disinfection, one from *Atari*, where a house was disinfected by the Hospital Assistant at the Dispensary there; the other was from a village *lumbardar*, who evidently thought that the application would show his zeal and knowledge; however, when the inoculating officer had dragged tubs and heavy disinfecting apparatus over many miles of bad country roads and ploughed fields, it was found that fear had got the better of the good intentions of that *lumbardar*, who had locked up his house and fled.

Although, during the cessation of operations in November and December, the cause of disinfection was preached to the people, it had no effect and, when inoculation operations were resumed, the matter was practically dropped and the superiority of inoculation preached, for could not an ordinary-sized village in a single day receive by inoculation a very much better chance of protection than from disinfection involving many days of labour and the employment of a large staff?

To expect such early reporting of the first case that disinfection can be done immediately and so effectually stop a plague epidemic is an optimistic dream, that hardly under any circumstances can be realized. To attain such realization would entail the appointment of a Medical Officer to every village, with compulsory inspection of every man, woman and child in it every morning and evening, with a disinfecting staff in the village ready to act at once.

2. *Phenyle.*—Phenyle was obtained from the disinfection depot, bottled locally, labelled with instructions and distributed to each tehsil; all villages were informed that they could obtain it from the Tehsildar at cost price.

A certain quantity was used by the more educated, but there was no general demand.

3. *Leaflet.*—To every village information was issued in leaflet form, instructing the people in simple methods of disinfection by fire, boiling water, exposure to sun, how to use phenyle, &c., and reports showed that, in many villages, the inhabitants were keen to take advantage of the advice proffered, and I believe a certain amount of good may have been done in this way; for, while the people as a rule are frightened at the trouble and the evils that they erroneously believe to be concurrent with disinfection by Government servants, they are generally eager to learn how they may help themselves.

At the end of every epidemic, there is a period of local immunity. What happens is that, at the height of the epidemic, the panic induces those people, who can do so, to remove themselves into the surrounding districts. They carry the disease there with them and, on the town epidemic subsiding, they return at the earliest possible date in large numbers. The overcrowding that existed before the general exodus is the same, in fact it may even be exaggerated, as many of the houses will be found to be unroofed or partially demolished through the usual plague operations. The sanitary arrangements that obtained before are continued and they are probably worse, as an adequate conservancy establishment may not be available. Yet, though cases of plague are brought back from the districts, there is no spread of the disease at all, until the usual period of quiescence has elapsed. This is not because the returned population has been rendered more hardy or resistant to disease by their stay outside their town. The large majority of such a population have always lived up to "the margin of subsistence," and, during their sojourn "in the jungle", have had to subsist as best they can from day to day. Anyone, who has been in a position to examine scientifically the general state of health of the poorer classes of the native population, after their return to a temporarily evacuated town, must have been struck with the debilitated condition of this class and their lessened power of resistance to disease other than plague, and this is a point which I have recently had an opportunity of noting in Mhow.

I am prepared to state the following as a law for the occurrence of plague epidemics in India:—In a population previously free from plague or free from plague in epidemic form for a period of seven to nine months (*the period of quiescence*), there occur, at irregular intervals and at scattered points, deaths from acute septicæmic, pneumonic, intestinal, cerebral or puerperal plague, which escape identification as such, until the occurrence of one or two instances of the typical bubonic form calls attention to these antecedent mysterious illnesses. This is the *stage of sporadic typical cases*. After the lapse of twenty or thirty days, one, two or three cases of indubitable plague occur in houses contiguous or nearly so, in one of the localities which have been infected and among people who have not come in contact with one another. This is the *stage of local place infection*. After a period of from one to two months, this locality shows dropping cases of plague, at the rate of one every three days or thereabouts. This is the *early epidemic stage*. The houses become infected in a certain order, slowly, but surely, *i.e.*, the infection runs down one side of a street in one direction only, or it runs through a group of houses in one direction only, sparing houses to right and left. In two or three weeks, the number of cases rises with comparative suddenness (the local epidemics fusing) to the total of thirty or a hundred a day, according to the number of the people in the area, the degree of congestion of the population, the degree of insanitation, absence of measures for evacuation and other factors. This is the *fastigial stage of the epidemic*. The fastigium lasts for two weeks or more and then a rapid decrease in the daily returns takes place, till one or two cases only occur per diem (*the stage of decline*), and this gradually drops to zero. This diminution in the daily total of cases is more rapid than the rise from the early epidemic stage to the fastigium. The *period of quiescence* then sets in and lasts for seven to nine months, and, if there are imported cases during this period, there is no spread of the disease, the period of quiescence representing a state of local immunity.

If any one knows of any exception to the last sentence of this statement, I should be glad to hear of it. This, be it noted, does not mean that the curve of a plague epidemic in a town would be represented by a straight line; there might be several wide oscillations during the fastigial stage. The descending lines would not signify that the epidemic was dying down, but that the disease was creeping from an area where circumstances were favourable to its spread through another where the conditions were less favourable. And the ascending lines would show that it had arrived at another part of the town where the surroundings were once more favourable. It cannot be certainly known to the plague operators that they have reached the commencement of the stage of quiescence, till the returns have been at zero for a week or ten days.

The problem before us is to attempt to find out the position and condition of the plague bacillus in nature during the latter portion of the period of quiescence, where it is probable, though not proven, that it exists in the state of a facultative saprophyte. In the elucidation of this, bacteriologists, with their laboratory experiments, so far from helping us, have only served to make confusion worse confounded. For instance, take the question of infected clothing. There is hardly anything better established by observation and collation of facts than that clothing may contain the virus of plague, carry it over long distances and give rise to epidemics, many weeks or months after it became infected in the original epidemic area. And yet there are brought before us experiments by most careful observers, which tend to show that plague bacilli, deliberately inoculated in the laboratory from virulent cultures into pieces of clothing, rapidly disappear therefrom. On the other hand, there are equally dogmatic assertions made from experiments on the other side.

Again, take the question of the manner in which rats become infected with the disease. One of the earliest experiments in this connection was the feeding of rats with the organs of patients who had died from plague and on the fragments of the bodies of rats dead of the disease, with positive results. Here is a dogmatic statement from a well-known text-book on Bacteriology: "Rats and mice can also be infected by feeding, either by pure cultures or with 'pieces of organs from cases of the disease, and animals infected by inoculation may transmit the 'disease to healthy animals kept along with them.'" Here is a counter-statement from a laboratory: "Experimental evidence of the infection of the rat through the channel of the alimentary canal 'is somewhat at variance. Dr. Gibson's experience in this connection is particularly striking."

"He fed ten rats on small bundles of corn, wrapped in pieces of gunny bag and then soaked in 'broth cultivation of plague, which was sufficiently virulent to kill in 36 hours when inoculated 'hypodermically into rats in the dose of 1 c.c. The bundles of corn were given to the rats in a 'moist condition and the supply was maintained for a fortnight. At the end of that time, the 'rats had consumed each 100 to 150 c.c. of plague culture. Subsequently, with a view to testing 'their resistance, they each received hypodermically 1 c.c. of the original culture, with the result 'that they all died of plague within 36 hours." There must have been some radical difference between Dr. Gibson's negative experiments and those which produced plague in rats fed on the decomposing flesh of cases dead of plague, and it is open to us to suggest that this was that, while in the Bombay experiments the animals received the plague bacillus alone, in the positive experiments the rats received the plague bacillus plus the micro-organisms of putrefaction co-present. And the same idea suggests itself, if one believes, as I do, that rats become infected (not entirely, but to a great extent) from gnawing the decomposing bodies of their own species dead of the disease, lying about in empty sheds and houses or within the soil inside the rat-holes. In other words, the laboratory experiments with regard to the infection of clothing and the infection of the rat *via* the alimentary canal do not correctly repeat the state and the environment of the plague bacillus which obtains in nature.

It may be conceded, therefore, that, until bacteriologists take more pains to exactly imitate the conditions that obtain in external nature, their experiments will not help us much.

Next, we should consider the question as to whether the rat infects man or man the rat. My view is that the rat is infected from man indirectly through the infection of the house and the soil and that the rat is only an important factor in disseminating the plague germs in the soil after local place infection has commenced. When, in the early epidemic stage, people see the rats "coming out 'of their holes and tumbling about in the sunshine as if intoxicated," they forget that the stage of sporadic atypical cases has been passed by for six weeks or more, that, in this animal, the incubation period is much shorter than in man and that the disease is much more rapid in its course, being a primary septicæmia from the outset, and they consequently come to have a settled conviction that the epidemic in the rodents precedes the disease in human beings. I repeat that dead rats are only found at the stage of "local place infection" and that, in many epidemics, diseased and dead rats have been hunted for in vain. And, if one believes that the poison lurks in the house or in the soil around and beneath it and remembers that these animals are most susceptible and that they live, so to speak, within the soil, it is precisely at this stage that one would expect infection to begin to spread among them. It was not until the disease in man, during the outbreak in Glasgow, had been so skilfully and successfully dealt with, that the infection was found among the rats. The theory that an epizootic in rodents is the cause of an epidemic among human beings is a pernicious theory, not so much because it is only half true, but because the modern tendency to put rat destruction in the forefront of preventive measures diverts the attention of the authorities from more important details.

A recent theory, which appears to have rather taken the fancy of the public, is the flea theory. Sanitary authorities have made use of their subsidised rat-catchers and now, I suppose, we shall see the utilisation of subsidised flea-catchers. Apart from the facts that the rat is infested by a particular kind of flea (*pulex pallidus*), which has hitherto not been found on man and that, if the flea were in any way a vehicle or an intermediate host for the plague bacillus, the disease would spread eccentrically from an infected house and not in the peculiar manner to which I desire to draw attention,—the theory at once falls to the ground from the fact that plague is by no means a contagious disease. Take a plague patient out of his infected house, place his relatives in a health camp and let these relatives attend the patient in hospital, lying, as he generally does, unwashed, in his own fouled clothes, in a not over-clean bed; let them receive the sputum of the patient in their hands and dry them on their *sarris*; let them hang over the patient, day and night, and in a ward full of such cases,—and the chances are very remote that they will contract the disease, unless they are already in the incubation stage themselves, at the time their house was shut up, or unless they surreptitiously return to the infected house. It has been pointed out that, in plague hospitals, it is the dobbies who are liable to become attacked, because they have to do with the infected clothing. Precisely the same thing might be said of enteric fever, and it is well known that nurses in enteric wards are liable to infection, if they neglect to remove the sheets and clothing of the patients, when these become soiled; but no one has yet suggested the flea as a vehicle for the *bacillus typhosus*. If the flea had anything to do with the conveyance of plague, this would be essentially a disease caused by contact, but it is not so.

Now, plague has come to India within the last eight years, and it appears that it has come to stay; and the same remark applies to China. It may, therefore, be of value to consider what conditions these two countries have in common. In both, there is an enormous population, a large proportion of which is crowded into cities, in which sanitary efforts are decidedly primitive, in which the disposal of the excreta both of man and animals is of such a kind that the soil tends to become saturated with animal organic matter and in which surface drainage is deficient or absent. The element of personal hygiene is absent. In India, the population has, during the last thirty years, enormously increased, but the superficies of the cities and towns has not increased in the same ratio. There are many reasons for this; in some, local geographical conditions render expansion of the city limits impossible; in others, the wages earned by the poorest classes are too low to enable such rents to be paid as to give high enough interest on capital to encourage

the enterprise of private builders. About the increase in the population of China of late years, we cannot be precise. Anyone who has walked through a Chinese city has received ocular and nasal evidence of the degree of insanitation in which human beings can exist. The houses are low, clumsily built, windowless and crowded, and the narrow roadway between the rows of houses is formed of a ditch covered with slabs of stone laid crosswise, through the broad chinks of which the contents of the ditch can be seen as a sluggish stream of black slimy foetid ooze. So that, in both India and China, we have a soil saturated with human and animal excreta, with the subsoil water insufficiently drained, and a congested population, living in close contact with such a soil, among whom the standard of health is lowered by insufficient or innutritious food and who are crowded into houses which are deficient in light and ventilation.

By a population living in close contact with the soil, I mean people who live in houses which are built on little or no prepared foundation and in which there is no raising of the level of the ground-floor above the level of the ground around the house and in which the occupants sit or recline on the ground itself and do not use chairs or beds; when, in addition, these people are accustomed to go about bare-foot, we may certainly speak of them as living in close contact with the soil.

In 1348, England was attacked by the great plague, which, appearing first at Bristol and Southampton, spread thence all over the country. Whole districts were depopulated. London and Norwich, being busy and populous centres, suffered especially. Why did the disease spread like a forest fire over the country? Because the hygienic surroundings of the English peasantry at this period were slightly worse than that of the dwellers in Indian cities to-day.

Now, let us consider the manner in which the disease spreads, in some part of a town, during the stage of local place infection, at a time when it is possible to watch the advance of the epidemic, step by step. The following is a typical instance. In January, February and March 1899, there was no indigenous plague in Poona Cantonment, but there had been a good deal in the latter part of that period in Poona City, which is separated from the Cantonment by a long narrow strip of thinly populated ground. There had been several cases of plague, typical and atypical, imported from the city, and these had without doubt deposited the poison in various spots in the Cantonment. We had no means, at that time, of employing evacuation on any but the smallest scale, but we employed disinfection of houses actually infected. Many of the inhabitants of the Cantonment worked or lived in the Cantonment, but kept their families in the adjacent city, and this was especially the case with the *gariwallas*. The condition of the stables in the Cantonment, of which there were a large number, was very bad. The paving of the floors had become worn out; there were no pains taken to see that the fluid portion of the excreta of the animals was conveyed away from the stable itself, but it continually soaked into the soil beneath the stable and the adjacent dwellings; the pipes, which were supposed to carry the surface washings from the stable to the nearest uncovered gutter, were almost always cracked or broken, so that the line of these pipes below the ground was marked out by the sodden earth above and around them. The ground about the stables was continually moist and smelt of ammonia.

One of the first outbreaks of local place infection concerned a row of six houses on the west side, at the south end of a long road known as Main Street. A cross-road broke this row here, and the line of houses on this side of the street was continued by another row. These first six houses were on a slight eminence, and behind them were some court-yards, and behind these a nullah, into which the surface washings of the houses were supposed to run *via* the broken under-ground pipes already mentioned. The houses on the opposite (eastern) side of the street were on a slightly lower level. The first indigenous case in the Cantonment was that of a *ghariwalla* living above a stable, which was the first of the six houses mentioned. When found, he had a large suppurating bubo in the right groin and stated that he had been ill for eight days. The next house was a good one, occupied during the season by a rajah, but then empty. The next house was occupied by the family of a well-to-do Brahmin. On the day following that on which the infected *ghariwalla* was found, there was a suspicious case in the house of this Brahmin. The woman had slight fever for three days, but was able to do her household work. She died one morning, after a few hours of incessant vomiting. In the light of subsequent events, there was no doubt that it was plague. On the following day, a daughter of the first *ghariwalla* died in the segregation camp from acute septicæmic plague. Twenty days after this, there was a case of bubonic plague in the house of the same Brahmin. Thirteen days after this, a *ghariwalla*, living in stables three doors off and in the same row of houses, died from septicæmic plague. He was a fine well-built man, who was taken in a dying condition out of his tonga, having been perfectly well, when he started out in it; he vomited up some blood, had high fever and died from heart failure in four hours. So that, in thirty-six days, the disease had slowly, but surely, passed in a southward direction (and not northward at all), infecting the six houses seriatim, picking out cases from each of the houses which were inhabited at the time and from families that had not come in contact with one another. Instead, however, of picking up the houses on the same side of the street, but on the other side of the cross-road, it passed obliquely across the Main Street, following the slope of the ground, and a young Parsee died in his house from bubonic plague, twenty-three days after the death of the last-mentioned *ghariwalla*. On the following day, another Parsee, living in the same row as the last and two houses off, was found to have bubonic plague. The disease then spread behind the eastern side of the

Main Street into a collection of hovels in a low-lying area, in which it became generalised and ultimately fused with another localised epidemic, which was spreading up another road running parallel to and on the eastern side of the Main Street.

There are many very well-established facts connected with house infection, which I might bring forward in support of my suggestion that plague is a soil infection, but, owing to the length to which this paper has unavoidably grown, one must suffice. It is that plague is essentially "the pestilence that walketh in darkness." It is not so much the people who go back to infected houses during the day-time, either to work or to remove property that has been left behind, who contract the disease. But it is those who return to their evacuated houses against orders, in order to sleep the night there and escape the cold nights under canvas, who contract plague. People can return to their shops in evacuated areas for the purpose of carrying on their trade by day, with impunity, so long as they leave them for the health camp before the sun sets, and the explanation of this curious fact, of which many instances could be given, appears to me to be that, when there are several people asleep in a crowded room with every window and door shut, the temperature inside the house rises considerably, with the result that the contained air, thus rendered lighter, ascends, and hence the relatively heavy cold air external to the house tends to produce a liberation of the ground air into the hot room. This ascent of the ground air would be certainly accompanied by an ascent of minute particulate matter present in the contaminated soil.

The uselessness of the disinfection of the poorer class of native houses, when infected with plague, has been amply proved by the absence of results, and, when one considers the extent and abundance of the bacterial flora in the soil of a native dwelling, this cannot be considered surprising. The mud floor, on which the occupants of the house sit or recline at night, must be bad enough, and the manner in which it must become infiltrated with animal organic matter in certain quarters and under certain conditions has been described above; to this, add the layer of cowdung with which it is covered, the fact that the interior of many native houses are as dark by day as by night, an excess of carbon dioxide, both from the exhalation from the ground and from the complete absence of ventilation, the rise of the internal temperature from the overcrowding by the inhabitants, the condensation of the vapour from their bodies on the walls and floor, the sputum expectorated by people, whose idea of personal hygiene is rudimentary and, lastly, in plague times, the vomit, urine and evacuations on the ground, and we have all the factors which must produce an intense infection of the soil.

The experiments which have been made in laboratories in this connection are as unsatisfactory and contradictory as most of the work on the ætiology of plague. In India, some experiments of a kind have been attempted, mostly negative, but some positive. Inoculation of the dust from infected houses under the skin of guinea-pigs has been followed by the animal's death from plague. But this may have been due to the recent infection of the ground from the sputum or evacuations of a patient. We know that the plague bacillus is remarkable for the manner in which it assumes various forms, when grown on different media, and on cultures in the laboratory it rapidly loses its virulence. One can see then the difficulty there would be in demonstrating this particular bacillus in a specimen of soil, when it had not only lost most or all of its virulence, but had also altered its shape and staining characteristics. In addition to the special difficulties due to the peculiarities of the plague bacillus, there are others due to the fact that, in the earth taken from a house, in which a large number of people, not at all cleanly in their habits, have been living, a prodigious number of many kinds of bacteria will be present, even in a minute sample of such earth. And some of these bacteria are likely to be pathogenic. Hence, if, after the inoculation of a guinea-pig with such a sample, the animal dies from tetanus, a thing which has frequently happened, there is no proof that the plague bacillus in one of its many forms was not present as well.

During the height of an epidemic in Hongkong, Yersin found in the soil, forming the floor of plague-haunted houses, four or five centimetres below the surface, a bacterium with all the morphological, staining and culture properties of the plague bacillus, but which was devoid of virulence.

If a bacteriologist takes a specimen of soil and sterilizes it (as he thinks) and then sows it with a culture of plague germs and ultimately finds that these bacilli have disappeared from the soil, his experiment is open to the criticism which has already been applied to others that have tended to produce conclusions which we know to be inaccurate, namely that he has not reproduced the conditions to which the plague bacillus must be subjected, if it is present as a saprophyte in nature. These conditions must comprise a certain temperature, a varying amount of animal organic matter, a varying degree of alkalinity, moisture, absence of light and probably, most important of all, other kinds of bacteria, which will comprise innumerable cocci, fungi (especially such as *mucor mucedo*), many kinds of nitrifying bacteria, the bacilli of tetanus and malignant œdema, the *bacillus coli* in great abundance and its allies, the *proteus vulgaris* and many more, named and unnamed, pathogenic and otherwise. Every living thing in nature is acted on in a most complex manner by living things of other species in its immediate environment, sometimes in ways which are almost impossible to follow. We know nothing about the symbiosis of the plague bacillus, except the solitary fact that, in animal tissues in the presence of the ordinary micro-organisms of suppuration, it rapidly dies out.

The subject is not one which can be dismissed by a few bacteriologists placing pellets of dirt under a guinea-pig's skin. It demands skilled and repeated investigations, carried out with the aid of apparatus to be found in laboratories, which in India could be counted on the fingers of one hand.

Should it be ultimately proved, as I venture to think it will be, that the plague bacillus exists as a saprophyte in the soil, it will have the result of impressing on the public, what I urged five years ago (and which only now is beginning to be appreciated by those responsible for the administration of plague-infected towns), that the one and only way of dealing with the problem is partial evacuation, carried out on scientific lines, and evacuation of houses rigorously maintained for eight weeks against all and any who refuse to avail themselves of the protection provided them by the Government through inoculation. It will also give an immense assistance to the efforts which the medical profession is making to bring about such sanitary improvements as will prevent that gross contamination of the soil which appears to be the cause of the persistence of the disease and, lastly, it will impel every one, who deplors the present waste of life and ruin of trade, to assist the attempt (recently initiated by Dr. Turner in Bombay) to infuse some elementary notions of personal hygiene among the poorest and least educated classes of the community.

THE LANCET.

P. 319.]

TRIUMPHS OF SANITATION.

[51st Jan. 1903.]

At a meeting of the Yorkshire Branch of the Sanitary Inspectors' Association held at Cleckheaton on January 17th, an interesting address on the triumphs of sanitation was delivered by Dr. C. H. Dyer, Medical Officer of Health of Cleckheaton. The examples which he selected as illustrative were drawn from the history of plague, typhus fever, cholera, malaria and tuberculosis. Of the first-named, he said that there was perhaps no disease which in its history more strongly emphasised the contrast between ancient helplessness and modern resourcefulness. In 1665, it was prevalent in London and is supposed to have caused 68,000 deaths among a population of 460,000. In 1900, it again visited the British islands, but London escaped altogether. In Glasgow, 27 persons were attacked, with 5 deaths in September of that year and, many months afterwards, four cases, in all of which the patients recovered, occurred in a large hotel adjacent to buildings in process of demolition, from which rats were displaced. The difference in the experience of the years 1665 and 1900 was due mainly to the fact that, in the latter year, the four following precautions were observed: (1) vigilant control was exercised over shipping which arrived in the various ports; (2) patients and persons who had been in contact with them were isolated; (3) disinfectants were used in infected districts and (4) rats were destroyed in great numbers.

P. 1253.]

IS PLAGUE SPREAD BY FLEAS?

[2nd May 1903.]

At a meeting of the Bombay Medical and Physical Society, held on February 13th, Captain W. Glen Liston, I.M.S., read a paper on some facts which would appear to associate fleas with the spread of plague. He said that the report of the Indian Plague Commission showed that the common mode of the entrance of the plague bacillus into the human organism was through the skin. With regard to rats, the Commission concluded that the infection of these animals, either through the alimentary canal or through the mucous membrane of the nose, could not be very common. It would, therefore, appear that both human beings and rats are, for the most part, infected through the skin. It is also well known that plague spreads in a certain class of houses, namely in those which are dirty, dark, overcrowded and vermin-infested, whereas, in houses or hospitals which are clean and have a sufficient access of air and light, it may be introduced again and again, without the infection spreading from man to man or man to rat. Dr. Simond was the first to suggest that plague might be communicated by fleas, not only from man to man and rat to rat but from rat to man and man to rat; his paper on the subject was published in October, 1898, in the *Annales de l'Institut Pasteur*. The arguments on which he relies are, however, far from being conclusive, and, in connexion with the theory of the conveyance of plague by rats, it has always been found difficult to explain why certain epidemics of plague among rats have not been followed by epidemics among men and *vice versa*. Captain Liston suggested that an explanation might perhaps be found in differences existing between the human flea (*pulex irritans*) and rat fleas. When in England, he had described the common rat flea of India to the Hon'ble Charles Rothschild, a great authority on the Siphonaptera, who believed that it was probably similar to *pulex pallidus*, a species which had been found in South Africa and Australia. The common rat flea of India is, at first sight, very like the human flea, but close examination reveals certain differences between the two species, principally (1) in the size and shape of the

claws on the legs in both sexes and (2) in the genital apparatus of the males. Captain Liston has examined some 50 specimens of fleas caught on rats (*mus rattus* and *mus decumanus*) in India and has, up to the present, found only *pulex pallidus*; he has also examined 28 specimens of fleas caught on man, of which 27 were *pulex irritans* and one was *pulex canis*, the common flea of the dog. He believed that the close resemblance between *pulex pallidus* and *pulex irritans* and the absence of *pulex pallidus* from many European countries might account for the frequent association together of plague epidemics in rats and man in India, South Africa and Australia and the comparative rarity of this association in European countries, where *pulex pallidus* is not found. In European countries, or at least in Great Britain, the common rat flea is *ceratophyllus* (? *ceratopsyllus*) *fasciatus*, which is structurally quite different from the human flea; it may perhaps therefore differ from the latter in its habits and possibly does not bite or infest man. In the discussion, Major W. B. Bannerman, I.M.S., said that it was very improbable that hospitals full of patients and their unwashed friends should be very free from fleas. Moreover, in the days of house-to-house visitation, hundreds of susceptible persons must have encountered vermin of various kinds in plague-infected rooms every day and yet plague among these visitors and among the staff of the hospitals was hardly ever heard of.

P. 1482.]

[23rd May 1903.]

NOTES FROM INDIA—THE INCREASING PLAGUE EPIDEMIC THROUGHOUT INDIA.

The severe and continued prevalence of plague in Bombay City has led to the enlargement of the Marathu Plague hospital. Five new wards have just been opened. They have been presented by some of the leading inhabitants and are constructed of red brick with Mangalore tiles and neat paving. They will prove a great improvement on some of the existing sheds. This hospital in Bombay has always been popular, the reasons given being that it is cheerful in appearance, is centrally situated and is of sanitary construction, that there is an option given to all patients of native or European treatment and that there is great freedom of access for the relatives.

Vol. II, p. 544.]

[22nd Aug. 1903.]

THE BRITISH MEDICAL ASSOCIATION AT SWANSEA.

Mr. Cantlie read a paper upon PLAGUE IN DOMESTIC ANIMALS, in which he drew attention to Dr. W. J. R. Simpson's and Dr. W. Hunter's experimental work in Hong-Kong in 1902. He drew attention to the fact that, in June 1903, two fowls, a duck and a quail were found in the Hong-Kong market suffering from plague. This fact, combined with the experimental proof that fowls, geese, turkeys, pigeons, rats, cats, dogs, pigs, goats, sheep and buffalo calves, etc., contracted the disease, when fed on plague-infected material, indicated a most serious state of affairs for any plague-infected town or district. Practically all domestic animals might suffer from the disease: hence, no doubt, the persistent endemicity attaching to plague, for, if the animals in the farmyard, the stable and the byre were all polluting the soil, etc., with plague germs, the continuance of the disease was certain. Natives of Oriental countries—and, for that matter, in countries nearer home—had frequently the fowls and animals under the same roof and therefore they both became liable to intercommunication of diseases. They had been assigning to rats solely the power of spreading plague, but the rat was only one of many infected animals and, whilst guarding their ships from rats from the plague-infected shore, they had been importing the disease in fowls, pigs or by way of any animal taken on board for food.

P. 564.]

AUSTRALIA.

[22nd Aug. 1903.]

THE BUBONIC PLAGUE.

2. The bubonic plague still exists in Sydney. An increase in the number of infected rats and mice is reported and one case has occurred in a human being. This is the first case since June of last year. The source of infection has not been traced so far. The destruction of rats is vigorously prosecuted. No case of plague having occurred in Brisbane for several weeks and no rats having been found infected since June 8th, that city has been declared to be free from the disease. All the other states of the Commonwealth remain free.

TREATMENT OF PLAGUE WITH LARGE DOSES OF CARBOLIC ACID GIVEN INTERNALLY

BY

J. MITFORD ATKINSON, M.B., LOND.; M.R.C.S., ENG.;
Principal Civil Medical Officer, Hong Kong.

4. *Case 1.*—The patient, an Englishman, aged 42 years, was admitted to the Kennedy Town Hospital, Hong Kong, on May 16th, 1903, suffering from plague. He was a little feverish and had a small right femoral bubo; plague bacilli were found in his blood. The case was a mild one. Ten minims of solution of strychnine were given in mixture every six hours and five grains of sulphate of quinine were given three times a day. Belladonna was applied locally to the bubo. Four ounces of brandy were taken in the 24 hours. The patient was put on a liquid diet. On the 25th, the bubo was resolving without suppuration. The diet was changed to a solid one. On the 30th, there were still a few plague bacilli in the blood. 12 grains of carbolic acid were given in mixture every four hours. On June 6th, no plague bacilli were present in the blood. On the 8th, the patient was discharged. This case is interesting, in that it was an ordinary somewhat mild case, which, when apparently quite convalescent, still harboured plague bacilli and in which the plague bacilli disappeared, within a few days after the use of carbolic acid.

(AN EPIDEMIOLOGICAL CONTRIBUTION)

BY

J. ASHBURTON THOMPSON, M.D., BRUX.; M.R.C.S., ENG.; L.R.C.P., LOND.; D.P.H., CANTAB.;
Chief Medical Officer of the Government of New South Wales; President of the Board of Health; Honorary Fellow of the
Incorporated Society of Medical Officers of Health.

6. Observation of two epidemics of plague, which have occurred at Sydney among whites and in circumstances of population, laws, customs, housing and food which closely correspond with European conditions, has led me, as well as all the members of the health staff over which I have the honour to preside, to form conclusions, which differ fundamentally from those commonly advocated. What the latter are can be most concisely shown by quotation from the latest work which deals with the subject. I refer to 'A Manual of Plague', by Major W. E. Jennings, I.M.S., and I choose it for the purpose, not merely because it has been published during the present year, but also because it is most carefully written and reflects with great accuracy the views as to the causation of the epidemic of plague which are all but universally held at this date. The quotation runs as follows:—"Our measures for the prevention of plague should be mainly directed against what the strongest evidence points to as the most important ætiological factors. "The disease is mainly spread by human beings, infected clothing or effects and ship-borne rats" (chapter X, page 200), and that the teaching thus indicated is not confined to the English school is tested sufficiently for the present purpose by reference to the extraordinary pains taken to isolate every person who had in any way come into communication with the subject of the case of laboratory plague which recently occurred at Berlin.

The teaching drawn from the first of the epidemics at Sydney directly opposed those views; it was that neither direct nor indirect communication with the sick had borne any share at all in diffusion of the disease, that place-infection almost certainly had not operated to maintain it and that the sole source of infection of man had lain in rats affected with it. The evidence on which these opinions rested was given in my official report, which probably has fallen under the notice of most of those who are specially interested in this subject; however, its contents were also summarised in an article which appeared elsewhere. Its importance lay wholly in positive exclusion of human intercourse and of place-infection as factors in the epidemic prevalence, a point which one author alone has perceived. It lay not at all in the assertion that the sole source of the infection consisted in diseased rats, which, though clearly seen by us to be justified, was but imperfectly supported by examples.

In the rat, plague is a septicæmia; certainly some special means are necessary for transmission of the infection from it to man. Now, we know that plague rats can deposit the virus on external objects with the nasal secretion and with the excreta; it is possible, therefore, that it might reach man in one of two ways: (1) by contamination of his food and (2) by casual contact with his skin. The former of these must be summarily dismissed from consideration, for there is practically no pathological evidence that man is infected by feeding. If it be possible, as

analogy from experiments made with the lower animals suggests, at all events it has happened so rarely that this mode can have no significance in relation to epidemics. But the pathological evidence that the infection is commonly received by inoculation in the skin is direct, uniform and clear; all but a small minority of cases in every considerable epidemic are of the bubonic form and all such cases are so caused. Consequently, that inoculation is the result of casual contact with deposited virus is at this date very generally held to be the most important cause of epidemics, although (altogether contrary to my experience) deposition is usually ascribed to man and, but rarely, or in quite a minor degree, and always with hesitation, to plague rats. This mode of infection—inoculation in the skin by casual contact with deposited infection—is a possibility, which, it may be admitted, has occasionally come into play; but what evidence is there that it is a factor of any practical importance in production of epidemic prevalences of plague? This is the question which I propose to refer to the test of practical experience.

The proof that the infection of plague is communicated to man by inoculation through the skin, in the vast majority of cases, has been well stated in the report of the Indian Plague Commission. It is, "that primary buboes practically always develop in connexion with lymphatics "which originate in the skin." The constant preponderance of "inguinal" or "groin" buboes over others was also shown in the same paper to stand in relation to the larger area of skin which drains through the lymphatic glands of the groin. Analysis of returns, which presented 5,142 cases of bubonic plague, showed that the ratio in which buboes occurred in the lymphatic glands of the head and neck, the axilla and the groin respectively was nearly the same as the ratio which the skin areas draining through the lymphatics of those regions bear to each other.

The proportion in which the buboes are met with in the groin always preponderates over that in which the buboes occur in other regions of the body; this was very early observed among Eastern races who habitually go barefoot. Before long, however, the same preponderance was noticed among Europeans (though in small number) who did not go barefoot, but the hint thus given seems to have been overlooked and (perhaps in consequence) assumed infectiveness of ground surfaces become a prominent feature in writings on the ætiology of plague. But, at Sydney in 1900, I was able to show that, in no less than 73 per cent. of the 283 cases which exhibited buboes, the latter were found in the groin, although all the patients referred to were whites clothed in European fashion and invariably shod. The validity of the banal explanation of the preponderance of buboes in the groin thus seemed to be rendered more than doubtful. But I had pointed out, in the same report, that the infection of plague was received by man, for the most part, within buildings, which seems also to have been noticed in India. Now, if the infection be usually received by man in houses, etc., the objection raised above to the banal explanation of the preponderance of the groin buboes must be revised, for there is a time of day when nearly all people, whites as well as others, go barefoot, namely when they are going to bed or rising from it. At that time, therefore, infectious material deposited on floors, carpets, etc., by rats (or otherwise) would be more likely to come in contact with the unprotected skin of the feet than with that of any other part of the body. So that, although conjunction with a recent breach of the epithelium and deposited infection in the requisite state of activity cannot often happen, here is the opportunity for it at all events, and plague was not so frequently contracted by our people in either epidemic but that possibly those persons who exhibited groin buboes might have received the infection in that way. Let us try, then, to ascertain what the fact was. Does the record contain any cases in which infection resulting in groin buboes was probably not contracted by casual contact with deposited virus of the unprotected skin of the lower extremities? If it turn out that it does, the hypothesis under examination will be very greatly weakened; it must, indeed, be discarded as an explanation of epidemic bubonic plague.

Among the 139 cases which constituted the epidemic, there were 106, in which buboes occurred in the groin. But it is necessary to speak more exactly. Our present concern must be with primary buboes, since these alone indicate the region of skin through which the virus entered, and, in order to leave no room for possible confusion between primary buboes and secondary glandular swellings, it is desirable to take into account only those cases in which the groin bubo was solitary. Then, the expression "groin bubo" is loose. A bubo in one of the oblique set of inguinal glands indicates infection through the skin of the lower part of the trunk. Buboes in one of the vertical set of femoral glands alone indicate infection through the skin of the feet or other part of the lower extremity. An examination intended to discover whether there were buboes betokening infection through the skin of the lower extremity must be limited, therefore, to cases which exhibited solitary buboes in one or other gland of the femoral chain. The total number of such cases was 60, but the majority are not available for the present purpose. Thus, the place at which the infection was taken could not be determined in 16 of them; either the enquiries made failed to reveal any clue to it or else the evidence for infection at home and at work seemed equally cogent. These 16 must be thrown out, therefore, for they (or some of them) may have been infected at their place of residence, where they were admittedly exposed to the risk ascribed to bare feet, which is now under investigation. In 25 other cases, it was considered that the patient did receive the infection at his place of residence, so that these too must be thrown out, for the reason just given. In three others, the place of employment probably was the place of infection, but the details left room for some slight doubt; these are excluded by way of precaution. Three more were Chinese, concerning whom either information of the required kind could not be got at all or it was untrustworthy. Lastly, one was a woman whose movements could not be traced. So that 48 of the 60 have to be discarded. There remain 12 patients,

who had solitary femoral buboes and who are confidently adjudged to have received the infection away from home and therefore while fully clothed. Of these patients, eight inhabited houses, in neighbourhoods which were distant or even remote from the infected area and which were at all times free from suspicion of infection with plague (yielded neither indigenous cases nor plague rats), and, while, on the one hand, 11 of the residences bore no traces whatever of infestation with rats (the twelfth alone having exhibited some slight signs), on the other hand, the places at which the patients were employed were badly infested and had yielded dead rats in numbers in ten instances at least. It is certain that these persons all fell in danger at their place of employment and apparent that they were not infected at home. At their employment, they were fully clothed; their lower extremities were protected by boots, socks and trousers or (in one case) by stockings and petticoats, while their hands, arms, necks, faces and, in some cases, no doubt, their chests too were uncovered, exposed and in no way protected from casual contact with deposited infection and therefore they should, *ex hypothesi*, have exhibited cervical or axillary buboes. In fact, however, they none of them did so. They were all of them inoculated in one or other lower extremity—in that very area of skin, which, beyond all doubt, was well protected from casual contact with deposited infection. These 12 cases form but a small proportion of the 139, of which the second epidemic consisted, but the necessary rules under which they were selected, in circumstances where great caution was indispensable, led to rejection of several others, which, were they to be cited as examples of a fact otherwise ascertained, might have been included. These 12 persons then were not infected by feeding, for the reason drawn from the pathology of plague, which has already been mentioned; it has just been shown that they could not have been inoculated in the lower extremity by casual contact with deposited infection and none of them had had any communication with preceding cases of plague. How, then, did they come to contract the disease? There is, in my opinion, but one plausible,—nay, but one possible,—explanation. Inoculation in that situation and in those circumstances can have been brought about only by a suctorial parasite. On the whole, the parasite which is best fitted to fulfil all the requirements of the case is the flea.

Several *a priori* objections have been raised, during two or three years past, to Simond's hypothesis of the flea, which, I may be permitted to add, I had myself accepted as a working hypothesis, before I had had any practical experience with epidemic plague, on the ground that it reconciled a much greater number of discrepant and even contradictory observations, which had then been recorded, than any other suggestions which had been made. I conclude, therefore, by mentioning first that the indirect objections raised by Nuttall, on grounds furnished by his unsuccessful experiments on the transmission of plague from animal to animal by means of bed bugs and on the rapidity with which the bacilli of several diseases, among which plague was not included, lost their virulence after entering the stomach of the flea, have recently been met. Successful experiments on the transmission of plague from animal to animal by means of fleas have now been reported by Raymond and Gauthier working at Marseilles and by Elkington working at Bombay, both, be it remembered, thus confirming experimental results originally reported by Simond himself. Secondly, that the objection, raised by Galli-Valerio and with him Nuttall, on insufficient grounds—namely, that "rat fleas" do not bite man—has also been met by direct experiments, recorded by the observers just mentioned, as well as by Tidswell at Sydney. The species *pulex fasciatus* (Baker) and *pulex pallidus* will freely bite man and can even live on his blood alone for several weeks. I take this opportunity of pointing out that Tidswell first observed *pulex pallidus* to be a species which most commonly infests the rats of the Australian coast line, an observation which was found to hold good with rats in India, after he had communicated it to correspondents at Bombay.

The question, which was asked above concerning inoculation by casual contact with deposited infection, must now be put with reference to transmission of the infection by the flea. The former was there admitted to be a possibility, which, sometimes, in all likelihood, had been realised; but the chances against conjunction of the necessary circumstances are so many that it cannot be regarded as the cause of epidemics. The latter, also, appears to be a possibility; but does it take practical effect often enough to constitute that cause of epidemics which otherwise is still unrevealed? The answer cannot be drawn from laboratory experiments; it can be furnished only by epidemiological investigation, and the evidence must always remain indirect. Much to the purpose has been recorded in my report on the epidemic of 1902. We are of opinion that the hypothesis of the flea fully explains its observed course, but the evidence is too lengthy for inclusion in the present communication.

Pp. 146 and 1247.]

[31st Oct. 1903.]

EXPERIMENTS DEVOTED TO THE ELIMINATION OF PLAGUE IN HONG KONG.

5. In addition to these practical steps, Sir Henry Blake fostered the scientific investigation of the general prevalence of plague in men and in animals. The question of the general infection of the community was investigated by Dr. W. Hunter. He examined 110 specimens of blood from men, women and children, taken at random, and found plague bacilli in 4.54 per cent. of

the persons thus examined. Extending these figures proportionately to the inhabitants of the city, it would appear that some 8,000 or 9,000 persons had plague bacilli in their blood, in whom there were neither signs nor symptoms of their being thus affected. In other words, chronic plague may exist in a plague-infected district amongst persons apparently well. Dr. W. J. R. Simpson had already shown that domestic animals suffer from chronic plague and Dr. Hunter found flies, cockroaches, bugs and the like to be similarly infected. A further interesting fact was brought to light by Dr. Hunter, namely that, in specimens of rice exposed for sale in the shops, plague bacilli existed. Sir Henry Blake recognises the fact that the unhygienic construction of Chinese dwellings and tenements is the chief difficulty to be contended with in the extermination of plague and, in the existing circumstances, therefore, he believes that the rigid observance of personal and household cleanliness is the only available method of eradicating or limiting outbreaks of plague. His attempt to render cleanliness easy of accomplishment has been attended by excellent results and we hope to see the disease eliminated, or at all events reduced in virulence, by his well-timed interference on behalf of the Colony.

P. 1471.]

AUSTRALIA.

[21st Nov. 1903.]

THE BUBONIC PLAGUE.

3. A man employed as a deck-hand on the steamer *Innaminka*, trading between Melbourne and North Queensland, died from plague at Townsville on September 7th. The case is of some interest in regard to the possible mode of infection. The vessel left Sydney on August 29th and arrived at Brisbane on August 31st. The patient is reported to have been taken ill on September 2nd, while the vessel was between Brisbane and Rockhampton. At Townsville he was landed and died on the next day. A plague-infected rat was caught on August 6th and a plague-infected mouse on August 11th, about 200 yards from the wharf at which the *Innaminka* was berthed in Sydney. Thus, the patient may have been infected in Sydney or at some other plague-infected port. The Board of Health is making every possible endeavour to investigate the case and to find out the exact method of infection in this case. A Chinaman has died from plague at the Perth Hospital. The President of the Board of Health of New South Wales (Dr. J. Ashburton Thompson) has published an elaborate report on the second or 1902 outbreak of plague in Sydney. Prefacing his report by the statement that the events of the epidemic of 1902 justify and enforce the advice which was given in the report of the outbreak of 1900, Dr. Ashburton Thompson proceeds to discuss the causes of the maintenance and spread of plague. The observations of 1900 that the epidemic was not caused by direct communication with the sick, nor by diffusion of infected articles, nor by place infection have been confirmed and amplified. The evidence in support of the theory that the rat is the sole source from which infection is communicated to man has been largely supplemented and the attention of the authorities is now being given to determine the species of the fleas which infest rats in this part of the world, to variations in their frequency on rats at different times and to examining into their ability to bite man. The President of the Board of Health concludes the preface to the report by emphasising the fact that the promise of safety for the future lies neither with attempts to prevent the importation of plague-infected rats, which must fail from time to time, nor with attempts to exterminate the rats infesting the locality to be defended, which have been found to be practically impossible, though both of these measures have their valuable uses. The really safe course lies in habitually excluding rats from inhabited premises.

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NOTES FROM INDIA.

[2nd Jan. 1904.]

ORIGINAL RESEARCH ON THE ORIGIN OF PLAGUE.

THE NEW PLAGUE POLICY IN THE PUNJAB.

After the existence of plague in the Bombay Presidency for seven years, the Government has deputed two officers to devote themselves to the discovery of the relation of plague outside the body to the organism associated with the disease in its clinical aspect. Dr. J. A. Turner of Bombay has joined the ranks of those few, who have recognised the inefficiency of the disinfecting measures hitherto adopted, but he has also clearly pointed out that neither all the commissions nor other investigators have thrown light on the origin of the disease or on its control. The Government still keep silent upon the Mulkowal mishap.

THE PLAGUE EPIDEMIC—THE FRENCH GOVERNMENT AND THE DESTRUCTION OF RATS.

The plague mortality throughout India fluctuates between 16,000 and 18,000, but, for this week, 17,295 deaths are recorded. For the corresponding week last year, 14,200 died from plague. There is a slight increase in the Bombay Presidency and in the United Provinces. The prospects are very disheartening, because the returns show how widely the disease has spread and how severe it is in places. In the Bombay districts, the number of deaths, as compared with the seizures, is appallingly high, but this may be because the deaths only are recorded and very few living cases come to notice. In the crowded populations of the Central Provinces and Berar, the deaths are about ten times as numerous as in the corresponding period last year. Central India has come on the register this year and reports about 1,000 deaths weekly. Bengal is once more showing a recrudescence—the Patna district especially suffering. The seaports of Bombay, Calcutta, Karachi and Rangoon return but few cases. In Kashmir (Srinagar), the plague is developing very rapidly and severely, the type being pneumonic. All cases are fatal. The outbreak is said to have spread from a common origin. Out of the 30 medical officers engaged two years ago for inoculation work in the Punjab, for an impossible scheme, only about five remain. In one or two districts, last year, some thousands of people were inoculated, but, in all the others, practically nothing was done. At present, there is nothing doing, but the recrudescence has not yet started in the Punjab.

By a decree of the French Government recently circulated in India, the destruction of rats on all vessels arriving from an infected port is compulsory. If done in port, some recognised method must be adopted, or it will be done by the port authorities, if desired. Considering how infested with rats nearly every vessel is and the farcical regulation of some companies for keeping a few cats on board, to absolve them from liability against action for the destruction of cargo, this decree promises to accomplish benefits other than against plague.

THE PIED PIPER OF HAMELIN.

A SUGGESTED ORIGIN OF THE LEGEND.

To

THE EDITORS OF *THE LANCET*.

SIR,

No adequate explanation of the famous legend of the Pied Piper has hitherto been offered, so far as I am aware, though an attempt has been made to connect it with the child-crusades which were inaugurated, when the word went forth that the Holy Sepulchre was recoverable to Christianity by the pure and innocent in heart. But this interpretation cannot be maintained, for the child-crusades took place in the twelfth and not in the thirteenth century, to which latter period the episode of the Pied Piper is very definitely ascribed. Yet, that it records, under the guise of a fairy tale, some historical event, is certain, for the actual date, June 26th, 1284, is inscribed on the wall of an ancient house in the town and the municipal archives are dated from the calamity. Grimm has collected a list of authorities, who speak of the event as an historical fact. (*Baring Gould: Curious Myths of the Middle Ages*). The date given in Browning's poem differs for some reason.)

The story, of course, is an adaptation of the ancient world-myth, current among diverse races, of the magic music compelling all who heard to follow. In its present application, it tells of a mediæval mid-European town, infested with rats. A magician appears, who entices the rats into the river and then, out of revenge for the parsimony of the citizens, beguiles the children into a chasm, which gapes without the gates.

The explanation I would suggest is that this legend records a visitation of plague to Hamelin. Acting on this supposition, we find the antecedent mortality among the rats, which, thanks to the unhygienic habits of the citizens, had hitherto swarmed in the town. It may even be that some travelling magician had acquired the art of inoculating the rats with a disease, which he had not learnt to connect with *pestis major*. The dead rats are cast into the river Weser and then follows an outbreak of the Black Death, the mortality from some local cause being greatest among the children and their corpses being borne along the Bungen-strasse—

“Where anyone playing on pipe or tabor
Was sure for the future to lose his labour,
Nor suffered they hostelry or tavern
To shock with mirth a street so solemn”—

to the plague-pit dug in the mountain-side without the city. The date fixed for the disappearance of the children would perhaps be the occasion of finally filling in the pit after the staying of the pestilence. The thirteenth century was the century of the “Black Death”—wave after wave ravaged Europe. 1284 was not one of the great plague years, but, in the intermediate periods, there were frequent more or less localised outbreaks.

I am, Sirs, Yours faithfully,

J. S. MACKINTOSH, M.R.C.S., ENG.; L.R.C.P., LOND.

HAMPSTEAD,

March 22nd, 1904.

EPIDEMIC OF PLAGUE IN JOHANNESBURG

[28th May 1904.]

BY

WALTER C. C. PAKES,

Medical Officer of Health. Rand Plague Committee.

The first intimation of the existence of plague in this Colony was obtained by the Government laboratories in April 1903, when a dead rat was sent to the laboratories from Johannesburg. This rat was shown to have died from plague. Between the previously mentioned date and the outbreak of plague in Johannesburg, 13 rats were found to have died from plague. These rats came from different neighbourhoods in Johannesburg, and the most careful inquiry failed to reveal the slightest connection between any two spots from which dead rats had been obtained. The inevitable conclusion was that these rats had been imported singly from the coast in grain or forage. Each place from which a plague-stricken rat had been taken was visited by the rat-catchers and disinfectors and cleaned up. It is a noteworthy fact that it only once occurred that a second rat was obtained from the same place. The authorities did not confine their attention to rats; cats and dogs and, by chance, ducks, fowls and small birds came under bacteriological observation, with the result that, although the rest proved negative, one cat was certainly found to have died from plague, and this fact was also notified to the Government.

The present Epidemic.

Nothing of an alarming nature was brought before the Health authorities of Johannesburg, until the evening of March 18th, 1904, when the Health Inspector of the municipality informed the District Surgeon of Johannesburg that he had found in the cooly location a large number of sick persons collected together. The Assistant District Surgeon was instructed to visit the place in question and he reported to the District Surgeon that he found a number of sick Asiatics suffering from what appeared to him to be pneumonia in a house in the cooly location. At 6–30 A.M. on March 19th, the District Surgeon, the Acting Medical Officer of Health of Johannesburg and the Assistant Bacteriologist for the Transvaal visited the house, in the location. They found 5 corpses and 12 cases of sick in a four-roomed house.

The *post mortem* examinations revealed nothing which could not be explained by death from pneumonia. There was not a single classical symptom of death from plague; the spleens were not enlarged and were not markedly hyperæmic; there were no ecchymoses or hæmorrhages; the organs, with the exception of the lungs, were normal. The lungs showed patchy pneumonic consolidation of the lobular type and, although a very careful search was made for enlarged glands, none were found. It is to be remarked that not even a single bronchial gland was found. Portions of the lung, on Bacteriological examination, showed organisms morphologically identical with the plague bacillus. Owing to the insanitary condition of the cooly location and to the large and unknown number of cases in that location, it was decided to cordon the whole area, in order, if possible, to keep the actually-infected people within a limited area. The cordon was formed at 4 A.M. on March 20th and, on the same day at 9 A.M., an emergency meeting of the members of the Johannesburg Town Council was held, when the Acting Medical Officer of Health and the District Surgeon were instructed to take all necessary steps. By 9 A.M. on March 20th, further deaths had taken place, making a total of 26 deaths in 36 hours. It is to be remarked here that not a single case of these showed any signs of buboes. On March 22nd, the Government published Plague Regulations and constituted the Rand Plague Committee, composed of ten members from Johannesburg and representatives from the various local authorities within the Witwaters Rand area. This committee was given plenary powers to deal with the outbreak within that area and to establish plague and isolation camps.

One of the first decisions arrived at by the Plague Committee was to remove the whole of the population of the cooly location to some site outside the town, and the transfer of the population within the cordoned area to the segregation camp was completed on March 30th. This population consisted of 1,600 Asiatics, 1,358 Natives and 142 Colored people, making a total of

3,100 transferred to the segregation camp. During the incubation period of the disease, only one death from plague occurred. After 12 days' interval, the inhabitants of the segregation camp were allowed to come and go under certain nominal restrictions. On April 8th, the cooly location was burnt to the ground. In order to prevent the escape of rats, cats, dogs, fowls and other creatures, a galvanized iron fence was put up round this location and the various animals and birds, which had not been previously caught and destroyed, were then caught, killed and burnt in the fire.

Methods adopted for coping with the Epidemic.

The Plague Committee has carried out, in the main, the recommendations of the Durban Plague Congress. "Contacts" are not segregated. So far as possible, they are kept under observation, but their movements are limited to the least possible extent. "Suspects" are isolated, as such, in a suspect camp adjoining the plague camp at Rietfontein. With the exception of the medical officers, the suspect and plague camps at Rietfontein are treated as separate entities. So far as possible, the methods adopted are early notification, removal and complete disinfection of all suspects and observation of contacts. The natives working on the mines within the Witwaters Rand area are inspected daily by the compound managers, and any natives who are found to be sick are at once examined by the Mine Medical Officer. It has been made compulsory upon all employers of natives to have every sick native medically examined within 24 hours of his falling sick. In order to minimise the spread of the disease, no Asiatic is allowed to travel by rail, even within the limits of the Colony, unless he receives a clean bill of health from the medical examining officer.

IMPROVEMENT OF INDIAN AGRICULTURE.

CHAPTER VII.—MANURE.

121. The most general manure, alike in India and in England, is cattle-manure or, as made in England, farm-yard manure. But, whilst in the latter country it has to be and can be supplemented, and even in part replaced, by artificial manures, this is not the case in India, and cattle-manure is the universal fertiliser and often the only one available. When, therefore, we find it the general practice, even in villages, to burn a large proportion of the dung from cattle as fuel and when, on nearing any town, we may see troops of women carrying, in baskets on their heads, the cow dung cakes or *bratties*, which they have made into cakes and dried in the sun, we cannot but pause to ask ourselves whether the burning of these cakes as fuel does not imply a great agricultural loss. Some have maintained that it does not, for they say that the ashes are saved and used on the fields and assert that that is practically the only thing of value in the dung; others hold that, even if the nitrogen be lost in the burning, the cattle are so poor and so poorly fed that there is but little nitrogen to lose, for the dung is of very low quality, whilst even what is lost is recovered in the extra amount of nitrogen which exists in the rainfall in India. Such statements as these have been made, even quite recently, by men who, though not agricultural chemists themselves, have not hesitated to express boldly their opinions on points which they were not able to investigate for themselves nor were qualified to pass judgment upon. And so it has come about that, from an error as to the amount of nitrogen in the rainfall, many theories have been built up and but little real investigation has been done. I do not mean to say that I have been able to investigate the question at all thoroughly, but I have done so sufficiently, at least, to satisfy myself of the incorrectness of many of the theories propounded and to show that cattle-manure in India is not the poor miserable stuff it has been represented to be, but that it must, and does, lose a very great deal, if it is burnt for fuel, this loss *not* being recovered in the rainfall. Even were the latter to be the case, we should have a further difficulty; the districts of slight rainfall, where most dung is burnt (because wood is most scarce there), would get least nitrogen back for the greater part would be transferred to the more rainy and more wooded tracts.

APPENDIX VI-A.

NOTES OF PERSONAL DISCUSSIONS AND CONFERENCES.

Conference at Coimbatore (14th June 1904).

N. S. BRODIE, Esq., I.C.S., Collector.
 Captain J. J. ROBB, I.M.S., District Medical and Sanitary officer.
 A. Fotheringham, Esq., I.C.S., Assistant Collector on Plague Duty for Coimbatore town and taluk.
 M.R.Ry. N. S. SUBRAHMANYAM, Plague Supervisor, Coimbatore taluk.

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury, acid solution 1 in 2,000 for ordinary clothes, 1 in 1,000 (salt solution) for very dirty clothes, 1 in 1,000 for houses ordinarily, 1 in 500 for very damp floors. These are found satisfactory.

Disinfecting Staff.—A temporary man was only used once and this was due to a mistake.

Unroofing.—Not practised as a rule. People object to it and want heavy compensation. Exposure to sunlight would no doubt be a good thing, but it comes too expensive. Compensation has been paid at the rate of 1 anna per square foot or 4 rupees per house. Mr. Brodie thinks that too little.

It is agreed that small holes in the roof are of no use, except for the purpose of detecting dead rats or catching live ones.

Further, Mr. Brodie points out that a serious riot at Méttupálaiyam was almost entirely due to the unroofing of houses.

Difficulties of Chemical Disinfection.—It is difficult to chemically disinfect huts completely, and even well-built houses are not always easy to disinfect, on account of chinks, holes and irregularities in the surface, but Mr. Brodie, Mr. Fotheringham and the Supervisor think that, in practice, chemical disinfection, as now practised, is satisfactory and sufficient.

The Supervisor suggests 'Scrubs' (rough branches of bamboo), as a means of getting the chemical disinfectant into interstices in the floor and walls.

Burning Bratties.—None of the gentlemen present have any practical experience of this method of disinfection. It is, however, pointed out that (1) bratties would be expensive and difficult to procure; (2) to burn bratties, after chemical disinfection (the Supervisor thinks that they would have to be burnt for two hours to be effective), would cause delay and this would be objectionable, where large groups of houses had to be dealt with: the disinfection of Coimbatore, as it is, took three months; (3) the method would be useless, where the floors were damp, as all the heat would be taken up in drying them.

No change, therefore, seems desirable in this direction.

Cost of disinfection.—Perchloride is the best disinfectant: but chloride of lime is said to have been used by Dr. Hankin (*vide* also Manson's 'Tropical Diseases,' page 254, edition of 1903) and is understood to be cheaper: none of the gentlemen present have practical experience of chloride of lime.

Examination of Grain.—All are agreed that it would be a good plan to have grain examined, to see whether it contained rats. It is believed that this would be practicable, in places like Méttupálaiyam, which are the head-quarters of plague supervisors.

At present, grain is spread out and exposed to the sun, in all cases in which villages are evacuated: also, as far as possible, grain from infected localities is treated in the same way; but in shandies (large fairs) this is not found practicable. Mr. Brodie thinks that it might be a good thing to make it compulsory on contractors to bring to notice the existence of rats in their grain and that some such condition might be inserted in their contracts.

Recrudescence and the allied problems.—A recent outbreak of plague in Dhárápuram taluk said to be due to rats.

Disinfecting apparatus, etc.—There are no complaints as to the apparatus, etc., supplied from the Medical Stores. Mr. Brodie suffered from some delay in their supply in March, but has now taken the precaution of keeping a very large surplus supply in stock.

Mr. Brodie finds all the more elaborate and expensive forms of pumps impossible to work, except under European supervision, as the coolies are careless and destructive. Mr. Fotheringham complains of even the simpler form of pump (supplied by Messrs. Thompson & Co., Calcutta, price 14 rupees), as it only lasts three weeks or so, owing to the metal getting quickly

corroded by the disinfectant. He suggests that the metal is partly unnecessary and might also to some extent be replaced by bamboo. He tried to get a local carpenter to carry out his ideas, but unsuccessfully.

The District Medical Officer thinks that a glass-stopper for bottles of chemicals with a rubber ring would be as effective as a rubber stopper.

Disinfecting Staff.—One or two cases of neglect have been brought to light; but, on the whole, Mr. Brodie and Mr. Fotheringham consider that the disinfecting staff has worked very well.

Attitude of Village Officers and people.—The village officers do not give the disinfecting staff much trouble; but neither they nor the people understand as yet the value of disinfection, nor could they for a moment be trusted to do it for themselves. The disinfecting staff will be necessary for a very long time to come.

The actual work of disinfection, as carried out by the staff, is the best training and example that the people can have. At first, the people objected to the process, but they no longer have any objection. They prefer, however, to have their clothes boiled rather than disinfected, and this is what is generally done in practice.

The Supervisor observes that there are no caste prejudices against disinfection now. The people will even allow coolies to stand at the door of the inner part of the temples and squirt disinfectants on to the shrine and inner walls: or caste people can go inside the shrine and disinfect. This is also Mr. Fotheringham's experience.

People at first objected to disinfection, on the ground (according to the Supervisor) that it drives rats away from the disinfected houses to other houses and even to the other villages and thus spreads plague. Mr. Brodie suggests that this may perhaps be a correct view, so far as the disinfection of isolated houses is concerned.

GROUP (A) (2).

Inoculation.—There has been a good deal of inoculation in Coimbatore town: this was chiefly at the beginning of the epidemic. People rushed to be inoculated and then suddenly the rush ceased. About 1,000 people were inoculated in Coimbatore town, mostly people connected with Europeans in some way.

Material for inoculation was supplied to the Medical Institutions at Erode and Méttupálaiyam, but it is not believed that any people have been inoculated so far at either town.

Attitude of the people.—The Supervisor says that inoculation is not popular. (It may be noted that he has himself been inoculated three times.) The people object to it on the ground that the process and immediate effects are painful and they also believe that the after-effects are bad. They say that many people, who have been inoculated, have afterwards died in consequence.

Mr. Brodie is of opinion that not a single man would get inoculated, if he did not get off the passport-rules by submitting to the process.

Results of inoculation.—To get at the results of the good or bad effects of inoculation in this district would require a most lengthy and intricate examination. No statistics are available on this point.

Suggestions as to inoculation.—All are agreed that a contact, who has been inoculated, does not cease to be a source of danger to his neighbours and consider that no relaxation of the plague rules should be allowed to such a person. Mr. Brodie and Captain Robb consider that nobody under the rank of a Civil Apothecary should be allowed to perform the operation.

GROUP (A) (3).

Rats.—All are agreed that rats exercise a most important influence in spreading plague. They pronounce this to be the result of experience. Captain Robb invites my attention to Sir Patrick Manson's views on the subject ('Tropical Diseases', page 257).

Other animals.—The Supervisor quotes the village of Kanjuni, in which, just before an outbreak of indigenous plague, six dead dogs were found.

Mr. Fotheringham, when engaged on disinfecting duty, has seen dead cats and bandicoots.

Captain Robb thinks that cases of dogs and cats affected by plague would be very rare.

Methods of destruction.—Mr. Brodie and Mr. Fotheringham are agreed that the present methods of killing rats (tar, with or without sulphuric acid) are insufficient and that nothing of any great value can be done on these lines.

Mr. Brodie and Captain Robb would like to give a trial to a poison, which would kill rats, but would not be fatal to any other organism.

[Mr. Marden, a resident of this town, is said to have tried successfully a poison for rats. His letter is included in Appendix VII.]

Attitude of the Villagers.—The Supervisor is of opinion that, though villagers understand the importance of rats as a symptom of plague, they do not understand the importance of destroying them.

Mr. Fotheringham states that villagers believe that *dead* rats carry plague, not *live* ones; hence their objection to disinfection (mentioned above), on the ground that it kills the rats.

GROUP (A) (4).

Plague Hospitals.—There are plague hospitals at almost every Tahsildar's or Deputy Tahsildar's head-quarters in the district. The largest are at Coimbatore and Méttupálaiyam. They have been built in small blocks of two or three wards each on separate cement platforms.

Their popularity.—They were unpopular at first, but are no longer so. The Coimbatore and Méttupálaiyam hospitals are especially popular. All are agreed that the plague nurses (French Catholics) were instrumental in making the hospital at Coimbatore popular.

Mr. Fotheringham states that he has only known of one man who ran away from a plague hospital.

Mr. Brodie observes that plague hospitals must always be unpopular at the outset and that they will continue to be so, unless and until they are properly supervised: he thinks that it is always possible to secure popularity for hospitals, in places where there is an official not lower than the grade of a Deputy Tahsildar, if the official in question really interests himself in the matter.

Private Hospitals.—There are none in the district and there is no demand for them.

The Supervisor observes that high caste people would prefer caste-hospitals, if they could get them for nothing, but, as the rules stand, they prefer to go to the Government plague hospitals. They like the system of small blocks of wards, as they can be isolated in that way from persons of different castes.

Private Native Practitioners.—The Supervisor observes that, though private doctors attend patients in their own houses, they do not attend them in the plague hospitals. The native doctors do not wish to come, nor do the patients appear to want them.

Captain Robb strongly objects to private practitioners being allowed in the hospitals, at any rate, unless they take up their residence in the camp. Otherwise, it is impossible to fix any responsibility for the health of the patient, and the position of the Government doctor becomes extremely awkward. What is to be done, if the patient suddenly collapses, when the native practitioner is not available?

All are agreed that, in Government hospitals, the patients should be attended solely by the Government Medical Officer.

The Supervisor points out that, if the patient dies through the unskilful treatment of the private practitioner, the hospital is thereby rendered unpopular in the eyes of the ignorant public. He is aware of such a case having actually arisen in Vániyambádi.

GROUP (B) (1).

The Observation Staff.—The circles were originally mapped out by Mr. Curgenvin, I.C.S., and have been adopted with a few modifications in detail. The circles represent the views of Mr. Brodie and his Revenue subordinates. All are agreed that the present staff represents the minimum for efficient working; if anything, less than the minimum.

The Supervisor is satisfied with the number of men in his circle.

Suggestions.—Mr. Brodie is of opinion that the 10 and 5 miles radii should be used as suggestions and not as a cast-iron rule. Many other points have to be considered, e.g., the imminence of plague, the geographical conditions, the population, the number of villages. No rules can profitably be laid down; each case must be decided on its own merits. Mr. Brodie also thinks that a better minimum than the 10 miles radius would be a minimum of 3 or 4 inspectors for each taluk. If you cannot put in as many as that, it is better to have none at all.

All are agreed that an observation staff should be retained during the hot weather, for the reasons mentioned in the list of questions.

Training of the Staff.—Mr. Brodie, Captain Robb and Mr. Fotheringham are in favour of putting clerks and revenue inspectors on temporary duty, rather than getting irresponsible men from other parts, on whom the district officers have no real hold. Such clerks should be given the full pay of the temporary appointment. It is very hard on them that they should get less than outsiders.

Captain Robb considers that he could give such men all the training that they would require in a fortnight. The work itself would be the best training. Honesty, thoroughness and a sense of responsibility are what is wanted in the temporary staff.

Mr. Fotheringham suggests that it is also desirable to hold out hopes of permanent employment in the Revenue Department to outsiders in the temporary staff who work well. He, as well as the other gentlemen present, considers that the age-limit for permanent employment in the Government service should be relaxed, where necessary, in such cases.

Supervision.—Mr. Fotheringham is in charge of Coimbatore town and taluk. When there was plague in the Palladam taluk, Mr. Curgenvin was in charge. An Assistant would be required for the Palladam taluk, if there was another serious outbreak of plague. Plague has not hitherto been serious enough in other taluks for European supervision to be necessary.

Relations between the Staff and the People.—The Supervisor thinks that the sanitary staff are liked on the whole and says that people ask that inspectors should not be transferred. Mr. Brodie and Mr. Fotheringham are not convinced that they are popular. They say that, on the whole, they have had very few complaints from the people of extortion, etc., on the part of the staff.

Attitude of the Village Officers and the Villagers.—All are agreed that the village officers would not report cases of plague, without the stimulus given by the observation staff.

The Supervisor says that, in his experience, village officers either report such cases late or do not report them at all. The sanitary staff get information of cases from leading villagers, as well as from the village officers.

Mr. Brodie and Mr. Fotheringham also are of opinion that the staff get a good deal of information, apart from the village officers. Mr. Fotheringham thinks that the plague constables get information for the staff. The Supervisor has not heard of this.

All are agreed that an observation staff is necessary, for the reasons stated above.

Village Patrols.—Many village officers and villagers do understand the necessity for keeping strangers out of their villages with their cloths and baggage. Mr. Brodie and Mr. Fotheringham have known of cases in which they employed guards for that purpose.

Mr. Fotheringham knows of a village (Chikkarayapuram, Coimbatore taluk) in which this course was adopted with great success, the village remaining uninfected in the middle of plague-infected villages. The Supervisor adds that, in that village, grain and clothes were kept out as well as travellers.

Mr. Brodie remarks that a great deal depends on whether the village munsif or the leading villagers have near relations outside the village.

Mr. Brodie knows of an instance in which a Tahsildar was not allowed to enter a village under patrol, and the Supervisor gave a similar instance in which a circle inspector was refused admission.

All are agreed that this attitude on the part of the villagers in regard to outsiders is deserving of every encouragement.

Rewards.—Rewards to private people might be of some use, but Mr. Fotheringham thinks that it might lead to the smuggling of corpses into uninfected villages. Mr. Brodie thinks that the reward would not be effectual, unless given promptly.

As regards rewards to native practitioners, all are in favour of it, except Mr. Fotheringham, who doubts whether it is sound in principle to reward a man for giving information, which it would be a penal offence for him to withhold. Mr. Brodie suggests that the principle of rewards might be extended to village officers reporting cases promptly.

Mr. Brodie and Mr. Fotheringham also suggest a notice in the District Gazette, as a suitable means of conveying approbation of good plague work.

The Supervisor points out that rewards to native doctors are not likely to be taken advantage of, as a doctor who gave information of a plague case would not be called in by the people.

All are agreed that it would be desirable that native practitioners should know something of the diagnosis of plague, in order that they might not make mistakes, but Captain Robb thinks that the question of instructing them would present grave difficulties.

GROUP (B) (2).

The passport-system.—All are agreed that the passport-system cannot be abandoned for the present. Mr. Brodie regards it as a necessary evil, but suggests that the village munsif need not insist on passportees coming to him daily for appearance. It might, he considers, be sufficient, if he was given the passport and simply made responsible generally for giving information of the sickness or departure of the passportee within the period prescribed.

Mr. Fotheringham has seen plague constables employed to carry the passport from the village munsif's house to the passportee and back again.

GROUP (B) (3).

The Plague Police.—They are nominally checked by the head constable in charge, but in practice they have to be controlled by the circle staff. All are temporary men, and the Supervisor says that he finds them very troublesome. Both Mr. Brodie and Mr. Fotheringham have heard of instances of their carelessness and disrespect to the plague staff. It is agreed by all present that the system works badly.

Mr. Brodie is of opinion that at least 10 per cent. (and, if possible, half) should be permanent constables.

The constables can only be punished by the Superintendent of Police, on a report through the Assistant Collector. Mr. Brodie thinks that this defect might in some measure be cured, if the Collector insisted on knowing how every such case was disposed of. Mr. Fotheringham suggests that an Assistant Collector on plague duty might be made a special Assistant Superintendent of Police and given powers of independently dealing with the plague police in the way of punishment.

Discussion with the Very Rev. N. Rondy, Vicar-General, Coimbatore, (15th June 1904).

Plague Hospitals.—Father Rondy is of opinion that plague hospitals are now popular in Coimbatore, though they were not so at first. He says that, at first, there was only one hospital assistant and the attendance was indifferent, but that these defects were, to a great extent, remedied later on. He attributes the popularity of the Coimbatore Hospital largely to the ministration of the French Nuns.

He believes in large sheds, where all the people can be looked after together, as they may be forgotten and neglected, if put in small groups distant from one another. But he thinks that all caste people, who want separate accommodation, should be given it.

Order is sometimes not properly preserved in the hospital. The nurses were sometimes annoyed by relations of the patients (who, according to Father Rondy, were allowed in the wards in too large numbers). These persons would get drunk and conduct themselves in an indecorous way. A sufficient number of hospital assistants must be on duty to preserve order.

People complained that, owing to the insufficient supply of carts, patients could not be taken to the hospital as soon as desirable and were sometimes not taken there, until they were in a dying condition.

At first there were vague stories of cruelties practised in the hospitals and it was only after people were seen to return alive and well that confidence was restored.

Disinfection.—Father Rondy is strongly in favour of disinfection and evacuation, as the best means of combating plague. As soon as a case occurs or dead rats are found in any house, the inmates should be made to vacate it at once. It would be necessary then and there to disinfect the house and to allow the people to re-inhabit it as soon as possible. Otherwise, the people suffer great hardships without sufficient reason. He has heard no complaints as to the disinfection of houses or the spoiling of cloths. He believes that the disinfecting staff did their work honestly and well on the whole and with due regard for the feelings of the people.

The ambulance and disinfecting staff, at the commencement of the epidemic, were rough and advantage was taken of the ignorance of the people to insult women. This was one cause of the panic. With increased European supervision, this state of things ceased.

Inoculation.—Father Rondy believes in inoculation. All his servants were inoculated but one. This man went into a house in which rats had died, got plague and died.

The opinion of the people is adverse. They say that, if a person is suffering from certain diseases (like diabetes) and is inoculated, he dies. To this they attribute the death of the late Treasury Deputy Collector, Srinivasa Rao.

The people should be inoculated, before the plague breaks out as an epidemic. Fifteen people died of plague after the inoculation at the time of the last outbreak. Father Rondy did his best to persuade the people that these men must have been infected at the time when they were inoculated, but such incidents militate against the success of inoculation.

Father Rondy admits that it would be difficult to persuade people to be inoculated, when plague was not actually raging.

Rats.—Father Rondy is strongly in favour of killing rats and has advised his own people accordingly. He has no doubt that rats help to spread infection and has observed that dead rats are an invariable mark of indigenous plague and of houses in which it is dangerous to live.

Native Private Practitioners—Rewards.—Father Rondy does not believe in rewards to native doctors or to informers. He says that native doctors would lose all their practice, if they reported cases of plague. He points out that native Catholics frequently did not call in the priest to see their dying relations, for fear lest the case should be reported to the authorities. He thinks that rewards to private persons would simply lead to information being given on account of grudges and animosities.

The passport-system.—The system may, with close supervision, be of use in towns, but it is wholly useless and harmful in villages.

The circle inspector can do nothing without the village officers. If the village officer wishes to report, he will do so; if not, not. Father Rondy would therefore dispense with the passport-system for villages and make the village officers and the caste head-men responsible for the observation of travellers.

He complains that the plague staff take bribes of one rupee and half a rupee to conceal cases of death by plague. He also says that, if nothing is paid, passportees are detained for hours, without being inspected; on the other hand, a bribe will enable them to get off being inspected at all. These things, he says, are notorious. He says that people will not complain to the authorities, for fear of what will happen to them later, if they do.

Village Patrol.—Father Rondy is strongly in favour of this system. He has seen it working in some villages and believes that, if it were officially recognised, it could be successfully worked everywhere. The village of Valipalayam, Satyamangalam taluk, is a case in which villagers joined to keep out outsiders.

Supervision.—The greatest essential is constant European supervision. While this can be ensured, things will work smoothly; in its absence, plague measures are always liable to become the means of extortion and oppression.

Discussion with Dr. W. J. Lubeck, Medical Officer, Jalarpet Railway Station, (19th June 1904).

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury, acid solution of 1 in 800 (enough hydrochloric acid to dissolve the perchloride, with salt added), for cloths. Dr. Lubeck has had no experience of chloride of lime.

Disinfecting apparatus, etc.—Everything comes from the Medical Stores, Madras, and is promptly and satisfactorily supplied; exceptional drugs, not supplied by the Medical Stores, are obtained from a Chemist, with the previous sanction of the Collector.

Exposure to sunlight.—Clothes, etc., are exposed to sunlight for two days, if chemical disinfection would hurt them.

Unroofing.—This is unnecessary, in the case of the light and airy buildings of which the camp is composed. Moreover, the cement floors present a surface which can be completely cleansed by the disinfectant.

Burning Bratties.—This system was not found to work satisfactorily in North Arcot. It was considered that the heat rose, instead of sinking into the floor and raising the temperature to a sufficient depth below the surface of the floor.

The whole floor was covered with bratties, so that a large number were required to disinfect a single hut.

Recrudescence, etc.—Dr. Lubeck has heard of cases in the villages near the plague camp, in which particular houses or streets were attacked year after year, without any reasons having been found, in the shape of outside importation.

Attitude of the people.—They do not object to disinfection, but they do not understand its value, unless they have been in contact with Europeans.

GROUP (A) (3).

Rats.—There has only been one case of a plague-infected rat found in the camp.

Methods of destruction.—Tar and sulphuric acid was on one occasion applied to 130 rat-holes in the plague camp, the rats being found a nuisance there, and it drove them completely and permanently away. Dr. Lubeck cannot say that any of them were killed by this method. In the observation camp, the method was not found equally successful in driving them away, as they got into the crevices of the mats and could not be dislodged.

GROUP (A) (4).

Attitude of the people as regards the Camps under Dr. Lubeck's charge.—There are many complaints of the detention and consequent loss and inconvenience (especially among the contacts), but no complaints of bad treatment. On the contrary, people from Tiruppattūr and surrounding villages and from the Kolar Gold Fields come to the camp to get treated and are admitted.

There has not been any case of active resistance, during the four years of Dr. Lubeck's tenure of office. People grumble, but they are quite amenable to the Plague Regulations.

None of the respectable or educated natives in the neighbourhood have ever come to Dr. Lubeck to make any general representations or suggestions. Had they done so, he would have been quite willing to give them a hearing and consider their representations.

There has only been one instance of an objection on the part of a native to European treatment. In this instance, a Vellala (fairly well educated, spoke English, a booking-clerk in railway service) would not allow his child's bubo to be cut with a knife. Dr. Lubeck (after an ineffectual attempt to persuade the father) blistered the bubo and thus drew out the inflammation in another way.

His objection arose from the fact that another child of his had died after the use of the knife at another hospital: the case of the child who died was not one of plague.

[I may note that the expressions used by all the occupants of the camps, whom I came across, showed not only contentment but real gratitude for the kind treatment they received; when they were asked if they had any complaints to make, they did not even understand what was meant, until it was explained, and were then most emphatic in their denials.]

Suggestions.—Dr. Lubeck thinks the detention of travellers in the same carriage as plague cases not generally necessary, unless they are relations or friends of the patient. They can proceed with passports, after thorough disinfection.

GROUP (B) (1).

Attitude of the people.—The people in camp seem to have no sense of the dangers of infection. If allowed, healthy and sick would mix freely and fearlessly.

Dr. Lubeck has heard, however, of one case of an arrival with a bubo being turned out of a neighbouring village and left in the road.

[In this connection, a feature in the Ilitorai case (Nilgiri district) is worth noting. Two cases of plague were detected and segregation ordered, the history of the cases being identical. One case had terminated fatally. The patients were members of different houses. The contacts of the dead woman, conceiving that she had not died of plague, refused to be segregated with the contacts of the sick woman. Both were of the same caste, so apparently there was no reason for the objection, except fear of infection. It may be noted that these were Badugars and therefore probably not wholly free from contact with Europeans.]

GROUP (B) (2).

Passport-system.—Worked very loosely and badly in the villages. For a consideration, the village munsif will let the villagers practically evade all observation.

Giving false names is very common. Dr. Lubeck had one case in Jalarpet, in which a healthy relative personated a sick passport-holder. The fraud was not discovered, until the patient died of plague. The responsible parties were duly prosecuted and convicted.

The only remedy lies in rigid prosecution, in case of detection. Dr. Lubeck detected a case where a different name was given on the station platform and in the camp. This case was prosecuted and convicted.

There have not been many such cases, within Dr. Lubeck's experience.

Dr. Lubeck considers that he has practically made fraudulent re-booking an impossibility, by a system of taking lists of such cases.

GROUP (B) (3).

The Plague Police.—The police give continual trouble and it is difficult to keep any authority over them. They get money from people, in order to assist them to evade rules or under false promises that they will speak to the doctor in their favour. Dr. Lubeck has succeeded in restricting the area in which these extortions are possible to the distance between the station and the observation camp, but what is really wanted is some direct control over the police. They can only be punished by their own departmental superiors on a report. Moreover, they care nothing for black-marks, being only temporary men. Even if they are discharged, they get re-enlisted under other names.

What is wanted is that the plague officer should have some authority over them in the way of inflicting fines and that a certain proportion of them should be drafted from the permanent police force.

Discussion with M.R.Ry. S. Vāsudēva Rao Avargal, Special Plague Officer for Tirupattūr and Krishnagiri Taluks, excluding Vāniyambādi (20th June 1904).

GROUP (A) (1).

Disinfectants.—Has always worked with an acid solution of perchloride of mercury (1 in 1,000) for houses. Clothes are generally boiled. Has no experience of any other chemical disinfectant.

Disinfecting Staff.—Temporary men are generally used. Permanent men sometimes employed, on promise of transfer to circle work, if they do good service. But the disinfecting staff get, on the whole, less pay than the circle staff and their work is more arduous, uncertain and risky. The present system of pay seems wrong.

The staff have been working fairly well. There have been few complaints and none that called for punishment, so far as the deponent's division is concerned.

Unroofing.—This is done in the case of dark ill-ventilated houses with thatch or tiled roofs: unless the roof is a very poor one, the unroofing is only partial (a long strip, in the line of the gable).

The people no longer mind disinfection, but they dislike having their houses unroofed.

Difficulties of Disinfection.—A substantially built house in good repair can be completely disinfected chemically, but an ordinary native house (and especially a hut with mud walls) cannot really be properly disinfected, and unroofing is necessary as a supplement in such cases. Moreover, if the presence of infected rats is suspected, a certain amount of displacement of the roof is necessary. Coir brushes are used for disinfecting walls, but for mud walls they are not of much use.

Compensation.—is given, for complete unroofing, at the rate of 6 annas per *anganam* in the case of thatched roofs and 12 annas per *anganam* in the case of tiled roofs. An *anganam* is a variable unit of measurement.

If compensation were given for *partially* unroofed houses, the expense would be prohibitive, and it does not cost much to repair the roofs in the case of partial displacement.

Apparatus, etc.—come from the Medical Stores entirely. They can only send by instalments in small quantities once a week, owing to the Railway Rules. Last September, when Krishnagiri town was to be disinfected, the rules caused considerable delay and inconvenience.

Now, the deponent has ordered the disinfecting staff to indent at once, when their stock falls below a stated minimum. This will, to some extent, obviate the difficulty.

Otherwise, there are no complaints on this score.

Burning Bratties.—The deponent has had no practical experience of this; thinks that it might be difficult to get bratties in large quantities; also suggests that, in villages, the lack of doors and the thatched roofs would allow the heat to escape.

Examination of Grain.—Grain from infected areas has been found to contain the excreta of rats, but this is difficult to detect; so, as far as possible, it is all desiccated. Grain is a great source of infection and requires close watching (*vide* also a case under the head "recrudescence").

Attitude of the people.—Very few people seem to have any idea of the advantages of disinfection. It is only in the rarest cases that anybody asks for a bottle of lotion. Even educated people do not understand its advantages as a rule.

The village officers could not, for a moment, be trusted to do the disinfecting work for themselves. The staff will be necessary for a long time yet.

The people are not, on the other hand, *opposed* to disinfection. Last August, there was a case of temporary active opposition to disinfecting a house, but this was really due to general dissatisfaction with the plague measures as a whole and quickly subsided.

Recrudescence, etc.—Mr. Vásudéva Rao does not think that this is proved, so far as his experience goes.

There was a case in the Rámakkapet Street of Tiruppattúr town last September, in which an arrack shop-keeper and his son were attacked with plague. There was no source of infection that could be traced and the shop-keeper was tied to his shop by the nature of his trade. The son was a constable on duty at the Krishnagiri toll-gate. The town had been free from infection for almost four months.

The damp soil in this particular locality may have been favourable to plague and it *may* have been a case of revivification, but deponent suspects that the son must have stealthily taken to his house some grain exposed at the toll-gate (passport-station) and thereby imported the infection.

Mr. Vásudéva Rao finds the course of plague in successive years rather capricious. It does not re-appear invariably in the same houses, streets or even quarters, but starts up here and there. This one would not expect, if the theory of recrudescence was sound.

GROUP (A) (2).

Inoculation.—Mr. Vásudéva Rao has had experience of inoculation in the Anantapur district in 1898. Many persons, from the Collector (Mr. Macleod) downwards, were then inoculated, the Collector's example inducing many to subject themselves to the process. Presents were given to some persons who were then inoculated.

Many rumours were afloat as to possible bad effects. The deponent could see, from his own experience, that no bad effects followed and was accordingly inoculated himself; but he has no great faith in the process, which at best only confers a temporary immunity; he has not been inoculated since.

The people dread inoculation. Nothing but a temporary wave of enthusiasm, such as that which prevailed in Anantapur in 1898, would induce them to subject themselves to the process.

In allowing concessions to inoculated contacts, there is the risk of their taking their clothes and goods to other districts and possibly spreading infection unobserved.

GROUP (A) (3).

Rats—spread plague from house to house and from street to street: the course taken by them is evidenced by dead rats being found first in one place and then in another: the course is very irregular and capricious and has been the subject of much observation.

The deponent knows of a case in which the infection was carried $\frac{1}{4}$ mile, from Madaválam to Mádapalli: there was another case of 1 mile (Mádapalli to Kolattúr), but this case is not so certain. Dead rats were found in the latter village, but the people were evacuated and no deaths from plague occurred.

There was another case, in which some grain was sent from Alangáyam (Tiruppattúr taluk), at the time when it was infected, and stored for six months in a neighbouring house. The Málígas opened the grain at the end of that period and found some dead rats. They handled those and got plague (*vide* appendix VII, for the first report of this case).

Methods of destruction.—Mr. Vásudéva Rao once saw two dead rats near a hole treated with sulphuric acid and tar, but cannot say what killed them. He has treated his own bungalow.

with the same preparation. The rats completely disappeared for 15 days, after which they began to come back again; in a month, they were as bad as ever.

On the whole, he thinks that the effect is to drive rats away, rather than kill them.

He has seen blood-suckers and bandicoots, as well as rats, lying dead in houses which he went to disinfect.

GROUP (A) (4).

Plague Hospitals.—The only two plague-camps under this deponent's charge are at Krishnagiri and Tiruppattúr. Even Muhammadans and Pariahs can be got to go to such camps, but by a sort of compulsion rather than freely. Once they are got into the camp, they are content. There have never been any disturbances or even complaints in regard to the hospitals. The town Civil Apothecaries have had direct control or general supervision over both camps: both of them are popular. Much depends on this.

People always grumble about *observation* camps.

Private Hospitals.—People have not got the funds or the organisation to build such camps: there have been none in this range. If Government would provide the money, they would be more popular than the Government hospitals. A move in this direction might make people more ready to give information as to cases.

Private Practitioners.—People are not allowed the attendance of their own doctors in plague camps, nor do they want it, though the deponent remembers one case, in which a man insisted on taking his own *medicine* with him into camp.

Mr. Vásudéva Rao does not recommend that private practitioners should be allowed to treat patients in Government camps, unless they are prepared to take up their residence in the camp. People in plague hospitals do not really object to European treatment.

GROUP (B) (1).

Training of the Observation Staff.—It would be difficult to get local men for training in some districts, but there would be no difficulty of that kind in this district. They should all be Matriculates or persons who have passed the middle school examination in the first class. In that way, they would be able to write proper diaries, which many of the present staff cannot do.

Practical training is what is really wanted. The deponent believes that, in the Madras scheme of training, only one day is allowed for practical training. This is of course insufficient. What is wanted is a probation of one month in an infected locality. No attention seems to be paid to their age and physique, in selecting them. Some of them are sickly or mere boys. People, if selected in the district, might be led astray by local sympathies and interests.

Popularity of the Staff.—The nature of their work makes them necessarily unpopular, but they try their best. There have been no complaints of extortion or dishonesty on their part, nor has the deponent had to punish any of them on this account.

Attitude of the Village Officers.—Village munsifs could not be trusted to work the passport rules without supervision. As it is, they do badly enough: many instances could be quoted of their evasion and neglect of rules.

Village Patrol.—In one village near Vépanapalli (Hosúr taluk), the people used of their own accord to keep out persons coming from infected localities (especially Ooregam): that village succeeded in keeping plague out in this way. Such an attitude is an excellent one. In other villages, they wait till the passportee gets ill and then turn him out, for fear of being evacuated themselves. Mr. Vásudéva Rao would always encourage the villagers to patrol for themselves, if they showed any desire to do so.

Rewards.—Private practitioners will not give out the names of patients, for fear of losing their practice. This applies to Tiruppattúr town, as well as to out-lying tracts. There would be no use in offering them rewards.

Private people would also become unpopular, if they revealed the names of plague cases. The deponent remembers a case, in which the house of the village munsif of Mádapalli was said to have been burnt down, because he gave information of a plague case. The deponent himself saw the burnt house, when he visited the village. These objections would apply more to villages than to big towns.

GROUP (B) (3).

Plague Police.—They do not work well. They even commit thefts of the property they are required to guard. They are only temporary men and have nothing to fear. Some constables in Krishnagiri were prosecuted for theft while on duty and convicted. It is impossible to discipline them. The only course open to the plague officer is to report them to the Assistant Superintendent of Police, and orders are only passed after considerable delay.

Two constables were reported for taking a bribe at the Pudupet toll-gate, yet they remained on duty at that gate for a long time after the report was sent and known by them to have been sent. What could one expect them to do in such circumstances?

They should be made amenable to discipline at the hands of the plague officer and a certain proportion of them at least should be permanent men.

Discussion with M.R.Ry. C. Ranganátha Mudaliyár Avargal, First-grade Pleader and Chairman of the Tiruppattúr Municipality (19th and 20th June 1904).

GROUP (A) (1).

Disinfection.—Perchloride of mercury used, strength 1 in 500 in very dirty houses, 1 in 1,000 otherwise.

Unroofing.—This was resorted to, during the first outbreak of plague. It was very unpopular. The compensation given was very inadequate. If proper compensation were given, the cost would be prohibitive.

Tiles should be shifted only to the extent necessary to discover dead rats, in cases where dead rats have already been found or where their presence can be detected by smell.

The method of unroofing has not been resorted to much since the first outbreak, and the deponent does not believe in it. It may be of use in cases where, owing to the floors being rough and full of crevices, chemical disinfection is useless, but in such cases proper compensation should be given.

Exposure of Grain.—This was resorted to during the first outbreak. People objected to it on account of the detention of the grain. Mr. Ranganátha Mudaliyár does not recall any case in which rats were found in the grain. In one case, three rats were found dead in a pot, but he does not recollect the contents of the pot.

Attitude of the people.—People no longer resent disinfection, though they are in no way convinced of its advantages. They trust in their own system of cleaning by means of cow-dung, etc.

At the time of the first outbreak in 1898, there was considerable panic and wild stories were circulated. There was a general exodus from the town, which was encouraged by the authorities, as it was thought that it would prevent the plague from spreading. People were afraid both of the plague and of the regulations.

At the time, certain Muhammadans assembled with sticks in and about a house in which there was a plague case, with the intention of resisting measures of disinfection, etc. Mr. Ranganátha Mudaliyár went alone to the house and managed, by his personal influence and by the use of persuasion, to induce the house-owner to submit to the regulations.

At a later date, Mr. Ranganátha Mudaliyár had considerable trouble in inducing the Muhammadan community to consent to the demolition of a hut, ordered by the Divisional Officer, two successive concealed cases of plague having occurred therein.

Apart from these two cases, there has been no attempt at active resistance to any plague measures in Tiruppattúr on the part of any section of the community. Tact and knowledge of the people are the requisites for preventing unpleasantness of this kind.

Revivification, etc.—Mr. Ranganátha Mudaliyár considers the favourable conditions of an epidemic of plague to be (1) dampness in the soil, (2) climatic conditions, (3) insanitary conditions, and is doubtful whether importation or re-importation is a necessary factor in the case.

As regards (1), he illustrates his position by the outbreak in Imam Sahib Street, shortly after a dampness caused in that locality by an overflow of the big tank. He also adduces the outbreak in Rámakkapet Street (a damp and low-lying locality) in support of his contention.

It is not his experience that plague breaks out in the same houses or streets or localities year after year, but rather that the conditions of the soil at the time of the outbreak are similar.

There is little to be said, as regards (2). Plague in Tiruppattúr has usually broken out in January, when the weather is particularly cold. In Krishnagiri, it has broken out in April, when the weather is hot; this may be due to some malarious wind.

As regards (3), Mr. Ranganátha Mudaliyár relies on the argument from analogy. Tiruppattúr is undoubtedly notorious for the number of its private cess-pools, into which filth of every description is poured. From his own personal experience, he can say that, in more than one case, these cess-pools (imperfectly closed) have bred scorpions and other noxious animals and insects (notably the *Sitamandalam*): he therefore suggests that such a foetid sub-soil may afford a favourable nidus for the plague germ.

Further, leprosy and other dirt-diseases flourish in Tiruppattúr, and the deponent thinks that the same may hold good of a dirt-disease like plague. He has himself devoted great attention to extending the private scavenging system and believes that, by the advocacy of this and other measures of ordinary sanitation, plague may lose its hold on the town.

Corpse Inspection.—There has been systematic inspection of corpses, in cases where no information as to the cause of death is obtainable. Every death has been certified to by local medical subordinates. There has been no opposition to this. On the contrary, the authorities are often asked to come and inspect the body, in order that the house-owners may not be dealt with as if the case had been one of plague.

GROUP (A) (2).

Inoculation.—There has been none in Tiruppattúr. Mr. Ranganátha Mudaliyár would never be operated on himself or urge anyone else to be operated on. Even if the serum is good and

the operation properly conducted and the constitution of the patient good (and all these conditions can only rarely be predicated as certain), the immunity is only for six months.

There are disputes as to the different sera. Medical subordinates are frequently not qualified to perform the operation and, moreover, the constitution of the patient cannot always be correctly diagnosed. Mr. Clegg was advised by Colonel Bannerman not to undergo the operation on account of his constitution, but every one cannot get the advantage of being diagnosed by an eminent doctor.

[*Note by Mr. Clegg.*—This is not strictly accurate. A mild dose, if any, was advised.]

Mr. Ranganátha Mudaliyár believes that inoculation sometimes produces bad results. He knows of one case in which the complexion of a whole family of children became darker after inoculation. Another case of which he has personal knowledge is that of a sepoy, who got fits of insanity for two or three hours every day for two or three months after inoculation and ultimately had to take furlough from his regiment in consequence.

An European official confided to Mr. Ranganátha Mudaliyár that, since he had been inoculated, the use of his wrist had been permanently impaired and cautioned Mr. Ranganátha Mudaliyár against inoculation.

Attitude of the people.—Most unfavourable. There is a rumour that inoculation causes impotency. The deponent is not prepared to positively assert the truth of this impression, but he thinks there may be something in it.

Suggestion.—From his own point of view, Mr. Ranganátha Mudaliyár would be averse to offering any inducements to inoculation, either by way of relaxation of the passport rules or otherwise. He thinks that Government should be very certain of the benefits of the process, in order to justify such a procedure.

GROUP (A) (3).

Rats.—The deponent thinks that rats are rather the symptoms of an attack of plague than its cause. They do not originate the disease, but catch it like men, sometimes before, sometimes after. They might spread it through a small lane but not further. Even if plague breaks out successively in different quarters of a town and dead rats are found in the different quarters, there must be an independent cause (apart from rats) for these successive epidemics. The development of a bubo in a rat might perhaps point to an incubation period, but the period must be very very short. While a diseased rat is running, sudden falls and failure of gait are to be noted. The legs are crippled at once and turned towards the body.

Mr. Ranganátha Mudaliyár deduces his views from his belief that with rats the plague breaks out at once and is rapidly fatal, there being no incubation period as with men. This belief again he deduces from the observed fact that rats which die of plague are quite fat, showing that the attack is very sudden and death almost immediate. A lingering illness or incubation would make them emaciated.

If these premises be granted, he argues that rats, while in the throes of a violent disease, could not run far and therefore could not convey the infection to any considerable distance.

Mr. Ranganátha Mudaliyár is, however, by no means opposed to the destruction of rats and notes with some approval the adroitness with which the sepoys employed on plague duty would take the tiles off the houses and destroy rats. A species of rat-register was kept at that time. He does not believe in the use of tar and sulphuric acid, as he considers it impossible to stop up all the holes by which the rats could escape.

GROUP (A) (4).

Plague Hospitals.—There has been a plague hospital in Tiruppattúr for the last six years. It is working satisfactorily under the supervision of the Special Plague Officer and the Civil Apothecary. There has been no unkindness or ill-treatment. Had there been anything of the kind, it would certainly have come to the deponent's notice.

Well-to-do people have generally been looked after in their own houses. They prefer this, as they then have their relations and caste-men with them. This is inevitable, unless enormous plague-camps are to be constructed at a prohibitive cost.

Guards are put on houses in which there is a patient. This is very little use, as the guards are careless and venal. People might just as well be left to themselves, as they have a healthy horror of infection and will shun an infected house, whether it be a case of small-pox, cholera or plague.

Attitude of the people.—They object to going to the hospital. At the first outbreak, there were wild stories of people being taken to the hospitals to be made a speedy end of and it was believed at that time that plague must always end fatally. These stories are no longer credited, but people feel it a degradation to go to a plague hospital, as it is mostly paupers who go there. The treatment of the people by Dr. Lubeck at the Jalarpet camp is much appreciated by the people who have had experience of it.

Private Hospitals.—People do not construct their own hospitals, for want of organization and money. If Government financed such hospitals and paid the servants, etc., the people would go to them.

Suggestions.—Mr. Ranganátha Mudaliyár considers that a committee of private gentlemen should be allowed to organize private hospitals, Government paying the cost and merely insisting on proper accounts being kept of the money. He thinks that, in Tiruppattúr, such a committee could be formed without difficulty. He would have it independent of all official or municipal influence, as it would then have to rely for its success on its powers of persuasion and on its responsiveness to popular feeling. In towns where there is not a sufficient number of honest intelligent men, the present system must continue.

He would have such a hospital managed medically by native practitioners, in whom (so far as those in this town are concerned) he feels considerable confidence and whose treatment he would himself seek for, if he were attacked by plague.

The municipal plague hospital should not take patients from villages. If this is done, the district board should contribute to their cost.

GROUP (B) (1).

Observation Staff.—Mr. Ranganátha Mudaliyár considers the observation staff an useless luxury. They merely hear the town gossip, after every one else has heard of it. They never detect cases independently. They pick up their news through their peons, who were originally circle inspectors and are local men of considerable intelligence and energy. The circle inspectors are mere postal media.

Pay, etc.—The present system is fundamentally extravagant and wrong. As already remarked, mere peons could do the work of the circle inspectors and used to do it satisfactorily in the first year of the epidemic.

A plague allowance is wrong. The staff is paid for plague work in the first instance.

A pony allowance is necessary for a division inspector, but he should be properly supervised, to see that he purchases or uses a bicycle or pony.

Huts should not have been erected for the circle staff. They get good pay and can provide themselves with quarters, as everybody else has to do.

The extravagant lives led by the observation staff show how much they are overpaid and how little they have to do.

There are many other needless extravagances in connection with the administration—800 rupees for boots, indiscretion in the distribution of mats (the deponent has known of cases in which such mats have at once been sold by the recipients) and so forth.

If the Municipality was itself given control of the plague administration, it would work economically and with a knowledge of local conditions and popular feeling.

Attitude of the people.—They regard the circle staff with abhorrence. There is not much terrorism in towns, but the idleness of the staff is patent.

Hot-weather Establishments.—These are maintained on an unnecessarily costly scale. If necessity arises, a staff can always be got together (in Tiruppattúr, at any rate) at a moment's notice. Mr. Ranganátha Mudaliyár has frequently himself sent coolies to Vániyambádi at the shortest notice.

Rural Tracts.—There is a good deal of bribery and oppression in rural tracts. The village officers are not to be trusted and the circle staff do not supervise them adequately.

Passportees in towns state that they are going to villages in which the village munsif happens to be a relation or friend or caste-man. They continue in the town unobserved, while the village munsif checks their passports, without their ever having been near the village. In the case of the village munsif of Athiyúr, this was found out, because the man, who was supposed to be under check in Athiyúr, was discovered to be ill in the town with plague.

Suggestions.—The village officers would work better, if they were under the control of Revenue officials, like the Tahsildars and Revenue Inspectors. Moreover, Revenue officials would be respected by the people. There would be no difficulty in recruiting men from the ranks of the Revenue department. A Taluk Head Accountant on Rs. 50 would be glad to be a Circle Inspector on Rs. 75. An acting Sub-Magistrate on Rs. 80 would be glad to be a Plague Supervisor on Rs. 120.

Clerks could easily be found to fill up vacancies in the Revenue department caused in this way—at any rate, in this part of the district.

Rewards.—A reward, or better still a certificate, to native practitioners who give us information would be much appreciated. The native practitioners are even now very helpful in this respect. They give information, not only of cases of plague, but also of arrivals from infected localities. They give the information privately, but, even if it was known that they did so, it would not affect their practice. Mr. Ranganátha Mudaliyár is on friendly terms with them and especially with one of them, whose treatment is mostly resorted to in plague. They are a respectable class of men, so far as Tiruppattúr is concerned.

GROUP (B) (3).

Plague Police, etc.—No complaints as regards their honesty, but they are simply an useless luxury. They do not guard the houses of the people and serve no other useful purpose.

Mr. Ranganátha Mudaliyár found the sepoys unsatisfactory. Some of them were dishonest and two of them were convicted for house-breaking and theft in a building. They were without consideration for the people and, though they worked cleverly, were guilty of acts of wanton mischief under cover of the rules.

Discussion with Dr. Palpu, L.M.S., and D.P.H., Health Officer, Bangalore City,
(24th June 1904).

[These notes can hardly represent Dr. Palpu's full view, being the result of a casual conversation during an experimental burning of bratties, kindly conducted for my benefit in Bangalore City.]

GROUP (A) (1).

Burning Bratties.—Our contract is at the rate of 85 bratties for one rupee. In the experiment now being conducted, we are using a little under 2 rupees' worth of material for disinfecting a house with six small rooms. It would require 2½ bottles of perchloride to disinfect the same house.

We use paraffin in small sealed tubes as a cheap and easily made form of thermometer, taking care to place the tubes at the points which are likely to be least heated (e.g., near apertures). The upper part of the room will be 15 degrees hotter than the floor. The paraffin only melts at 72° C. or 73° C., whereas the plague germ dies at 55° C. The ordinary thermometer usually goes much higher [110° C. in the experiment now under trial]. I have known it go up to 200° C. and burst.

The heaps in the present experiment are smaller and nearer together than prescribed in the instruction. This is because the roof is low. The whole experiment lasts about 45 minutes. After the first half hour, the embers are spread over the whole floor.

We disinfect the adjoining houses, as well as the house actually infected. In the rains, pots are put on the roof to stop leaks.

Comparison with chemical disinfectants.—Perchloride is corroded by metal: it is also neutralized by organic matter, which is often found in native floors. If exhausted in destroying the organic matter, it will not kill the germs.

The people prefer the method of burning bratties as a rule, as they can re-occupy their houses at once, but it spoils decent floors; so far as they are concerned, chemical disinfection is efficient. We also use perchloride of mercury for open rooms and verandahs. The objection to leaving clothes in the room, when the bratties are burning, is that it discolours them. So it is not much done now in practice.

All superficial dampness will be removed from the floor, after the ¾ hour is over.

In thatched houses, there is some danger of fire; I have only known of one case in the city.

I cannot say whether the bratties are getting scarcer. We have not yet renewed our yearly contract and so I cannot say whether the price has gone up. The experiment has only been tried for a little over a year.

Recrudescence, etc.—I doubt, from a bacteriological point of view, whether the plague bacillus could live for any length of time without organic nutriment. In the experiment described by the Plague Commissioners, some of the culture may have got in with the bacillus and kept it alive. If the plague bacillus was to flourish for a long time in a cowdung floor, it would probably be due to excreta, remains of food, saliva or some other organic matter with which the floor was contaminated.

In practice, I think that the cases attributed to recrudescence are simply cases in which we have not been able to find out the real source of re-infection. The people believe in recrudescence, because the same house will be affected year after year. I think that this is simply because the house offers special facilities for re-importation.

GROUP (A) (3).

Rats.—They have mostly died of plague now. We do not see the big varieties. The "common-sense rat exterminator" is good, but very dear. The efficacy of the *colon bacilli* for infecting rats with disease is still *sub judice*. There have been few experiments in the matter of rats, fleas, etc., because they are attended with great danger and no inducements are afforded for undertaking them. That rats play a very important part in spreading infection is certain, and this branch of the subject is well worth investigation.

GROUP (A) (4).

Plague Hospitals.—are very popular. We get lots of voluntary applicants for admission.

Discussion with Lt.-Col. J. Smyth, I.M.S., Senior Surgeon and Sanitary Commissioner with the Government of Mysore (24th June 1904).

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury, acid solution of 1 in 1,000 or 1 in 500, according to circumstances. Clothes sometimes treated with the disinfectant, but people do not usually like this: they are more usually steeped in boiling water.

Unroofing.—This is very frequently done, in the case of huts or loosely tiled houses. The unroofing is not complete; a strip of the thatch or of the tiles is removed.

The object is partly to let in air and light and partly to dislodge rats and vermin.

Difficulties of chemical disinfection.—The floors of the houses frequently consist of spongy mud, which soaks the disinfectant up, and there are holes and crevices in walls, which cannot be operated on easily and effectively. Moreover, it is difficult, without adequate supervision, to ensure that the solution is properly applied. The honesty of the subordinate staff cannot be completely relied on. By using a weak solution, they could preserve and sell the remainder (perchloride of mercury always has a sale) or they might escape the trouble of constantly indenting for new stuff. Incomplete chemical disinfection is useless. What good is gained by destroying 3 bacilli out of 4?

These objections do not apply with the same force to pukka-built houses.

Izal.—A by-product in the manufacture of coke. Was used in the South African war. Messrs. Spencer & Co., Madras, are the local agents. It works out one-fourth cheaper than perchloride. Its effect as a disinfectant is more continuous and prolonged than that of perchloride. There are many high testimonials to its value. I have used it for my own house. I am not sure of its having yet been used by the Mysore authorities, but we are indenting for it and intend using it, as soon as it arrives. Its smell is very powerful and it would probably destroy the vermin with which the native houses are in many cases infested.

Chloride of Lime—not likely to be efficacious.

Hydrocarbon—very dear, apart from other objections.

Burning Bratties—has decided advantages over chemical disinfection in some respects. Perchloride of mercury does not permeate the whole house like bratties.

When burnt, the bratties form a thick smoke, which fills every cranny of the house in 10 minutes. They can be evenly distributed on the floor by sticks or branches, when they have got to the red-hot (or nearly white-hot) stage: they then take 3 or 4 hours to completely cool down. By that time, the whole interior of the room is supposed to be completely sterilized, so far as plague goes. Cloths, furniture, etc., can all be left in the house and sterilized at the same time. Fleas, bugs, etc., are killed and rats are either stifled or driven away.

The great thing is to get the bratties dry and to see that the glowing cinders are raked into every part of the floor, especially near the door, where the temperature would be lowest.

Some houses are too open to admit of the method being completely satisfactory. There is something in the objection that it is burning up the manure (or fuel) of the country, but in practice we have found no difficulty and had no complaints. One planter, however, wrote that he could not procure bratties and I had to advise him to use perchloride of mercury.

Note by Dr. Srinivasa Rao.

[I have not got Manson's 'Tropical Diseases' and the other books I have in the Laboratory do not say any thing about this * point. So I made certain experiments with Bouillon emulsion of plague bacilli and find that exposure to 65° C. for 5 minutes is sufficient to kill the plague bacillus.

Note by Lieutenant-Colonel Smyth.

	RS.	A.	P.
Cost of 100 gallons, HCl (1 in 500)	...	...	6 7 0
Cost of 100 gallons of Izal (1 in 100)	...	...	3 6 0
In favour of Izal, per 100 gallons	...	...	3 1 0

* (i.e.) the temperature at which the plague bacillus is destroyed: 80° C., according to Manson (page 234).]

Examination of Grain. We expose to the sun grain found in infected houses. It helps to clear out rats, but it is a method that can only be resorted to in dry weather.

Recrudescence and the allied problems.—I would rather not express an opinion as to the length of time during which the plague bacillus can flourish without the support of an organism to prey on. In practice, I think that you will always find, by sufficient enquiry, that cases of so-called recrudescence are due to re-importation in some shape or form or to continuity of infection by rats.

Attitude of the people.—Nothing is compulsory in Mysore State, so that the measures actually in force are a fair test of the feelings of the people. What they mostly resent is intrusion into their houses. They therefore prefer the method of burning bratties to that of chemical disinfection, because they can arrange the bratties and set light to them themselves. Moreover, burning bratties leaves the house dry, so that they can re-occupy it at once without discomfort.

Whether chemical disinfection or the burning of bratties is resorted to, complete disinfection of every stitch of clothing is difficult to attain in practice. In my own house, the servants have to put out every rag of their clothing in the sun every day, or in the verandah in the wet weather.

GROUP (A) (2).

Inoculation.—There was a rush for it at first, but it fell away afterwards. Now it is confined to the jails. Inoculation is worth the risks, but there are risks in the process, partly the result of operations being performed on persons of unsuitable constitutions and partly the result of bad stuff and unskilful performance of the operation. Abscesses sometimes ensue and I have seen more than one case of paralysis of the arm, which could be traced back to inoculation. In the case of men with diabetes, etc., a full dose should not be given. I was ill myself after the operation.

GROUP (A) (3).

Rats.—Rats are a source of spreading of plague within a village, while men spread it from village to village. Rats may sometimes be the vehicle of infection from village to village, but only very rarely.

Methods of destruction.—I use "rough on rats" in my own house, putting it in tin tubes, to prevent cats getting at it. The "common-sense rat exterminator" (American) is said to be harmless to cats and dogs, but is not so. It is composed of phosphorus, glycerine and flour.

Cats are of course useful also for destroying rats: I have never known of a cat getting plague.

We have not sufficient experience to judge yet of the efficacy of the methods purporting to spread exterminating diseases among rats.

Tar and sulphuric acid does not kill rats and only drives them away for a week or ten days. Tar would probably last longer, if used alone.

Rats and Fleas.—In a recent number of the *Lancet*, an Australian Doctor seems to have conclusively established the agency of rat-fleas in spreading plague. The fact that a recently dead rat, if handled, communicates infection is relevant, as establishing the agency of fleas: those who are of the contrary opinion have to explain how the microbe is, under such circumstances, communicated from the rat to the man. Puncture or abrasion of the skin or mucus membrane is necessary to enable the bacillus to operate on a human being.

Other considerations.—The saliva and the urine of the rat probably also spread the infection. The groin glands usually infected show that the leg must have been inoculated: a corresponding deduction must be made as to the axillary glands—infection of neck glands probably indicating infection *via* the throat.

GROUP (A) (4).

Plague Hospitals.—They are fairly popular. They are usually quite full in the plague season, though nobody need go, unless he wishes to. The people may treat themselves and their own doctors may attend them. Private doctors need not remain *permanently* in the camp, unless they wish to.

Conference at Hosūr (25th June 1904).

R. NARAYANA AYYAR, Esq., I.C.S., Divisional Officer, Hosūr.

Mr. GILBY, Plague Supervisor, Hosūr.

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury, 1 in 1,000. Clothes boiled. Only burnt in the cases of corpses. People prefer clothes being boiled to their being disinfected.

Unroofing.—Thatched houses are entirely unroofed and the thatch burnt. Tiled roofs are only partially unroofed. This applies to wet weather as well as fine weather. People build huts for themselves in the fields.

We give compensation for entire unroofing at the rate of 12 annas an *anganam* (2 yards).

Mr. Gilby has seen dead rats in some of the roofs, but does not remember having ever seen live ones.

Houses adjoining infected houses are only partially unroofed.

Difficulties.—Chemical disinfection is difficult, in the case of the poorer sort of houses. Flooding is good enough for the floors, but it is difficult to get at the walls completely.

Burning Bratties.—Neither officer has any practical experience of this. Mr. Gilby thinks that bratties could be easily got in any quantity in this division. Twenty-two bratties cost a pie. If bratties were used all over the division, at the rate of a cart-load a house, it would certainly cause a scarcity.

Exposure of Grain.—This is done in cases of evacuation, but not otherwise, unless the grain is suspected to have come from an infected part.

Mr. Gilby has seen some dead rats in a heap of ragi, which was accordingly burnt.

The examination of grain would be a good thing, from the point of view of disinfection, as grain may contain the excreta of infected rats, which might not be noticeable. The exposure of all grain would be possible in Hosúr town, but the deponents do not think that the advantages would out-weigh the inconveniences which would be caused to the people.

Attitude of the people.—There is no complaint as regards disinfection, but not much belief in it, except in the larger villages and amongst the more intelligent people.

Mr. Náráyana Aiyar thinks that one cause of the popular scepticism may be that, in the villages, the work is often scamped, a fact which he knows from personal experience.

People object to unroofing, chiefly in the rains. There have been no written complaints about it.

Apparatus, etc.—partly got from the Government stores and partly from private firms, with the Collector's sanction. There have been no complaints about it.

Village Officers.—As a rule, they give all required assistance to the disinfecting staff, but they do not understand the advantages of the process and could not be trusted to carry it out for themselves.

Recrudescence, etc.—We get a history of re-importation in so many cases that it is fair to presume that, in the few remaining cases, re-importation would be found to be the cause of re-infection, if we could get at the full facts.

Mr. Gilby cannot say (after six years' experience of plague work in Hosúr) that one can predict with any confidence in what houses, streets or quarters infection will re-appear in successive years.

GROUP (A) (2).

Inoculation.—In 1898, many people were inoculated. Now, there is no inoculation, except at the Remount depôt. Practically this is confined to employés of the depôt, though anybody could be inoculated who wished to be.

Mr. Gilby does not think inoculation much good. His disinfecting coolies used to be inoculated at regular intervals, but they seemed to get plague just as much as before: so it was given up.

Neither of the deponents have been inoculated. The people do not believe in inoculation—even the respectable ones.

In exempting inoculated persons from the passport rules, there is the risk, in the case of contacts, of their spreading infection unobserved by means of their clothes or baggage.

GROUP (A) (3).

Rats.—Both deponents are agreed that rats spread infection from house to house. Mr. Gilby also believes that rats spread infection from one quarter of a village to another.

Rats could of course carry infection from village to village, if conveyed in carts, etc.

Mr. Gilby has come across cases in which the history of infection could be traced back no further than dead rats and thinks that some of these cases may really have been due, not to human infection, but to the introduction of rats or other infected articles into the village.

Remedies.—Part of the ordinary disinfecting operations is to cover as many rat-holes as the disinfectors come across with tar and sulphuric acid. Rats are sometimes afterwards found dead in the holes with tar on their feet. The process does not kill them all.

Fifty wire traps are in stock and are distributed to people who want them in Hosúr town, when it is threatened with plague. Mr. Gilby has seen rats caught in these traps; people sometimes let these rats loose far away from the village and sometimes drown them.

People are aware that rats spread plague and most of them would be glad to have the rats exterminated, though some people think it cruel.

GROUP (A) (4).

Plague Hospitals.—There is a hospital at Hosúr town. People used to object to going there, but are getting over the objection now. When once they got there, they do not mind.

Seven people died in February, and this made the hospital unpopular at the time. It was said that this was due to neglect, but this could not be substantiated. The medical officer then in charge has since been transferred.

When the Divisional Officer is not in head-quarters, the medical officer is in absolute charge of the hospital. The Tahsildar has nothing to do with it.

Native practitioners are not allowed in the Government hospitals and they should not be allowed in.

Private Hospitals.—have never been erected in this division. People do not think it worth their while to go to the necessary expense.

GROUP (B) (1).

In Hosúr, the circle inspector has a pony allowance, especially sanctioned on the Special Plague Officer's recommendation. He uses his pony.

A plague allowance is not a good thing, except for disinfecting inspectors. They have an especially hard time and moreover have no opportunities of manufacturing plague cases.

An observation staff is useful in the hot-weather months, for the reasons stated in question (d).

Training.—Something might well be tried in the direction of deputing permanent district subordinates for temporary sanitary inspectors' work, on an understanding that promotion would be the reward of good work. They should get the full pay of the appointment.

Mr. Náráyana Aiyar says that, in Hosúr, there would be difficulty in getting clerks to fill vacancies.

Apart from the permanent revenue subordinates, it is doubtful whether we should get as good men in the district as those we get now.

With proper supervision, the local knowledge of revenue subordinates would be more of an advantage than their possible local sympathies would be a disadvantage.

The present temporary staff cannot be considered satisfactory.

Rural tracts.—Mr. Náráyana Aiyar does not think that the circle staff are useful as a stimulus to the village officers. Mr. Gilby thinks that to some extent they are and says that the staff do on occasions get reliable information, apart from the village officers.

There is some dishonesty in the staff, but not much.

There was a temporary sanitary inspector in Royakóttai, whose services were dispensed with. Subsequently, he re-appeared as a certificated inspector and now his certificate has been temporarily withdrawn for six months.

Attitude of the Villagers.—Villagers frequently quarantine out-siders in this taluk, but not in market towns, where their pocket is touched and where faction rages high, rendering united action impossible. The bigger the village, the greater the difficulty in concerted action.

Rewards.—Mr. Náráyana Aiyar thinks that a system of rewards to native doctors for reporting cases of plague would be useless, but Mr. Gilby thinks that it would be desirable as an inducement. Both deponents are agreed in thinking that, as matters now stand, native doctors afford no assistance in this matter.

GROUP (B) (3).

Plague Police.—Mr. Náráyana Aiyar is not satisfied with the plague police. They are slack in the performance of their duties and there is no discipline amongst them. The control over them is loose, but the deponent is sure that any representations he might make to the Police authorities in regard to them would be duly attended to. Mr. Gilby thinks that the plague police work fairly well.

Both deponents are agreed that it would be much better if a proportion at any rate of the plague police were permanent men.

Conference at the Kolár Gold Fields (26th June 1904).

Dr. T. J. O'DONNELL, Chief Medical Officer, Kolár Gold Fields.
Dr. A. M. ELLIOTT, Assistant to the Chief Medical Officer.

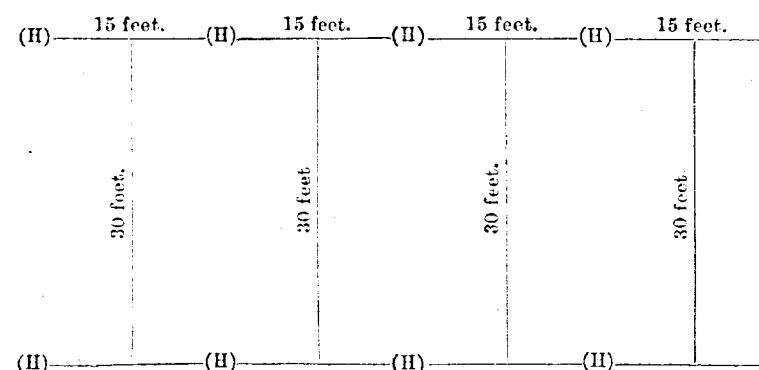
GROUP (A) (1).

Disinfectants.—Perchloride of mercury, acid solution of 1 in 1,000 for floors and cloths. It is mostly used for cemented floors.

Izal is not used for plague purposes, but only for general disinfection. It might be useful also for plague disinfection.

Removal of roof, etc.—[The notes under this head embody the results of my own inspection, as well as being a record of the discussion.]

Since the plague appeared, the huts of the employés are not being built in connected lines, but each hut is isolated and at a reasonable distance from the next hut, and the intervals between the lines of huts are broad—*vide* the diagram below:—



The sides of the huts are made of tatties, the roofs of corrugated iron, the flooring of cyanide sand. Cyanide sand is the finely powdered quartz rock from which the gold has been extracted, by saturation with a solution of cyanide of potassium. It is absolutely "sterile" and on this quality depends its efficacy as a flooring medium. This is a by-product from the mining operations, and the chemical reaction is believed to leave the floor in a completely sterilized condition.

This is the ordinary type of hut and it is not necessary either to unroof or chemically disinfect it. The sides are taken down, put inside the hut and burnt under the roof, thereby subjecting the roof to severe heat. The floor is completely removed, to a depth of 3 to 5 inches, taken away and buried. A new floor of the same composition is then laid down. The hut is then left vacant for two or three months.

Not only the infected hut, but the huts next to it on each side, are thus treated.

In the case of tiled roofs and pukka houses with cement floors, chemical disinfection and partial unroofing are resorted to.

Difficulties of chemical disinfection.—Dr. Elliott's experience in Karáchi, Sholapur, Nasik and Poona was that plague would re-appear in a house within six weeks of chemical disinfection. Further, he has seen the plague bacillus obtained alive from scrapings of a wall, scraped three days after chemical disinfection. In Karáchi, plague would break out year after year, in spite of incessant and renewed disinfection. Dr. Elliott is sure that in these cases the material used was good and the operation conducted in the most efficient manner possible under adequate European supervision. He considers that chemical disinfection must be inadequate as a general rule, (1) because the perchloride of mercury expends itself largely in chemical reactions with the albuminous and other organic matters contained in an ordinary native floor and wall, (2) because, so far as the wall is concerned, the perchloride cannot rest on it in sufficient quantities. The second objection could be got over in some degree (*vide* below).

Burning Bratties—not used for houses, but used for grain (*vide* that head). As regards native houses, it would be efficient, if a temperature of 72° C. or higher were maintained throughout the interior of the hut for one hour or more; but the floor and wall should be scraped to a depth of 1½ inches or so and left in the hut in this loose form during the bratty-burning operation. This would result in that portion of the floor and walls which was likely to harbour bacilli being exposed to the action of the heat.

At the end of the bratty-burning experiment, the loose earth of the floor and walls should be treated with a chemical disinfectant and then pressed down again over the floor.

Dr. Elliott had experience in Deolali of the burning of bratties in houses.

Disinfecting apparatus.—The Japanese pump (sold by Messrs. Foster & Co., Chemists, Bangalore, price 6 rupees) is the one used on the Fields. It lasts almost six months. There is practically no metal in it (except a small zinc grating, where the disinfectant enters the pump), so that there is little or no corrosion. It makes a very good jet of water [tested in front of me].

Exposure of Grain.—In bazaars, all the grain that comes from outside is shut up in rooms and bratties burnt. The shandy is under Government control, so the deponents are not able to say what is done with the grain that comes in there.

Regrudescence and allied questions.—This is a scientific question, but no opportunities or inducements are offered for scientific research. Dr. Elliott is inclined to think, from the way in which plague re-appeared year after year in the same quarters, streets and houses in Karáchi and from the confidence with which the direction taken by successive outbreaks could be predicted, that there is something in the theory of recrudescence. Dr. O'Donnell confirms this view as regards Kolár itself, having seen cases recur in a particular house, though the people successively occupying it were different and their habits dissimilar.

Plague does not appear to be a disease of dirt. Experience shows that it does not specially favour the dirtiest cities or the dirtiest quarters of cities. Nor does it seem much affected one way or the other by climatic conditions.

Though earth floors may afford a good medium for the plague bacillus, they are by no means a necessary condition. Dr. Elliott has seen plague raging 11,000 feet above the sea-level, where there was nothing but bare rock.

* *Infectivity of Plague Patients.*—Dr. Elliott has got plague bacilli out of the blood of a plague patient, two months after recovery. So has Dr. Simpson in Hong-Kong. If plague can be transferred from one person to another by suctorial insects (*e.g.*, mosquitos, fleas or bugs), this would render a plague patient infectious for at least two months after recovery. If the disease is not so transferable, the existence of plague bacilli in the blood would not render a patient highly infectious, as internal or external bleeding would be necessary in order to let the bacilli loose.

Dr. Elliott has tested the urine of sick and convalescent plague patients and found no bacilli in it. He has not tested the fæces, but does not think it likely that bacilli would be found therein.

Dr. O'Donnell confirms the view expressed in the last paragraph and adds that the view that a plague patient is infectious after recovery may be a false analogy from what takes place in cases of enteric fever.

GROUP (A) (2).

Inoculation—

Number of inoculations during 1898-1899.	Number of attacks amongst those once inoculated.	Recoveries.	Deaths.	Number of second inoculations.	Attacks.	Recoveries.	Deaths.
11,533	37	14	23	86	1	...	1

Dr. O'Donnell's experience as regards inoculation has been favourable. He can remember no case of plague on the Fields contracted by an inoculated person. There were very few cases (in his experience) of illness after inoculation. Paralysis of the arm would be the result of *bad* inoculation, resulting in abscess or injury to the nerve by the needle. There has been no inoculation on the Fields for three years.

Dr. Elliott does not believe in its efficacy. He has inoculated 25,000 cases. In Karáchi, a Commissioner had to be appointed, on account of the number of inoculated people who got plague.

Both deponents are agreed that inoculation has (or is at any rate popularly believed to have) a favourable influence on other diseases, such as rheumatism. People have requested to be inoculated, with this object in view. They have not heard of anybody expressing the opinion that the operation would tend to bring out diseases.

The operation requires no particular skill: merely care, cleanliness and attention to antiseptic precautions.

GROUP (A) (3).

Rats.—Rats are undoubtedly a means of spreading infection both from house to house and (both deponents think) from quarter to quarter.

Dr. Elliott has known of a case in which a vulture dropped a dead rat in some police lines and the policemen who picked up and threw away the rat got plague and communicated it to some other people.

Rats and Fleas.—Dr. O'Donnell does not see sufficient reason to believe that fleas spread the infection. Dr. Elliott observes that Dr. Simpson in Hong-Kong claims to have found the bacillus in the flea, but that other bacteriologists have made similar experiments with negative results. He has made similar experiments himself with only negative results. In these circumstances, the theory cannot be said to be established. It needs further working out.

In most of the cases of infection by rats, both deponents agree that it is the cervical glands rather than the axillary glands that are affected. This is especially the case with children, who probably get the disease through getting their fingers soiled with infected matter and then sucking them.

If the infection had been derived from the bites of fleas on the hand or arm, it would be the axillary glands that would be affected.

Methods of destruction.—Any method of exterminating rats would be welcome. Great attention is paid to this, and the number of rats has materially decreased. A crusade against rats is undertaken in July and August (*i.e.*, before the season at which plague is most likely to appear).

The common-sense rat exterminator is used and found to be very good. It can be made into a paste with sugar and flour and smeared over a large surface; the advantage of this is that it cannot be all taken away at once.

In the course of the re-flooring of infected houses (described above), rat-holes are invariably dug up and the rats destroyed.

GROUP (A) (4).

Plague Hospitals.—There was some trouble in inducing people to go to plague hospitals at first, but this is no longer so. The patients are mostly employés in connection with the mines and it is not difficult to induce them by one means or other to follow the guidance of the authorities in this matter.

[It may be added that the hospital buildings, which Dr. O'Donnell kindly showed me, are made with tiles or Cuddapah slabs for the floor, tatty sides on hinges, capable of being raised or lowered at pleasure, and corrugated iron roofs: they are airy and comfortable. They are, of course, of a more expensive type than those in use in most stations of the Madras Presidency. They are really what we should call *private* plague hospitals, the cost being divided between Government and the Kolár Sanitary Board.]

GROUP (B) (2).

The Passport-System.—The passport-system is worked with great strictness in and around the Gold Fields. Dr. O'Donnell supervises its working, so far as the Fields themselves are concerned, whilst the surrounding villages are worked by the Mysore Government authorities.

It is an excellent system, where (as in Kolár) it partakes of the nature of a cordon round a restricted area which can be adequately supervised. In Kolár, its working may be said to be perfect, in the sense that every or nearly every passportee is observed without fail.

When these conditions cannot be obtained (and there is hardly any part of India, either rural or urban, where they can be obtained), the value of the system is materially diminished. Still, both deponents agree that it cannot be pronounced useless, in places where it enables the authorities to inspect (say) two-thirds of the arrivals from infected localities.

GROUP (B), (3).

Plague Police.—[I may note that Dr. Séshagiri Rao, Civil Surgeon in charge of the Kolár District, whom I met at the plague camp, informed me that the constables had full police powers within the limits of the camp, but that they were under his absolute control and that he could punish them, even to dismissal. He added that the system worked satisfactorily.]

Discussion with Captain R. F. Standage, I.M.S., Health Officer, Civil and Military Station, Bangalore, and Mr. F. Deeks, Assistant Surgeon in charge of the Sixth District (27th June 1904).

GROUP (A) (1).

Disinfection.—Perchloride of mercury, 1 in 500 for cowdung floors and 1 in 1,000 for cement or solid floors. The disinfectant is squirted to the top of the wall, but not on the roof. A coat of lime is afterwards applied to the walls.

Clothes are boiled, if we can get them. These disinfecting methods are compulsory, but they are not carried out while the sick man is in his house, as it would be useless and impracticable. Re-infection would obviously be immediate in such a case. The disinfection, in such cases, is postponed until the patient dies or recovers.

The town was completely disinfected, in the course of the year 1902-1903, by 27 gangs, supervised by 11 European officers.

Unroofing—not practised. It might serve to destroy rats and vermin, but would require a very large increase to our staff and a corresponding increase in expenditure.

Difficulties in disinfection.—We scrape the walls before disinfection and brush the disinfectant in, but even so it cannot be said to be a complete sterilization of the interior of the house. The difficulty with walls is to get the disinfectant to stay long enough on. Captain Standage, however, believes in the general efficacy of chemical disinfection.

Burning Bratties—was only tried experimentally here. Captain Standage does not believe in it, but agrees that it does sometimes have the effect of stifling and so destroying rats and vermin.

Exposure of Grain.—only practised, when houses are disinfected. Dead rats have been found in grain and in the areas used for storing grain. Grain is undoubtedly a possible source of infection.

Recrudescence, etc.—In most native houses, there is probably enough organic matter to support a plague bacillus indefinitely. Cow-dung would very likely support it, apart from anything else. Great stress is laid on the digging up of cow-dung floors during the process of disinfection.

It is observed that particular houses and streets (*e.g.*, the milkman's street) are re-infected year after year. This might be due to spontaneous breaking out of the infection from the soil.

GROUP (A) (2).

Inoculation—has been going on up to recently, though not during the current official year. The operations have been performed by Captain Standage, Mr. Deeks and the Assistant

Surgeons in charge of the two other plague districts. The staff are still prepared to perform the operation, if any one comes forward. Pamphlets were distributed on the subject. Neither of the deponents have been inoculated.

Results of inoculation.—There are probably about 20,000 inoculated people in the town, out of a population of about 100,000. Out of about 3,300 cases of plague during the year 1903-1904, only three of the patients had been inoculated. This not only shows a relative immunity, but also shows that the protection afforded lasts for longer than six months, most of the 20,000 having been inoculated some years ago. Both the deponents testify from their own personal experience to cases in which inoculated members of families, etc., have escaped an attack or had it in a comparatively mild form.

No cases in which inoculation has led to serious illness have been brought to notice. They certainly would have been brought to light, if they existed.

Captain Standage is sure that inoculation would not bring out or aggravate a constitutional infirmity like diabetes.

It is not impossible that a person inoculated while incubating for plague would get a worse attack on that account, but this is not certain. Such a point could only be settled by scientific research.

If the infection gave an *immediate* power of resistance, you would lessen the severity of the attack: if the action of the fluid was only gradual, it might have the contrary effect.

Attitude of the people.—The people here have no horror of inoculation. Educated natives seem to believe in it, rather than otherwise. People have got used to the plague and don't like being laid up for three or four days. The Chucklers have hitherto been keener on inoculation than other castes, partly because they live near Mr. Deeks's office and partly through the influence of the headman of their caste, who is a believer in its efficacy.

GROUP (A) (3).

• *Rats*—are likely to spread the disease. Some roofs harbour rats and some do not. Rewards used to be given for the destruction of rats, but this is only a palliative, not a cure: moreover, it needs caution, for fear lest rats should be bred in order to secure rewards.

Rats and fleas.—Even if patients were attacked with plague in the cervical glands after contact with rats, it would not follow that the infection came from the mouth. They might have got it from the neck.

A flea, even if it jumped on to the hand, would not necessarily (or even probably) bite the hand. It would make for a tender spot like the neck.

On the general question of fleas as a source of infection, Captain Standage would rather not express an opinion.

GROUP (A) (4).

Plague Hospitals.—Suspicious cases of sickness are merely kept under observation: but, if a case can be diagnosed as one of plague, attempts are made to induce the relations of the patient to allow him to go to hospital; no compulsion is used. In the case of home segregation, no watch is kept over the contacts; they can go about as they will. Guards were put on at one time, but they were found to be careless and venal.

In large towns and big epidemics, further precautions or a stricter attitude are not likely to meet with success.

GROUP (B) (1).

• *Methods of observation.*—Each Inspector has to hunt up about 5,000 people a day. He has a register, which he keeps up to date, in the matter of arrivals and departures. Inspectors in the same district compare their registers twice a day in the Assistant Surgeon's office, so that alleged changes of residence within the same district can be verified. No such comparison of registers is made, in the case of different districts. A return of all sick people and of all deaths is also submitted in a prescribed form.

What is relied on chiefly is the fact that the people, knowing that they will not be compulsorily turned out of their houses (*vide* above), give information of their own accord for the most part. Finding this to be so by experience, Captain Standage has succeeded in reducing his observation staff to half what it used to be.

Conference at Vellore (28th June 1904).

A. C. DUTT, Esq., I.C.S., Sub-Collector.
 Captain D. N. ANDERSON, I.M.S., District Medical and Sanitary Officer.
 MUHAMMAD HABIBULLAH SAHIB, Secretary to the Vellore Municipal Council.
 M.R.Ey. V. GOPÁLAKRISHNA MUDALIYÁR Avargal, Municipal Councillor, Vellore.
 M.R.Ey. R. VENKATAVARADACHÁRYA Avargal, Plague Supervisor, Vellore division.

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury, acid solution of 1 in 1,000 for cement floors, 1 in 500 for mud floors.

In rural tracts, valuable cloths are boiled; ordinary cloths are first soaked in an acid solution of perchloride (1 in 1,000) and then boiled.

In Vellore town, valuable cloths are exposed to the sun and other cloths are boiled.

Disinfecting Staff.—consists entirely of certificated men. The Municipal Secretary suggests a pony allowance for disinfecting inspectors, on the ground that their work and pay are at present less attractive than those of the observation and preventive staff, though their duties are more responsible.

Unroofing.—This has not been practised in rural tracts since 1899. The result of the experience of that year was unfavourable.

Captain Anderson had experience of the process of unroofing in Aurangábád, where it was freely practised. Rats and squirrels were found in the roofs in some cases: Mr. Dutt on one occasion found two rats and on another occasion 11 snakes in the course of unroofing. Unroofing was dropped, because it was found to be unpopular and the amount of compensation came to a high figure.

In the Municipality, thatched houses are unroofed, in addition to chemical disinfection. The rates of compensation run from 2 to 5 rupees per house. The poor people go into the fields for the time being. There has been no dissatisfaction about this. Mr. Gopálakrishna Mudaliyár thinks that it would cost from 10 to 12 rupees to restore the roofs. The Municipal Secretary observes that the rates are fixed on the estimate of the Municipal Overseer, a professional man.

Captain Anderson believes in unroofing, because of the resultant exposure of the floors and walls to the action of direct sunlight and because there may be rats and vermin in the roof. There have been no riots, within the experience of any of the gentlemen present, on account of unroofing.

Difficulties of chemical disinfection.—The interior of houses cannot be completely sterilized by the mere application of perchloride of mercury. The chinks and crevices in the walls and floors cannot be got at by the fluid. The District Medical Officer suggests the necessity for digging up the floors.

Burning Bratties.—Mr. Dutt had experience of the old method in which the floors were collected and burnt in the open air.

The Municipal Secretary was present at some experiments in the Vellore Municipality. The floor was dug up, removed and buried. Two thousand bratties were burnt inside the room in which the sick man had lived; they continued to smoulder for a whole day. The disinfection of one room cost from 4 to 7 rupees. The bratties were not burnt in any other room, but the heat would spread all over the house.

Apparatus, etc.—No complaints as to promptitude, quality of the drugs, etc. They are got from the Medical Stores, but can be got locally, in case of emergency, with the sanction of the Collector.

The District Medical Officer has had experience of the bamboo form of China pump and found it simple and cheap.

Exposure of Grain.—All are agreed that grain is infective and that the exposure of grain to the sun is a good measure and not a very unpopular one. It is even now practised as a part of the ordinary process of disinfection and, in Vellore Municipality, grain shown to have come from infected areas is exposed to the sun, though it is not easy to find out whether the grain has or has not come from an infected locality.

Captain Anderson has known of cases in Aurangábád, in which the probable cause of plague was sleeping on grain-bags. The Municipal Secretary has found rats (alive and dead) in grain. The Supervisor has known cases in which the history of an epidemic could be traced back to imported grain and no further.

Attitude of the people.—People do not object to chemical disinfection, but dislike unroofing. They do not yet understand the advantages of chemical disinfection and could not be trusted to perform the process efficiently by themselves. Mr. Gopálakrishna Mudaliyár does not think they would like having bratties burnt in their houses.

All are agreed in thinking that the people themselves are getting to understand advantages of evacuation. Even in Vellore, they quit the town of their own accord, when

epidemic had become wide-spread, but not at the beginning. Captain Anderson's experience in Aurangábád was that the inhabitants would at once quit the town for their fields or (in the case of the more well-to-do) for other towns.

Recrudescence, etc.—Mr. Dutt's experience is that the same quarters get re-infected year after year and he suggests that this might be even more the case but that disinfection is now carried on more carefully. The Municipal Secretary's experience agrees with that of the Sub-Collector, though he believes that the direct cause of re-infection is re-importation. He observes that Tótapáláyam is always re-infected and attributes this to the fact that the inhabitants of this quarter, who are cultivators, are in the habit of stacking manure in their backyards. Mr. V. Gopálakrishna Mudaliyár has not observed that plague breaks out in particular quarters more than others. He thinks the course of infection and re-infection rather capricious and would not be prepared to predict the course of an epidemic.

Infectivity of convalescents.—Plague patients in the pneumonic form of plague are segregated for one month after they are pronounced convalescent: the same method is adopted when the bubo does not burst. In other bubonic cases, they are kept one week after the healing of the bubo.

GROUP (A) (2).

Inoculation.—was resorted to in 1899 and 1900: not since then. Mr. Dutt and the Municipal Secretary were inoculated four or five years ago. Captain Anderson was inoculated in 1902. The other two deponents have not been inoculated at all.

Effects of inoculation.—It is said to cause permanent weakness and impotence. Cases of paralysis of the wrist have occurred.

Mr. V. Gopálakrishna Mudaliyár's brother's wife was inoculated and miscarried ten days after.

Captain Anderson has seen a good deal of inoculation and himself suffered severely after the operation, first from fever and then from swelling. Several other people were inoculated besides himself and were also ill, but only one besides himself severely so.

Mr. Dutt observes that the number of people who died of plague after inoculation was so marked that a rule was made that contacts should not be inoculated.

Attitude of the people.—People are fairly contented with the plague measures now, and it might make them suspicious, if steps were to be taken in regard to inoculation at this stage. An attempt to revive inoculation would not be received with favour.

GROUP (A) (3).

Rats.—All are agreed in regarding rats as a source of infection and thinking that they spread plague, even from one quarter of a town to another. The Municipal Secretary further knows of a case in which rats appear to have spread plague from one village to another village about a mile away.

Methods of destruction.—A mixture of tar and sulphuric acid is the only method hitherto in use. The Supervisor has not seen any dead rats as a result of this. The Municipal Secretary has seen one or two dead rats after the application, but cannot say that the deaths were the result of it; he cleaned his own house in that way last December and the rats have kept away ever since.

The effect of the mixture is, as a rule, to drive the rats away; it is possible that it may thus have the effect of spreading the infection. All are agreed that it would be a good thing to adopt a method, if practicable, for exterminating rats.

GROUP (A) (4).

Plague Hospitals.—There is a hospital for the Vellore Municipality and another at Arkonam. The latter was erected in connection with the inspection of trains. These hospitals are decidedly unpopular. People had an idea that they were taken there to be poisoned and they still think so. Last official year's statistics are: Vellore camp, 18 deaths out of 36 admissions; Arkonam, four deaths out of six admissions.

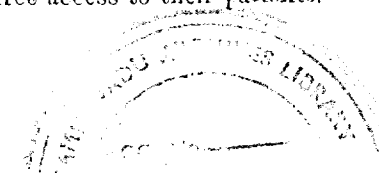
Suggestions.—Captain Anderson found that the hospital in the Tinnevely district was popular enough. Hospitals should be made comfortable and attractive and some provisions should be made to satisfy caste prejudices. The huts here are all in long blocks: if they were made in small groups of two or three wards, it would be easier to satisfy caste prejudices and disinfection would also be simpler.

Private Hospitals.—None have been erected. There appears to be no demand for them.

Native Practitioners.—are allowed to treat the patients and are not compelled to live in the hospital. The hospital assistant does not live in the camp, but visits it three times a day. There is a strong objection to European treatment in Vellore town, which the authorities have vainly tried to remove. Hospitals would, in the opinion of the Municipal Secretary, become even more unpopular, if native practitioners were not allowed free access to their patients.

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GROUP (B) (1).

Training and recruitment of the Staff.—Efforts are being made in this district to recruit the temporary sanitary staff from the permanent establishment. 75 per cent. of the staff are permanent men. They take leave and get the full pay of the appointment. The Plague Supervisor himself gets the full pay of the appointment (Rs. 80 and 45), though his permanent post is only 50 rupees. He was an acting Sub-Magistrate, before he took up his present post. The Sub-Collector considers that the system has satisfactory results, but observes that there is a difficulty in filling up the vacancies thus caused.

The District Medical Officer considers that there would be no difficulty whatever in training the men locally. Practical training is what they want.

The Plague Staff.—Mr. V. Gopálakrishna Mudaliyár observes that they are not much respected by the people and are of very little use, as they can only find out cases when the whole street knows of them.

The Municipal Secretary agrees with this view, though he thinks the staff are fairly honest. There have been very few complaints of bribery, and the complaints have never been proved. Mr. Dutt agrees in thinking that the staff are fairly honest.

The Secretary is of opinion that his old sanitary staff, which consisted of the ordinary sanitary establishment, did far better work in the detection of plague cases between 1899 and May 1903 than the subsequent special observation staff. He observes that the figures for these respective periods prove this.

He attributes the indifferent success of the special staff, in comparison with the permanent men, to the fact that the latter were known and respected in the town, whilst the former are low-paid outsiders and cannot get people to talk freely to them.

The special observation staff consists of a supervisor and five circle inspectors on Rs. 25 each. The pay is too low to make it possible to depute the permanent staff to the work. A smaller staff, of which each individual was more highly paid, would probably work more efficiently.

Rural Tracts.—There is not much corruption in the rural tracts, and there have been no actual cases in which the staff have had to be punished for dishonesty.

The staff get their information practically entirely from the village service, but the village officers would not report, unless they had the circle staff to look after them. Occasionally, in factious villages, outside information is obtainable, but this is very rare. A villager who reported such cases would risk injury at the hands of his fellow-villagers.

The Sub-Collector has twice had information of an outbreak of plague from the Assistant Superintendent of Police. One such piece of information came from an inspector's diary and was with regard to Vellore town, which was then under observation.

Village patrol.—Mr. Dutt has known of a case in the Kuppam zamindari, in which a plague inspector was refused admission to a village, and knows of other cases in which outsiders were kept out. The Supervisor knows of similar cases, but thinks that those proceedings on the part of the villagers are exceptional.

The Municipal Secretary and the Supervisor observe that this attitude is characteristic of remote villages rather than villages near big towns. In the latter class of villages, the towns-people go out to their fields as a matter of course and would not allow themselves to be restrained from doing so.

Mr. Dutt observes that an attitude of this kind goes far beyond the views of Government, who are content with insisting on *observation* of travellers from infected localities. He remarks that there is a danger of such a movement, if carried too far, leading to something like the anti-kallar movement and causing riots and breaches of the peace.

Rewards.—The Secretary and Mr. V. Gopálakrishna Mudaliyár are in favour of a system of small rewards to private practitioners for giving information in plague matters. Mr. Dutt, however, fears that recognition of their services would do them harm rather than otherwise, as it would destroy their popularity and ruin their practice.

Mr. V. Gopálakrishna Mudaliyár (himself a private practitioner) says there are four or five others in the town besides himself. He says his position is a little difficult. He attends plague cases and it would render him very unpopular if he reported such cases to the authorities. In fact, even now, patients will not call in doctors until too late, for fear of being reported.

The Secretary remarks that, for fear of being called on to report, most of the native practitioners will not admit that they attend plague cases at all. He agrees that, if the native practitioners reported cases, they would become very unpopular.

Examination of Corpses, etc.—In and within five miles of Vellore town, every corpse must be inspected or a certificate of the cause of death produced. This is so long as the town remains on the infected list, but in practice the same procedure is adopted when the town is under observation.

There is no prosecution in the event of failure on the part of the people to comply with the rule: the case is simply dealt with as if the death had been due to plague. There has been no opposition to the attitude of the authorities in this matter, nor have any complaints been made on the subject.

The Municipal Secretary suggests that the Collector should himself be allowed to bring the rules on this matter into force at his own discretion. It takes time to get the sanction of Government for the adoption of the rules.

GROUP (B) (3).

The Plague Police—do not work satisfactorily and are unpopular. They are simply cart-drivers in uniform. All or a certain proportion of them should be permanent men and the plague authorities should have direct control over them.

At rural passport-issuing offices, they have a free hand and the Municipal Secretary and Mr. V. Gopálakrishna Mudaliyár understand that they and the clerk take an anna each to excuse travellers from taking out a passport. In such rural offices, they and the seven-rupee clerk are practically unchecked. In the neighbourhood of a big town, they would not be likely to risk detection by resorting to such practices.

Conference at Chittoor (2nd July 1904).

R. C. C. CARR, Esq., I.C.S., Collector of North Arcot.

SAIYID QADIR BADSHAH, Treasury Deputy Collector.

M.R.Ry. T. RÁMA RAO Avargal, Head-quarter Deputy Collector in charge of Plague Operations for his division.

M.R.Ry. B. C. RÁGHAVAYYA Avargal, B.A., B.L., Government Pleader, Chittoor.

M.R.Ry. P. NARASIMHAYYA Avargal, B.A., B.L., First-grade Pleader, and Chairman of the Chittoor Union.

GROUP (A) (1).

Disinfectants.—Perchloride of mercury, 1 in 1,000 for houses and cloths, 1 in 500 for mud floors. Valuable cloths are simply exposed to the sun.

Disinfecting Staff—consists of temporary men. The certificated men are mostly employed on circle duty. The subordinates usually prefer circle work to disinfecting work.

Unroofing—only resorted to in the case of very old thatched houses. Their value is so small that there is usually no need for compensation. There have been no cases of rats having been found in roofs, whether dead or alive. Unroofing on a general scale would be unpopular.

Efficacy of chemical disinfection—believed to be sufficient, even in the case of ordinary native houses. It is not unpopular, but people would like it better, if they could do it for themselves.

Burning Bratties.—There would be difficulty in getting bratties for disinfection on a large scale. Bratties are used now for fuel and for burning corpses. Doctor Voelke, in his agricultural report, condemned the burning of bratties from an agricultural point of view.

Exposure of Grain.—When Chittoor town was threatened with plague, merchants were advised to expose their grain. Some did it and some did not.

Grain is a possible source of infection and, from that point of view, its exposure to sunlight would be a good thing.

The Treasury Deputy Collector does not think that grain usually comes from infected areas. The other gentlemen present are not so sure of this, and it is pointed out that some of it comes from Vellore.

It is doubtful whether it would be practicable to expose grain systematically, but it is not considered that excessive inconvenience would result from the process.

Attitude of the people.—People do not altogether understand the use of disinfection and could not be trusted to do it properly without supervision. There was a riot six years ago in connection with an attempt at house inspection, but there has been no opposition since. There have been no complaints of dishonesty or oppression on the part of the staff.

Apparatus.—No complaints.

Recrudescence.—Mr. Carr's experience of Bellary is that the same streets seemed liable to re-infection in succeeding epidemics. In Adóni, plague broke out twice in the same house, with an interval of six months and without any trace of re-importation. Further details as to this case can be got from Bellary.

GROUP (A) (2).

Inoculation.—Mr. Rághavayya and Mr. Narsimhayya were inoculated, when Colonel Bannerman visited Chittoor in 1899, also about 150 other people. There has been no inoculation since then. People have a vague dread of inoculation and believe that it brings plague. An attempt to revive it would not meet with success. None of the gentlemen present, except the two mentioned above, have been inoculated.

GROUP (A) (3).

Rats—believed to be a source of infection. Dead rats are the usual accompaniment of the commencement of an epidemic. Mr. Carr's experience is the same in Bellary.

The deponents are not prepared to say from experience whether rats spread the infection from one quarter of a village to another.

People understand the danger of rats and would welcome measures for their destruction. The deponents themselves use rat-traps and some of them keep cats.

Tar and sulphuric acid have been used, but they are not found to be efficacious in destroying rats.

GROUP (A) (4).

Plague Hospitals—are not popular, as people even now believe that they will be killed, if they are sent to them.

GROUP (B) (1).

The Observation Staff.—They do not get information independently of the village officers, but they serve as a check on their work.

The Head-quarters Deputy Collector does not think that the Tahsildar and his subordinates could perform the duties of an observation staff efficiently, in addition to their ordinary duties. The Tahsildar thinks that they could do so.

The Collector took the opportunity afforded him by jamabandi of impressing the village officers personally and individually with a sense of their responsibilities in this matter and instructed his Divisional Officers to adopt a similar procedure.

The passport staff in rural tracts are believed to take money from people and connive at their not being examined. In general, they are feared rather than respected. Outsiders from Madras would be even less respected and would get less information and be less in touch with the people.

Village Patrol.—Villagers do, in many cases, keep outsiders from their villages—even officials have been kept out in this way. Prickly-pear hedges are planted round the villages and guards are posted also. Mr. Carr's experience was that this attitude on the part of the villagers was very wide-spread in Bellary also.

All are agreed that this attitude on the part of the villagers deserves encouragement.

Inspection of Corpses.—There is no objection to the inspection of corpses amongst Hindus. They only object to their being touched. There was a small riot recently, on the occasion of a corpse being attempted to be inspected by an apothecary, but this was probably due to personal enmity against the apothecary concerned.

Rewards—to private persons would do more harm than good. Such offers would be taken advantage of to gratify spite. As to native practitioners, they would not be of much use in any case, as they do not treat plague cases, except in Vellore town.

GROUP (B) (3).

Plague Police—do not work properly or obey the observation staff. The Head-Quarters Deputy Magistrate convicted a plague constable for extortion. He had detained a cartman, taken his temperature and threatened to send for the doctor, unless he was paid. This case is still pending appeal.

The plague officers have no control over the police and have to report their misdeeds to the District Superintendent of Police. They are all temporary men. Some of them should be permanent men.

Discussion with the Rev. J. J. Chamberlain, Vellore (3rd July 1904).

(The portions in brackets represent notes of my conversation with the Rev. J. I. Chamberlain.)

It is with some hesitancy that I offer the following opinions on the questions raised, as it is some time since I have had any personal responsibility in the administration of plague measures. My observation of conditions and knowledge of the practical working of these measures are limited to the Vellore Municipality, chiefly in the early part of 1903.

GROUP (A) (1).

(a) I think so.

(b) Hardly, it seems to me. Two weeks of only 2 hours per diem do not give a man much advantage over the ordinary inspector trained in sanitation.

(c) Greater, with advantage.

(d) This is somewhat beyond my experience. *Sunlight* is the natural process, but impracticable in large towns. [In villages, it is a good method, where the roofs are of an inexpensive kind. Unroofing is somewhat unpopular in a big town.] The free use of *bratties* is somewhat expensive. [People would *understand* it better than chemicals. The more *intelligent* villagers understand something of disinfection. If a rat dies in their houses, they will sometimes come and ask me for chemicals.]

Chemical disinfectants are both efficient, when properly used, and not prohibitive in the matter of expense. The people are coming to understand and call for them for their own use.

[Unless you dig up the floor, it is often difficult to ensure that the chemical disinfectant penetrates everywhere.]

(d₍₁₎) In towns, chemicals and bratties. In rural tracts, chemicals and sunlight, as the houses are so largely roofed with thatch and can therefore be easily unroofed.

(e) We have usually been able to trace the appearance of plague to importation, which rather goes against the revivification theory. However, I have not sufficient knowledge to give a definite opinion on this question. [Certain quarters in Vellore town tend to become re-infected in each succeeding epidemic, e.g., Saidapet. The streets in Saidapet are narrow and poorly drained.]

(f) I think we have had no ground to complain.

(f₍₁₎) Yes, I think so.

(g) Fairly well, when supervised and when interference from the occupants of the house does not go too far.

[*Exposure of Grain*.—I consider that grain is a source of infection. Last year, we turned out the Mandai street and exposed all the grain to sunlight. Captain Abdul Aziz examined the market on the same occasion. It had been shut up. He found hundreds of rats in it—dead of plague. The rats spread all over the cantonment. I believe that the grain was the cause of this outbreak.]

I do not think that grain exposure would be very unpopular, but traders are afraid that the grain may be lost or spoilt and also afraid that people will suppose that there is something wrong with their grain.]

(k) (I) By closer and stricter supervision of the superior staff.

(II) I do not know how, other than by the application of the general principles of economy and the co-operation of the occupants and owners of houses.

(III) By doing what officers usually try to do, enlisting the sympathy and confidence of the leaders of the various classes of the community and setting them an example of interest in their welfare.

GROUP (A) (2).

Inoculation.—Inoculation was attempted in Vellore only during the first outbreak of plague in 1899. I thought it had since been practically given up. It has certainly not been attempted or encouraged in Vellore since then, although I know of no evil or disappointing effects that followed its use in 1899. In general, I have thought it was not worth while pressing it.

[People were against inoculation on the whole. It seems to me that it means a good deal of suffering for a very small result. I think that inoculation sometimes affects people's weak points. My brother's throat gave him great trouble, for some weeks after inoculation. I have known two or three other cases of the kind.]

GROUP (A) (3).

Destruction of rats.—(a) Hardly, I think.

(b) Yes, in regard to both advice and inducements, it seems to me.

(c) I have accepted the general theory that they do.

(d) In my experience, rats and squirrels have seemed to exercise the most influence in spreading plague. [Captain Tucker, I.M.S., was driven out of his house by dead rats and squirrels. I found dead rats and squirrels in my godowns and my syce got plague. These rats and squirrels were quite a feature of the epidemic of 1903.]

I believe that rats spread plague, even from one quarter of a town to another. I think that people would welcome measures for their extermination.]

In the Philippines, I think rewards were offered for every rat brought to head-quarters. They were nearly deluged, I think; but plague was brought under control. [I think an offer of a small reward for rats would probably do good. People feel too great a terror of plague, I think, to breed rats for money.]

GROUP (A) (4).

Plague Hospitals.—(a) Generally speaking, they are unpopular enough, but, when they are made fairly comfortable and the inmates are looked after by superior officers they become less so. I have known many people to be quite content in them. [It would improve the

popularity of our hospitals to have small separate wards. This would make it easier to keep different castes separate and would also help in the matter of disinfection, but it would be more expensive.]

(b) *Vide supra.*

(c) Not at all that I have heard of in this district. They construct temporary shelters in their own gardens, but not hospitals.

GROUP (B) (1).

Observation.—(a) Fairly well, in detecting, after it is in good running order, but not very well in suppressing.

(b) It seems to me that expenditure under this head could be reduced materially, without serious loss of efficiency. While "life, health and the pursuit of happiness" are all right as the objects of good Government, there are also degrees in perfection, even as "one star differeth from another star in glory." It seems to me that there is room here for the application of the homely principle of cutting the coat according to the cloth, though this may be a very heterodox view from the stand-point of the sanitarian, who seems to develop schemes on the basis of "prosperity budgets." These last, unfortunately, do not appear very often in this district. Should the pressure of plague, while it runs its course, prevent or block all schemes for the permanent betterment of the health of a community under normal and average conditions? For example, water-works, drainage, a new hospital, all of which Vellore sadly needs, but which are getting farther and farther away, while the present plague expenditure is insisted upon. I am not so disposed to question the present distribution of the staff in relation to population and extent of territory, but:—

(c) I think the pay could be kept more within the bounds of the average municipal income. The many extras seem to be unnecessary, e.g., a pony allowance, especially when the inspector is known to have a bicycle supplied by the Municipality, and the extra allowances during the plague and a month following. The pay of the cholera staff might well be made applicable to the plague staff in my opinion.

[I think we could get a good enough class of men for 50 rupees a month, including everything.]

(d) Not on the first ground, though, theoretically, possibly on the second. However, it is usually possible to organize a preventive staff on short notice from among the sanitary officers of the given area, and these last can be recruited from those on temporary employment from time to time. The regular sanitary staff, usually containing many with plague experience, might suffice during the hot months.

(e) It depends upon who the District Medical and Sanitary Officer is. The Sanitary Commissioner can of course always be depended upon. I incline to a longer and fuller course with the latter. A month at least, with 5 or 6 hours a day and some practical work, if possible. However, training by the former would secure men with local knowledge, a very important factor.

[I would, for example, be in favour of deputing the permanent municipal staff for plague duty and supplying *their* places with temporary men. These principles have been adopted in Vellore town with success.

Local people will get information quicker: people will not talk freely to outsiders. Early in 1903, we failed to get information of a serious outbreak of plague in a street in the town, though the plague staff was at work at the time.]

(f) Not very great, unless the plague officer has a very limited area or the Chairman of the Municipality has little else to occupy him. The more of this, the better, but the expense?

(g) It is impossible to generalize. [Extortions, etc., will be commoner in villages than towns.]

(h) I fear, not a very great influence.

(i) Could not candidates of higher educational qualifications be induced to enter the service and undergo better training for the salaries offered? The temporary nature of the appointments works somewhat against this.

(j) to (s) I have had no personal experience in rural tracts, but have heard much in the direction of (m).

[Dishonesty sometimes takes the form of threatening to report an ordinary case of sickness as plague, but more commonly takes the converse form of offering, for a consideration, to suppress true or suspicious cases.]

GROUP (B) (2).

Passport-system.—The passport-system seems to me to be very well conceived. Its personnel might be improved, by appointing passport-issuing officers of better education and better pay.

The additional questions are so largely technical that I shall not attempt to answer them.

[*Examination of Corpses.*—As far as possible, we endeavour to ensure that no dead body shall be disposed of without examination. There is no opposition to this measure. Hindus object to the *living* body being examined, rather than the *dead* body. A corpse would hardly be considered by them to have especial sanctity, as the spirit of the deceased may be embodied elsewhere.

Plague Police—have not worked very well. They are mere temporary men, without a proper sense of responsibility. They used to sleep and desert their posts at night. We would endeavour to surprise them, and they would keep dogs who were trained to bark and warn them of our approach. I got on best with those who were pensioned sepoys. They had a sense of discipline and moreover we have their pensions as a hold over them.]

Discussion with H. R. Bardswell, Esq., I.C.S., Arkonam (5th July 1904).

(The portions in brackets represent the notes of my discussion with Mr. Bardswell.)

I should like to state, to begin with, that all my experience of plague has been at Kampli (Bellary district) in 1900 and at Arkonam in 1904.

GROUP (A) (1).

(a) The disinfections that I have seen have been about as thorough as could be wished for. I have not noticed the need of any further attention to disinfection.

(b) I do not think they are. A longer period of training is, I think, necessary, if the plague staff are to properly understand the work to be done by them.

(c) I consider the present expenditure quite sufficient.

(d) I believe in sunlight, but do not feel competent to theorise on the subjects raised in this question.

[No unroofing in this district. There used to be unroofing in Kampli, a large Union. It aroused no opposition. It was not wet weather, when I saw the unroofing done.

I have found no objection to chemical disinfection, but people prefer it, if they can do it themselves under supervision.]

(d₁₁) I believe in evacuation in all cases, if it can possibly be managed, followed by a thorough cleaning of all the premises, etc., with perchloride of mercury, the burning of all old food substances and the thorough cleaning of clothes, etc., with disinfectant.

(e) I have nothing to offer on this head.

(f) Yes.

(f₁₁) Yes.

(g) I have found it so, so far as I have had experience.

(h) I am told they are, by plague inspectors whom I have consulted on the point.

(i) The inspectors give advice.

(j) No.

[People are not likely to disinfect properly for themselves without supervision. A disinfecting staff is therefore a necessity.]

(k) It would be more popular, if the people could feel greater security for the safety of the property left in their evacuated houses. The temporary plague constables appointed to watch their houses often, I am convinced, steal from those houses. The people who evacuate their houses should, I think, be encouraged to help in watching their houses at nights.

GROUP (A) (2).

(a) to (d) There has been no inoculation in this division, since I have been in it. I do not think the degree of protection afforded by inoculation sufficient to justify pressure being put on people to be inoculated.

[I had my butler inoculated and he was ill and feverish for a month. I have not been inoculated myself.

I do not think people would care about inoculation, judging by their attitude in regard to vaccination.]

GROUP (A) (3).

(a) I do not think there is.

(b) Advice might be given on the subject. I do not think that any inducements are necessary.

(c) Rats are certainly an indication of the approach of plague. The death of rats in a house not seldom shortly precedes the outbreak of a case therein. I cannot pretend to say what the scientific reason of this may be, but perhaps rats catch the infection more quickly than human beings.

(d) Squirrels, as well as rats, may communicate plague from house to house. The best remedy is to try and keep the rats away. But how to do this is the difficulty. Last year, tar and sulphuric acid was tried on the rats in my office, but without much result. The rats are still there.

[I came across a dead rat in Kampli, when unroofing a house, but have not come across any live rats.]

I think that people in Arkonam are now getting to understand that rats bring plague. We tried to get rats out of my office by the use of tar and sulphuric acid. They came back again in two or three days. The tar solution does not seem to have any effect in killing rats.]

GROUP (A) (4).

I have no experience of plague hospitals. There are none in my division.

GROUP (B) (1).

(a) A few cases have been discovered in this way and the progress of the disease has, no doubt, been retarded, but it cannot be said to have altogether checked the disease from spreading.

(b) Yes, by getting rid of supervisors and reducing the pay of inspectors, as suggested further on—in answer to question (B)(1)(c). Hospital assistants permanently attached to dispensaries, when deputed to plague work in addition to their ordinary charge, sometimes run up large travelling allowance bills. Some economy might be practised under this head, by allowing actual expenses and batta.

I see no need for the re-distribution of the plague staff in my division.

(c) I think that it would be quite sufficient, if inspectors were paid at the rate of Rs. 35 a month, with Rs. 15 as a pony allowance. The present rates of pay for supervisors and inspectors are, in my opinion, far too high. The work of an inspector, except when he is in a charge where plague is prevalent, is not very heavy or objectionable, and yet a clerk, who has been drawing Rs. 20 or Rs. 25 in an office, suddenly finds himself with a salary of Rs. 70, including allowances, when appointed an inspector. I think that a pay of Rs. 35 would include quite a sufficient increase over the ordinary pay to be a remuneration for the greater responsibility that an inspector's position has over that of a clerk. The post of supervisor, I am told by members of my establishment who have acted in it, is hardly necessary and might be abolished. A pony allowance is, I consider, generally advisable.

An extra allowance might be given, when plague is prevalent, on the same principle as extra allowances are granted in malarious tracts.

(d) I do not think there is much good in keeping up an observation staff, for either of the two purposes suggested, in any area where plague has definitely died down during the hot weather.

(e) A month's training would, I think, be advisable, if it could be arranged for. The principles of sanitation should be taught more thoroughly than I understand they are done at present, so that the staff can explain more clearly than they can always do now the necessity for the measures which they have to enforce. It would be more convenient to have the staffs trained by the District Medical and Sanitary Officer and, if this was done, it might also tend to greater efficiency, as the District Medical and Sanitary Officer might give useful instruction, with reference to his knowledge of local requirements. [The training would be more likely to be of a practical nature, if conducted in a plague-infected district.]

(f) Little, except that the Divisional Officer and the District Medical and Sanitary Officer see the diaries, which generally arrive late. The Assistant Collector was Special Plague Officer in the district last year. I should think that his charge was too large for him to thoroughly supervise the work of all the staffs, especially as he generally had other work to do also.

(g) They seem to be fond of saying that things should be done, without seeing that they actually are done.

(h) I have heard no complaints.

(i) I am told that, unless inspectors, etc., are Government servants deputed to the work, they command little respect. Volunteers temporarily put in are apt to be regarded as men of no position or qualifications, to whom no attention need be paid. So it would appear that, in the interests of efficiency, Government servants should be delegated to these posts.

(j) Yes, in most cases, as long as there is the fear of the inspector coming in to enquire.

(k) They are useful for the purpose indicated above. Without them, the village officers would probably be less active in making known cases of plague.

(l) They may obtain information from other villages, especially if there is a faction in the village. The ryots are often respectable and will give information.

(m) No cases of undue influence or terrorism have been brought to my notice.

(n) I found, at Arkonam, that the people were very alive to the importance of keeping away people who come from infected areas, inasmuch that the latter felt and complained of much inconvenience.

(p) So the answer to this question seems to be that in some cases they can. People, in places hitherto uninfected, seem to have a wholesome dread of plague.

[The inhabitants of a plague-infected suburb of Arkonam, who had been evacuated, were not allowed by the people of the main village to go into the town and get their supplies. I think this attitude on the part of the villagers deserves encouragement on the whole.]

(q) Yes. I do not think more can be done in this direction than in the ordinary way of giving advice.

(r) I think this would be more trouble than it would be worth.

(s) I have already written on this point above.

GROUP (B) (2).

(a) I have written about this in a separate report.

(b) and (c) I cannot suggest any improvements on the present system.

ADDITIONAL QUESTIONS.

I have no experience to enable me to answer these questions. [In Kampli, we used to expose grain to the sunlight, when we had evacuated an infected area: the same is done here. No enquiries seem to be made here, to find out what grain comes from infected areas. The measures actually resorted to have excited no opposition.]

GROUP (A) (2).

(e) I believe, not at all, in my division during my time.

GROUP (A) (3).

(d_(ii)) I have no views or experience in this connection.

(f) In my experience, human agency has always been traced as the primary cause of plague, though rats may have given the first indication of the approach of plague.

GROUP (B) (1).

(i_(ii)) There is no certificate, other than the entry of the village officer in the death report. If he reports a case as doubtful, the corpse is inspected. Otherwise not. [This procedure has aroused no opposition.]

(i_(iii)) I think so, as long as tact and discretion are used in the administration of it.

(t) I do not think a system of rewards at all to be desired.

(u) Very little. It would be useful to give some instruction to native doctors. Once they felt they had been taken into confidence, they might do a good deal of useful work.

GROUP (B) (3).

(a) By the divisional inspector. I think they should be put under the local station-house officer. I have a very poor idea of the ordinary plague constables and their controlling authority should be nearer at hand. [In Bellary, two of the plague constables were convicted for theft of property they should have helped to protect. In this division, there were nine cases of house-breaking in evacuated houses, showing neglect or, more probably, connivance on the part of the plague police.]

Things might improve, if permanent instead of temporary men were employed.]

(b) There are not too many of them, if only their quality was better.

(c) They watch at passport gates and at road frontier inspection stations. They also watch evacuated houses—with little efficiency, as far as my experience goes.

First Conference at Bellary (7th July 1904).

D. W. G. COWIE, Esq., I.C.S., Collector.

Colonel R. PEMBERTON, I.M.S., District Medical and Sanitary Officer.

M.R.Ry. C. S. SUBRAHMANYA AYYAR Avargal, Chairman of the Bellary Municipality.

Mr. G. O. D'SOUZA, Assistant Inspector of Salt, Abkari and Customs Revenue; acting as Plague Supervisor in charge of Bellary taluk.

M.R.Ry. A. RAMACHANDRA AYYAR Avargal, Tahsildar of Bellary taluk.

M.R.Ry. P. SRIRAMULU Avargal, Sub-Magistrate of Bellary town.

GROUP (A) (1).

Disinfectants.—Perchloride of mercury: acid solution of 1 in 1,000, for houses: in the case of especially muddy or dirty houses, a solution of 1 in 500 is used. Clothes are sometimes boiled and sometimes steeped in perchloride (1 in 1,000 solution). Very valuable cloths are simply exposed to the sun.

Disinfecting Staff.—Mostly consists of temporary men. They do not work satisfactorily, except when under immediate supervision. They are decidedly dishonest. Twenty per cent. have been dismissed (*vide* the statement in appendix VII). In one case, a man whose services had been dispensed with was sent back to the district for being employed, but he was recognised and sent to Madras again. Since that time, we have been circulating statements of dismissed men to other districts and receiving similar statements from other districts. The staff does not command the confidence of the people.

Difficulties of chemical disinfection.—Chemical disinfection, if thoroughly done, would probably be complete. Mr. Cowie, Colonel Pemberton and the Sub-Magistrate consider that, to secure this end, the walls should be scraped and the floor dug to a depth of 6 inches.

Colonel Pemberton observes that the method which he suggests was actually in force in 1901. He observes that the dust from the floor and walls would not be carried about, if they were damped at the commencement of the operation. The scrapings should be placed outside the hut and chemically disinfected and then tamped in again.

Mr. D'Souza would be in favour of these measures, except that he considers that the taking up of the floor to a depth of 6 inches would be unnecessarily troublesome. Colonel Pemberton explains that the suggestion was made with regard to the *possibility* of the bacilli penetrating to some depth below the surface of the floor.

The Chairman and the Tahsildar doubt the practicability of the method suggested.

Unroofing.—Colonel Pemberton considers partial unroofing a necessary adjunct to disinfection. Mr. Cowie agrees that it would make the disinfection more effectual, but observes that it would increase the expense and unpopularity of the process. The Chairman and the Tahsildar consider that these objections outweigh the advantages of the process.

Such partial unroofing (2 feet square) was practised in 1901, but has not been in use since. No one openly complained about it then, nor was it specially unpopular. Colonel Pemberton would not grant compensation in such cases, as he thinks that restoring the roof would be a very simple affair. The other gentlemen present would grant compensation and the Chairman would insist on the staff restoring the house to its proper condition themselves, if the people wished it to be done.

All are agreed that it is only in ill-ventilated houses, if at all, that unroofing should be resorted to. They agree also that the process would be advantageous from the point of view of the destruction of rats and vermin.

Burning Bratties.—Colonel Pemberton had experience of this process in Bellary Jail and the Bellary Tahsildar had experience of it in Chingleput. Colonel Pemberton found that the heat caused was insufficient. No thermometer was used, when the experiment was tried in the jail. He thinks, however, that the results of the Mysore methods, as described by the special officer, deserve favourable consideration. None of the gentlemen present think that any scarcity of bratties would supervene. A cart-load of bratties could be purchased for 2 rupees. All present think that the method would be much cheaper than that now in vogue, though Mr. Cowie points out the likelihood of prices going up, if the method was extensively resorted to.

All are agreed that the method would probably be decidedly more popular and better appreciated by the people than chemical disinfection in any shape or form.

Recrudescence.—All are agreed in believing that the bacillus could live in a cow-dung floor for a practically indefinite period. The Supervisor observes that the case at Kapagallu, visited by the special plague officer this morning, was probably a genuine case of recrudescence.

Colonel Pemberton knows of a case in which plague broke out in a house in Cowle Bazaar, which had been infected in the preceding year. The owner was a Muhammadan trader.

In Bellary, plague tends to break out year after year in the same quarter. The flower-bazaar (which is also the grain quarter) and the kambli-bazaar are always infected.

Infectivity of patients.—Colonel Pemberton has examined the blood and secretions from ulcers of convalescent patients and has found no bacilli.

Exposure of Grain, etc.—This is always done as an adjunct to evacuation. No attempt is made to get hold of grain coming from infected areas. It would be useless to attempt to secure the disinfection of infected grain. The necessary information would not be obtainable.

The Collector and the Sub-Magistrate have found lots of dead rats in grain in Brucepettah. Mr. Cowie and Colonel Pemberton think that the infection resides in the gunny-bags, rather than the grain. There is a very large traffic in gunny-bags going in and out of Bellary.

Colonel Pemberton considers that something could and should be done, in the way of disinfecting gunny-bags coming by rail. This could be done at the railway station, in the case of Bellary and the larger towns. It is the empty gunny-bags that should be treated in this way.

There are cases on record in which grain is believed to have been the source of infection of a village, but this risk must be submitted to. Shandies might, however, be ordered to be held outside the town in open spaces, in order to aerate the grain.

Attitude of the people.—The people do not understand the advantages of chemical disinfection and could not be trusted to perform the operations efficiently for themselves, without supervision.

GROUP (A) (2).

Inoculation.—There has been no inoculation in this district for a year or so. The Collector, the Municipal Chairman and the Tahsildar have been inoculated, but not the other gentlemen present.

Effects.—The immunity is at best only temporary and there are decided risks attending the process. The District Medical Officer knows of a case in which a person was ill for a year or 18 months after inoculation.

The Supervisor knows of two cases in which inoculated persons developed plague shortly after the operation.

Colonel Pemberton comments on the fact that, when the operation was conducted in 1899, a large proportion of the bottles opened were found to be putrid and in the highest degree offensive.

Attitude of the people.—They are indifferent. Only the educated people, so far, have heard of the disaster in North India.

No relaxation of the rules is called for, in the case of inoculated persons, as they are not thereby rendered harmless to their neighbours. Mr. Cowie thinks that matters would be placed on a sounder basis, if people were made to pay for being inoculated.

GROUP (A) (3).

Rats—are a source of infection. Would spread the disease to adjacent blocks of houses. People generally realize this.

Methods of destruction.—Mr. Cowie and Colonel Pemberton have tried tar and sulphuric acid, the former for his own house and the latter for the District Jail. Mr. Cowie saw one rat killed from the effects of the tar, but Colonel Pemberton did not see any rats killed by the process. All are agreed that it is not an effective method of destroying rats.

It may drive them away to some extent and might spread plague in this way. In fact, when tar and sulphuric acid were used on a large scale in the railway lines, the rats dispersed over the town and even reached the jail.

The Chairman and the Sub-Magistrate keep traps in their houses: many other native gentlemen adopt this precaution.

Other animals.—Colonel Pemberton kept cats in the jail, but one of them got plague and he then had them all killed. Mr. Reilly (late Head Assistant Collector) is also reported to have seen a cat with a bubo. The Sub-Magistrate has also had experience of plague-infected cats. Colonel Pemberton has also seen dogs, monkeys and squirrels infected.

GROUP (A) (4).

Plague Hospitals.—There are two in Bellary, one in Adóni and one in Hospet. They are unpopular: the Municipal Chairman observes that other hospitals in some degree share this unpopularity, though not to the same extent as plague hospitals.

Suggestions.—The unpopularity would be lessened, if the buildings were of a more permanent character and if they were sub-divided into smaller blocks, which would in some degree enable castes to be treated separately. A central position and better accommodation for relations would tend in the same direction. Inspection of hospitals by non-official visitors is also suggested as a possible improvement.

Private Practitioners—can attend patients in the Government hospitals, if they want to do so. No one is bound to accept European treatment, but the people prefer to do so. Colonel Pemberton sees no objection to private practitioners going in and out of camps, under the usual precautions. He observes that patients have been sent from private hospitals to Government hospitals voluntarily and further that people in private hospitals have asked for European treatment.

GROUP (B) (1).

The Observation Staff.—It is agreed that, as at present constituted, they do not work satisfactorily (*vide* also the notes under group (A) (1)). Colonel Pemberton considers them useless for purposes of observation, either in towns or villages. He is strongly in favour of deputing hospital assistants to do observation work in towns and villages. They would be men of some position and of some local knowledge. They would command respect and would be able to diagnose cases properly. The sanitary inspectors, in practice, have to frequently decide whether they shall report a given case as one of plague and they cannot be trusted to do this properly from any point of view. Revenue subordinates could be drafted into the plague staff, on occasions when hospital assistants were not available, and they would correspond with the temporary staff now employed, but, in an ordinary way, there would be no difficulty in replacing the hospital assistants on deputation by other members of the department.

Mr. Cowie would find considerable difficulty in replacing revenue subordinates deputed on plague duty.

All the gentlemen present are strongly of opinion that the appointment of permanent men and, as far as possible, of local men would be a great improvement on the present system.

In cases of emergency, local men of lower position (*e.g.*, schoolmasters and union clerks) could be employed. They would at any rate have local knowledge and work better and command more respect than outsiders.

Their duties and the extent of their charges.—All the gentlemen present think that hard-and-fast rules are to be deprecated and suggest that the local authorities be allowed a freer hand in these matters than at present. Local authorities, for example, might be allowed to decide when to appoint and when to dispense with the staff. If they were allowed to act on their own judgement, subject to the final approval of Government, the time occupied in reporting and obtaining orders on such matters would be saved and it is believed that great economy would be effected. The rules as to 5 miles and 10 miles radii and the rule as to how many inspectors are required to supervise a given number of houses or people might be treated as suggestions or regarded as maxima rather than minima. At present they tend to cause waste of money and hamper the discretion of the local authorities. The local authorities might again with advantage be given discretion to shift about various classes of work among the various members of the subordinate plague staff, especially during the hot months. Under the present system, it is difficult to find any work for the bulk of them. It is believed that the adoption of these suggestions would tend to efficiency as well as economy.

Pay.—All are agreed that the present rates of pay are too high. A plague allowance is unnecessary and inadvisable: so is a pony allowance for inspectors in towns. The salary in towns might be Rs. 35 for inspectors and Rs. 25 for assistant inspectors, without any additional allowance of any kind.

In rural tracts, certificated sanitary inspectors and hospital assistants might get 40 rupees, and other inspectors Rs. 35. In addition to this, all the rural staff require, as now, a pony allowance of Rs. 15, for which they must of course keep a pony and use it. No further allowances of any kind whatever are required.

The allowances proposed should be amply sufficient to secure the services of suitable men of the class required.

The pay of the supervisors might remain as it is. If they are to be of use, they must be men who can command considerable respect, and Rs. 125 is the smallest pay for which such men could be obtained. They should be recruited from the ranks of the permanent departments—Salt, Revenue, etc.

Training.—It is desirable that the staff should be trained by the District Medical Officer in head-quarters. This would be real practical training and not the theoretical (or almost entirely theoretical) training that they now receive.

Other suggestions.—For the term "Supervisor" the term "Special Deputy Tahsildar" or "Plague Deputy Tahsildar" might be substituted. This would emphasize the fact that these officials were really a part of the district Revenue establishment. The people, moreover, would understand this nomenclature.

The Tahsildar and the Sub-Magistrate suggest the advisability, in times of plague, of deputing Tahsildars to act as Special Plague Officers, giving them an assistant for their ordinary work. The Collector considers that this would unduly disorganize the revenue administration of the district.

Attitude of the people.—Village officers cannot be depended on to report plague cases. The observation staff, as at present constituted, has no means of getting information, except the village reddy (village munsif). There are a few exceptions, mostly due to local factions. The present staff do not understand or command the confidence of the people. Very often, they are ignorant of the language. One man, who was sent here, was found to know nothing but Malayalam.

Village Patrol.—Some villagers join to keep outsiders out of their villages: on one occasion, a Tahsildar was kept out of the village, because, having been newly appointed, he was not recognized. Guards are placed round the villages and thorn fences put up. This attitude on the part of the villagers is deserving of encouragement.

Rewards.—There are one or two respectable native practitioners, but the majority are people of low reputation and acquirements, though the people have considerable faith in them. They are not worth the trouble and expense of conciliating and would lose their popularity, if they gave information of plague cases. At present, they conceal them.

None of the native gentlemen present would consult a native practitioner, if attacked by plague.

The Collector thinks that it would be a mistake to encourage such a low class of persons, by offering them rewards or recognizing them in any other way.

It is considered that rewards to private persons would be useless and would merely serve the purposes of spite and blackmail.

GROUP (B) (2).

Passports.—Colonel Pemberton suggests that every person leaving a village (infected or uninfected) within the Bellary district should get a passport from the reddy of his village. As matters stand, the passport-issuing officers know nothing of a man or where he comes from or where he is going to.

All are agreed as to the uselessness of most of our passport-issuing offices and think that what is really requisite is that the reddy of the village which the traveller enters should be responsible for passporting him and notifying his arrival at once.

GROUP (B) (3).

The Plague Police.—The District Medical Officer and the Sub-Magistrate consider that they do not work satisfactorily. The Sub-Magistrate observes that the number of thefts and burglaries, in the case of evacuated houses, went up last year. The Chairman thinks they are working satisfactorily on the whole.

A special Assistant Superintendent of Police has been in charge of them for the last year, and this system worked well. They require a great deal of supervision.

The only other remedy would be to get a certain proportion of permanent men (10 per cent., or more, if possible). At present, their slackness and the consequent fear of loss of property constitute the chief objection to evacuation.

Second Conference at Bellary (8th July 1904).

(Mr. Cowie was present at this conference: his views were recorded on 7th July 1904.)

The Rev. J. J. HOUBAER, S.J.

The Rev. B. LUCAS, London Mission.

C. J. M. BLAKE, Esq., Head-Quarters Deputy Collector.

M.R.Ry. D. KRISHNAMÁCHÁRLU Garu, First-grade Pleader and late Chairman of the Bellary Municipality.

M.R.Ry. SINDIGI MARASIDDAPPA Garu, Merchant.

GROUP (A) (1).

Disinfectants.—Perchloride of mercury, 1 in 1,000, but Mr. Blake found 1 in 500 work much better: a solution of 1 in 500 is used for cloths, but the more valuable cloths are exposed to the sun simply.

Disinfecting Staff.—The staff require a great deal of supervision. Mr. Blake, on one occasion, when he took them by surprise, found them using nearly plain water for disinfection.

Unroofing—is only practised in exceptional cases. It is very unpopular and would be very expensive, if compensation were given.

Mr. Blake considers it a valuable supplement to chemical disinfection.

Mr. Lucas considers unroofing no use *by itself*. He tried it for two months and plague broke out again in the houses treated in this way.

Burning Bratties.—People would understand it and there would be no opposition. Mr. Blake thinks it would result in a scarcity of bratties, but the native gentlemen present doubt this.

Mr. Lucas tried the process, according to the Bombay rules, with the object of destroying vermin, but found it wholly ineffective. No thermometer was used. There was a thick black smoke, but no great heat.

Mr. Sindigi Marasiddappa has had experience of the burning of bratties together with tar and sulphur to eradicate cholera. It was very popular.

Difficulties of chemical disinfection.—It is very difficult to adequately disinfect the ordinary type of native house. Mr. Blake tried a solution of 1 part of sulphuric acid to 10 of tar (with kerosine oil added). It was ignited and a thick black smoke was formed. It had the effect of driving away rats.

Recrudescence, etc.—Mr. Krishnamácharlu thinks that plague tends to lie latent and re-appear in certain quarters of the town. Mr. Blake agrees with this and thinks that this is the result of bad disinfection. The other gentlemen present have not been able to discover any method in the re-infection of towns.

Attitude of Villagers.—Villagers do not understand the advantages of chemical disinfection. It is very often badly done, and this renders them all the more sceptical. The method of burning bratties they understand and would probably be ready to practice for themselves.

GROUP (A) (2).

Inoculation.—Father Houbaer and Mr. Krishnamácharlu are the only gentlemen present who have been inoculated.

Mr. Sindigi Marisiddappa thinks that inoculation produces fairly good results and thinks that, if people, on being inoculated, were exempted from plague regulations for the rest of their life, many persons would be willing to submit to the process. He would do so himself. None of the other gentlemen present would recommend a campaign in favour of inoculation. They think that it would meet with bitter opposition. Many people are aware of the recent disaster in Northern India.

Father Houbaer was inoculated, because he was going to Europe and wished to escape surveillance and detention.

Effects of Inoculation.—Mr. Krishnamácharlu was inoculated in 1898 and again in 1900 or 1901. Three hundred of his friends were inoculated and one hundred of them have since died of plague. So he has lost all faith in the process. He has known of inoculation producing bad results, one man becoming slightly paralysed in his right arm, another man having his sight impaired, another man having his hearing impaired and so forth.

Mr. Lucas knows of a man, who got an ulcer after inoculation, which did not heal for 18 months. Father Houbaer had high fever after inoculation and would not go through the process again. He continued to have pains in his arm for a year. Mr. Blake thinks that many constitutions have been impaired by inoculation.

GROUP (A) (3).

Rats.—All the gentlemen present think that rats help to spread plague.

Mr. D. Krishnamácharlu lived 250 yards away from an infected locality in Bellary. Observed a dead rat, 100 yards from his bungalow: two or three days later, he saw a dead rat, 50 yards from his bungalow: two or three days later, a rat was found dead close to his bungalow. He then left his house. A servant who remained in the house got plague. Mr. Sindigi Marisiddappa confirms this story, being a neighbour of Mr. D. Krishnamácharlu.

Mr. Lucas speaks of an article in the Indian Medical Gazette (about June 1904), in which rats are said to give the bubonic not the pneumonic form of plague.

Attitude of the people.—The native gentlemen present think that the people would not welcome methods for the destruction of rats, because they are supposed to give warning of the approach of plague. The other gentlemen present think that they would not resent any method by which Government tried to effect the extermination of rats.

Methods of destruction.—Mr. Blake thinks that tar and sulphuric acid drives rats away. This might have the effect of spreading plague. Mr. Lucas remarks that the general opinion is that plague was spread in Guntakal in this way.

GROUP (A) (4).

Plague Hospitals.—Father Houbaer and Mr. Lucas think that the hospitals are popular on the whole and have heard people speak loudly in their praise. The other gentlemen present think them unpopular, but Mr. D. Krishnamácharlu agrees with Mr. Lucas in remarking that Hindus have on occasions been deserted by their friends and relations and have been very glad to get into the hospitals. Father Houbaer observes that the Municipality started by working the hospitals badly and under-feeding people, which led to some temporary unpopularity.

Suggestions.—Mr. D. Krishnamácharlu thinks that relations should be allowed to go into the hospital with the patient. Mr. Lucas points out that they can even now do so, if they choose to stay in.

Father Houbaer illustrates certain difficulties and delays which occurred in the disposal of dead bodies.

All are agreed that careful supervision is an important point and that the type of building should be improved.

Private Hospitals.—There is a private hospital for Brahmans and Lingayats, maintained at the expense of Mr. Sindigi Marisiddappa, a prominent member of the Lingayat community. Mr. Blake and Mr. Sindigi Marisiddappa say that this hospital is popular and that the communities concerned prefer it to the Government hospital. Mr. D. Krishnamácharlu says that Brahmans do not mind being in the same shed with Lingayats, but would prefer a quarter to themselves.

All are agreed that, if small wards were built for the use of separate castes, Government hospitals would be as popular as private hospitals.

Native practitioners.—Native treatment was entirely adopted in the Lingayat hospital. The native community are divided on the subject of treatment, half being in favour of native treatment and half in favour of European treatment.

Mr. Blake has had no complaints against European treatment. The missionary gentlemen say that their respective flocks like European treatment.

Mr. D. Krishnamácharlu is himself a private practitioner, but gets only a very small amount of practice in plague cases and does not go to the houses of plague patients to treat them. He considers that native practitioners, as a class, are too ignorant to make it desirable for Government to recognize them in any way.

GROUP (B) (1).

The Observation Staff.—All the deponents have a low opinion of the observation staff and would welcome any suggestion by which they could be replaced by permanent officials with local knowledge. At present, the municipal staff get their information from their peons, who are local men. The deputation of the permanent municipal staff for plague duty would be a move in the right direction. Mr. Blake speaks to there being a few good men on the staff, but his general opinion coincides with that expressed above. The staff have no sense of responsibility; their work is distasteful to them and what they want is to make the maximum amount of money in the minimum amount of time.

Pay.—The present rates of pay are too high, especially for temporary men and outsiders. Mr. Blake knows of a case in which a karnam on 8 rupees took leave and is now a circle inspector on Rs. 80 in the Anantapur district. The other gentlemen present have heard of similar instance, a vakil's clerk now employed as a supervisor on Rs. 120 and so forth.

Training.—The staff could be trained locally with advantage. Now they get ten days' lecturing and one day's practical work. Mr. Blake complains of their utter ignorance of disinfecting work. Mr. Sindigi Marisiddappa knows of an inspector, who spoiled a disinfecting solution by mixing sulphuric acid with it. Mr. D. Krishnamácharlu's experience is that the disinfecting staff have no faith in disinfection and think it a farce themselves.

Rewards.—Mr. Blake and Mr. Sindigi Marisiddappa know of good native practitioners and Mr. Blake is strongly of opinion that it might do good and could not do harm to offer them inducements to co-operate with Government. Father Houbaer, the Rev. Mr. Lucas and Mr. D. Krishnamácharlu are against the system. Mr. D. Krishnamácharlu says it would make the native practitioners unpopular (*vide* also the head, Native Practitioners).

Both Mr. Blake and Mr. D. Krishnamácharlu are in favour of native practitioners being instructed in the European diagnosis and treatment of plague, if they wish for such instruction.

GROUP (B) (2).

The passport-system.—Mr. Sindigi Marisiddappa thinks the system a failure, but Mr. D. Krishnamácharlu thinks that it has worked very successfully on the whole and has kept plague out of a good deal of the Presidency.

Mr. Lucas questions the utility of issuing passports at railway stations within infected localities. He thinks that it would be enough that such tickets should be punched. In general, he thinks that the uninfected localities should look after themselves. He questions the utility of issuing passports at places within infected areas, whether the village to which the traveller is proceeding be infected or uninfected. He also thinks that Europeans (and such native gentlemen as the Collector might select) should be given the privilege of examining their servants and reporting cases of sickness amongst them, instead of each servant being given a separate passport. Father Houbaer thinks that such distinctions would be difficult to draw.

Mr. Blake, on the other hand, thinks that the passport-system, as between the different villages of the district, is not strict enough. To be really effective, it should partake of the nature of a cordon. The system, in the relaxed way in which it is now worked, is of comparatively little use.

Mr. D. Krishnamácharlu points out that, in the large towns, the stated hours at which passports can be examined are too few. Mr. Lucas has experienced similar inconveniences, through his servants being detained for hours together. If passports could be examined at any hour of the day, a good deal of the inconvenience caused by the passport-system would disappear.

GROUP (B) (3).

Plague Police.—work badly on the whole and cause great trouble. They are little better than a rabble. They should be men of some status or members of the permanent police force. Mr. Blake would far prefer the Military. Mr. Lucas strongly deprecates the entrusting of such powers to men of no position and with no sense of responsibility.

Discussion with F. Noyce, Esq., I.C.S., Divisional Officer, Hospet (9th July 1904).

(The portions in brackets represent notes of my conversation with Mr. Noyce.)

GROUP (A) (1).

(a) If disinfection is to be continued at all, the class of men sent out as disinfection inspectors must be very considerably improved. As things are at present, disinfection is useless, unless carried out under the closest European supervision. The temptations to extortion are too

much for the morals of the average inspector, who is only a temporary man, anxious to make provision for the future. Of the six inspectors employed under me in the Hospet division, one was dismissed both for extorting money for disinfecting houses and for leaving them undone and another for scamping work. Two others were fined heavily at different times for scamping work. It is obvious that, however thoroughly 99 houses out of 100 are disinfected, if the 100th is left undone, the whole object of the disinfection is defeated.

(b) No. The theoretical training received in Madras is of little help to an inspector, in meeting the many difficulties he encounters, when sent up-country. In practice, an inspector has to be taught his work over again in his district by the supervisor or the Special Plague Officer. The period for training appears to be inadequate and it would be infinitely more useful, if carried out in the infected districts themselves. There were dozens of evacuated villages in the Bellary district this year, in which classes for inspectors might have been held.

(c) Less, most decidedly. It is impossible to disinfect a whole district properly, which was practically what had to be done in Bellary last year. There were at one time 135 infected villages in the Hospet division alone and so, in many cases, only infected and rat-fallen houses were disinfected. As I have pointed out above, disinfection, unless properly done, as it seldom is, only entails waste of money.

(d) The only two methods of which I have any knowledge are disinfection by desiccation and by chemicals. The latter is undoubtedly effective, when properly carried out. Under the present system, the former, however, is quite as good. I am inclined to think that, if a village is evacuated for two months in the hot weather, the plague germs are quite as thoroughly destroyed as they would be by disinfection.

[*Burning Bratties*—would certainly be more popular than chemical disinfection. It has been tried. The houses are fairly easily closed in this district.

Chemical Disinfection—cannot be done with any approach to certainty, except by the use of brushes, which is very lengthy. The darkness of the interior makes it difficult to see how far the process has been completely done.]

(d₁₁) Putting aside the question whether disinfection is worth doing at all, unless under much better supervision than at present, I would recommend in towns disinfection by blocks and in villages disinfection of rat-fallen and infected houses only.

(e) To a very large extent, the recrudescence of plague after an interval is due to the revivification of plague germs. Malyam, a village in the Rayadrug taluk, was three times evacuated last year, owing to fresh outbreaks of plague. This was undoubtedly due to the revivification of plague germs, as there was no other infected village in the taluk, i.e., within 20 miles. In Hospet, at present, rats are again falling, probably on account of germs, which have been brought back in clothes from the health camps. It is impossible to say after how long an interval such a revivification takes place—judging from my experience, at any time between three or four months. [After an interval of four months, rats have begun to die in Hospet. The houses in which they have been dying are not inhabited by traders and there is no history of re-importation that we can get at. It looks like a case of recrudescence. When we evacuate a large town (as was done in the case of Hospet), we cannot disinfect all the clothes of the people in the health camp. Probably, the infection came back with the clothes. Grain might also be a possible source of re-infection. The first village infected in Harpanahalli village last year was the first village infected this year.]

(f) On the whole, yes. More suits of clothes and boots might be supplied to the coolies.

(f₁₁) Yes. In the Bellary district, the supervisors and Tahsildars were directed to frequently check the supply which was kept in the taluk office and see that there was always a good stock. In consequence, supplies were always obtainable at once from the taluk office.

(g) Distinctly not. My views on this point have already been expressed, but I would repeat here that disinfection will never be done properly, unless there is one supervisor to almost every inspector. Apart from the opportunities for making money, some castes, the Lingayats especially, are exceedingly obstructive with regard to their cook-rooms and God-rooms, and the inspectors frequently give in to avoid trouble and leave these parts of the houses untouched. If a supervisor is detached to disinfect a town, it may possibly be properly done, but, in out-of-the-way villages, where the supervisor's visits are less frequent, the inspector does just as he pleases.

(h) A little, but a very little. In a few cases, they have themselves asked to have their houses disinfected, but these are few and far between. The cases in which the falling of dead rats is hushed up to avoid disinfection are infinitely more numerous.

(i) Something has been done in this direction both by Plague and Revenue officers, but with doubtful success. Bellary is a backward district and it is not easy for an official, who already has his hands full, to explain to a Biragi or Lambhadi why a mixture of water and chemicals will render his house free from plague.

(j) Disinfection is distinctly not popular and, on that ground, it might be expedient to endeavour to make the people more independent of official help. Whether it would be more effective is another question.

(k) Disinfection could be made more effective by—

(1) Better men with better training.

(2) Closer supervision.

I shall have something more to say with regard to this, in answering the questions as to the observation staff.

I do not think that there would be any loss of efficiency, if general disinfection were given up and disinfection of blocks in towns and infected and rat-fallen houses in the villages only was carried out. I do not think there is any method by which it could be made more popular, unless it be to leave the people to see what could happen, if their houses and villages were not disinfected.

GROUP (A) (2).

I have had no experience of inoculation, as it was not practised in the Bellary district, during the time I was Special Plague Officer. Inoculated persons might perhaps be allowed to vacate their houses, when a village has been ordered to be evacuated. A good deal here might be done, I think, in the way of encouraging inoculation, but the accident in the Punjab appears to have made people, who know a great deal more about the matter than I do, very chary of using this method. A good deal of inoculation was done in Adoni, the year before last.

GROUP (A) (3).

(c) Undoubtedly. In nearly every case, rats fall before the first case of plague in a village. The cases in which the infection is brought from village to village by means of rats are, I should say, extremely rare and I have not come across any. The course of events seems to me to be as follows: when a village is evacuated, some of its inhabitants go to another, taking with them a few germs in their clothes or their grain. These are communicated to rats, which are peculiarly susceptible and in which they increase and multiply and from which they are communicated to human beings.

(d) Fleas, cats and squirrels are operative in the same way and, judging from the extraordinary mortality amongst syces, horses must be a vehicle for carrying germs, though they do not appear to be themselves susceptible to plague. I do not know on what grounds the system of rewards for rat-killing was given up. The most practical remedy is to encourage the villagers to kill rats, wherever found.

[Natives might take objection to the destruction of rats, because they give warning of plague.]

GROUP (A) (4).

(a) Very unpopular, which is the reason why, in large towns like Kampli and Hospet, so few cases are reported before death. Their unpopularity arises from many causes, e.g., the restrictions which have to be placed upon friends and relatives, caste difficulties and, most of all, the fact that most of the people who are taken to the plague camp die (naturally), a fact which is often attributed in the villages to a malign influence in the sheds themselves.

[I should say that, in the real plague hospitals, the proportion of deaths is less than that in the rest of the district and in the private hospitals.]

(b) I cannot suggest any method by which they might be made more popular. The people will always prefer their own hospitals and their own treatment. [I doubt whether people are allowed stimulants enough in the plague hospitals, but this is a medical question. If the wards are smaller, it might be more possible to separate caste from caste and disinfection would be easier.]

(c) They are, as a rule, always willing to do this, but the system of private hospitals does not work properly and, in nearly all cases, the private hospitals in Bellary were closed and the patients compulsorily removed to the Government Camps, with the result, as I have said above, that no cases were ever reported in the town before death. The private camps are, as a rule, scattered, which makes supervision a matter of considerable difficulty. Too much ingress and egress of friends, relatives and vigilance committees is permitted and, in the villages, the patients are usually taken home for meals.

GROUP (B) (1).

(a) In very few cases does the observation staff actually detect plague. The inspectors report a great many house-to-house visitations, but the actual detection is usually done by the reddi, who reports or points out the fever cases which were examined by the inspector, in many cases, of course, not till after death. One striking instance of an inspector's detection of plague was shown in a small village of about 500 people (Aralahalli) in Hospet taluk, which was voluntarily evacuated by the people, on account of three or four deaths from plague, at the beginning of January. Twenty-eight deaths occurred in the rest of the month, which were without exception ascribed by the inspector (a temporary man) to simple fever, and measures or rather no measures were taken accordingly. The observation staff usually disinfected people and houses in the first few cases, but their measures seldom have any effect.

(b) The present observation staff is, as a rule, so bad that expenditure under this head might be abolished, without any serious lack of efficiency. The inspector mentioned above was the worst specimen of his class I came across, but there were others almost as bad. What is wanted is permanent men. The present inspectors are men who have failed in other walks of life. Very

many of them are men who have tried to obtain Government clerkships, but without success. Their English is meagre and they are often unable to write an intelligent or legible diary. My own opinion is that much more might be done in employing hospital assistants as plague inspectors. Both fourth and third grade hospital assistants get much less than plague inspectors (a third-grade hospital assistant gets Rs. 40, I believe). As permanent men, they would naturally work better, having more to lose. They are distinctly better educated and would undoubtedly have a great deal more influence over the people, as they could help them with regard to diseases other than plague. Hospital assistants are now employed, but only in places in which there are several plague patients already. They could diagnose cases, of course, much more easily and certainly than the present inspectors and would need very little training in other ways. Failing these, a selection might be made from clerks in the various offices. The plague inspector's pay is high, because he is a temporary man. A permanent man could be paid less, though he should be given something extra, on account of the unpleasant nature of the work. There would, perhaps, be some difficulty in providing for such men afterwards, but it might be done gradually. I do not think the present staff could be distributed more economically than it is at present.

(c) This, of course, is linked with the last question. I see no reason why a plague inspector should get any more pay than a revenue inspector. He works no harder and has not half so much intelligence. If clerks, hospital assistants or school-masters were obtained, they should, I think, be given 25 per cent. above their present pay and pony allowance, which is, I think, necessary, as it is most essential that a plague inspector should move about his circle quickly. The nature of a plague inspector's duties implies travelling and there seems no valid reason why he should be given travelling allowance. I do not think that the extra allowance during plague is necessary or that it has any effect on an inspector's work. I may say that I have not come across any cases in which inspectors have reported plague, where there was no plague, in order to prolong their appointment.

The present system of sending men, who pass in the second class of the Sanitary Commissioner's Examination, on reduced pay (Rs. 25, instead of Rs. 40), to take charge of towns and large villages, seems to be radically wrong. It should be obvious that much more intelligence and tact is needed in a large town than in a village and that better men should be sent to Hospet or Kampli, for example, than to a thinly-populated circle in Hadagalli. The circle inspector gets an extra Rs. 15 travelling allowance and Rs. 15 for his pony, and the town inspector's pay should be at least equal to the balance, Rs. 40.

[I agree with the conclusions arrived at in the first Bellary Conference.]

(d) Yes. When properly supervised, it is more useful than at any other time. It is more possible then for houses and persons to be thoroughly and immediately disinfected and for the supervisor to superintend the work in person. The inspectors so kept on are, of course, more useful than the new arrivals, when the epidemic starts in real earnest.

(e) The present system of training appears to be wrong from the outset. Training by a Special Plague Officer or by the District Medical and Sanitary Officer (though I much doubt whether the latter officer has the time to devote to it) would be much more useful. A class might, for instance, have been formed in Bellary or Hospet, during the last season. The members thereof would have had ample opportunities of seeing plague symptoms in all their various forms, which they fortunately have not in Madras at present, and of studying disinfection work. If they had been under a special officer, I do not think they would have been much in the way of those in charge of operations. A month's training would be sufficient, after which they should be on probation for a month, at the end of which time they should be liable to be dispensed with for no other reason than general lack of intelligence. As things are at present, a plague inspector is seldom dismissed, unless he does something very badly wrong or is hopelessly lazy.

[The duties of the staff should be interchangeable, at the discretion of the Collector or Special Plague Officer.]

(f) Generally, one supervisor to a taluk—and, on an average, to about six circle inspectors and one assistant inspector.

(g) The European Staff, on the whole, yes, as they are permanent men. A few of the temporary men (those who hold permanent appointments in Local Board Offices, for example) do too.

(h) Very little, I am afraid, but of this I have written already.

(i) These have already been given at length, but may be again expressed in the two words "Permanent Men".

(j) On the whole, the village officer compares very favourably with the plague inspector. As a rule, though they are not equal to the task of diagnosing a plague case, unless there are buboes, they report fever cases or suspicious deaths to the plague officers. Their passport and other registers, considering their pay and their education, are well maintained.

(k) A few of the best circle inspectors act as a useful stimulus to the village officers, but, in the majority of cases, there is a good deal of friction generally. I think the fault is that of the inspector, who, clothed with a little brief authority, endeavours to assert it unnecessarily, by reporting the village officers for petty misdeeds.

(l) I should say, not. They may gather some, in their so-called house-to-house visitations, but not often. [If local men were appointed (e.g., revenue inspectors), they would have independent means of information. One of the temporary men I had could only understand Hindustani. How could such a man get information?]

(m) Undoubtedly, I think; in the way of extortion. Far greater opportunities for this, however, are given to the disinfection staff. There were very few cases in which complaints were made against the observation staff of taking money. I do not think the people have sufficient respect for the ordinary circle inspector to be afraid of him.

(n) To a certain extent. Several inspectors were dismissed, during their term of office, for various misdoings, and the example probably had some effect on the others.

(o) To a very small extent, I think, but they are now beginning to keep out outsiders from infected areas. There were several cases last year, in which people from infected areas had been refused admittance or kept outside for ten days, occasionally with the result that they died in the nearest ditch.

(q) Yes, if it does not mean that the people kept out are sent on to the next village. They must be kept outside in a hut or temple for at least ten days. At present, the villagers are told by all plague officers that admission of persons from infected areas will probably mean evacuation again in the near future.

(r) I do not see how it could be worked officially. It is better left to the villagers. If worked officially, it would entail greater hardship than is entailed by the present regulations.

(s) The number of cases of plague in the Bellary district during the last two years gives reason to think that the large amount of money spent on the staffs is in many respects wasted. I am not in a position to make any definite statements, but I should think that the proportion of cases to the population of the district must be (in spite of the large staff sanctioned) very little less than in the Punjab or Bombay, where no staff is maintained. Complete evacuation at any early stage appears to me the only measure which can be carried out with any degree of success. The hardship and the dislocation of trade occasioned by it is considerable, but there are many villages that lie in the western part of the districts, which now evacuate on their own initiative, on the first rat-fall. Voluntary evacuation should undoubtedly be encouraged, e.g., by the grant of money for sheds and of temporary police to watch the empty houses.

GROUP (B) (2).

(a) The passport-system works well on the whole and has undoubtedly been the means of detecting many cases of plague. A better postal system would of course render it much more effective, as the intimation often does not reach the local authority, until towards the end of the observation period. I would suggest that the present system, by which a man going from one infected area to another and returning to his own area after one or two days has to undergo the full period of observation in the latter, might be modified and that, on return to his own infected area, he might be allowed to give up his passport. In places where a cluster of villages is infected, it seems to me to entail a good deal of unnecessary trouble. If this is not possible generally, there might be a block system, by which people in a group of small neighbouring villages infected might be permitted to move freely within that block without passports. [When a whole taluk, with the exception of a few villages, as in the case of Hospet and Hadagalli taluks, is infected, it might well be declared infected as a whole and inter-passporting stopped. The difficulty would arise, when the plague began to decrease and become scattered. Passport-issuing offices are very little use, except near large towns: the same applies to Frontier Stations.]

(b) I have had no experience of any stations, at which this has been possible, all the railway stations in my charge being infected and so there being nothing to gain by re-booking.

(c) More care might be exercised by passport clerks, who often register addresses without making any enquiries and who often accept a vague address, which it is afterwards found impossible to trace.

ADDITIONAL QUESTIONS.

GROUP (A) (1).

(c₁₁) I should think so, judging from experience, but it is more a question for a bacteriologist.

(e) Infection is undoubtedly carried in grain and its desiccation is therefore often very useful as a preventive measure. All grain from infected areas ought most certainly to be exposed to the sun for a few days. [In practice, the inconvenience and difficulties would, I think, be great, even in large towns.]

GROUP (A) (2).

(e) Not at all, since I have had anything to do with plague.

GROUP (A) (3).

(d₁₁) I have not met any cases, in which fleas have been assigned as the direct cause of infection. But, from the number I have seen on both rats and corpses, I have little doubt that they are a fertile source of infection, both from rat to rat and from rats to human beings.

(f) It is not possible to answer this question with any certainty. Rats die in different parts of a village and there are cases of plague in these houses. It is, however, impossible to say whether the human occupants of the two may not have communicated in some way, but these cases are so frequent that I am convinced that, in many cases, it is due to the rats alone.

GROUP (B) (1).

(c) As a rule, yes, if they happen to be in the village at the time or if the reddi's report reaches them in time to enable them to arrive there before the corpse is disposed of. All reddis have not, however, been educated to the pitch of reporting all deaths at once, nor is it possible for them to do so, owing to ignorance of the inspector's whereabouts; speaking generally, however, all suspicious cases are seen by the plague inspectors after death. In the villages, there is of course no one, as a rule, who can give a certificate of death, and the reddi's opinion or that of the other inhabitants has to be accepted. The plague inspector has, however, usually seen the sick person before death.

(t) In my opinion, certainly not, as it would only lead to blackmail and other abuses. I may add, however, that my opinion does not coincide with that of some of the Tahsildars in my division, who think it would be useful.

[I don't think it desirable to grant rewards to native practitioners. They are not a trustworthy class of people. I tried to get their co-operation in Ráyadrug, but without success.]

(iii) The present regulations are not as clear as they might be. I have not a copy with me and so cannot select any particular one which I should like altered, but, speaking generally, disobedience to any order which the Collector thinks advisable ought to be made an offence punishable under section 188, Indian Penal Code. It is not, for instance, laid down clearly in the regulations where compulsory evacuation is to end and when segregation begins or when refusal to take a patient to the Government hospital or to isolate him ceases to be a punishable offence. In such matters, the authorities should have more discretion.

(u) No. Their numbers are not sufficient to make it worth while. Their methods of treatment differ so radically from ours that I doubt whether any action in this direction is desirable. I see no objection to their being instructed in the diagnosis of plague. Doctors in the Bellary district ought to know a plague case by this time.

GROUP (B) (3).

(a) By the District Superintendent of Police. Their work is not satisfactory, as a rule. The pay is not sufficient to attract a good set of men. More head constables should be used to supervise them, i.e., head constables taken from the regular line. Special Inspectors should be appointed, for the supervision of the Plague Police alone. The regular Inspector has too much else to do to instruct men in their duties.

(b) If properly supervised, fewer would be required.

(c) Their chief duties are—

(1) Guarding plague camps, i.e., preventing ingress of all unauthorized persons and egress of patients and contacts.

(2) Guarding evacuated villages.

(3) Assisting passport clerks in the work of detaining persons who should take out passports and ascertaining their names and addresses.

Conference at Hospet (11th July 1904).

C. ATKINSON, Esq., Assistant Superintendent of Police, recently in charge of the Police employed on plague duty in Bellary town.

Mr. E. A. d'Cruz, Civil Apothecary, Hospet.

M.R.Ry. B. GOPÁLÁCHÁRI Avargal, B.A., B.L., First-grade Pleader, and Chairman of the Hospet Union.

(Mr. NOYCE was present at the conference: his views have been separately recorded.)

GROUP (A) (1).

Disinfectants.—Perchloride of mercury: solution of 1 in 500, in the room occupied by the patient, otherwise, 1 in 1,000: cloths are first boiled and then steeped in a solution of perchloride (1 in 1,000): valuable cloths are simply exposed to the sun for two days.

Mr. d'Cruz has tried phenyl experimentally for house disinfection for two months. He mixed it with water, until it ceased to be viscid. He thinks phenyl a good deoderant, but would prefer perchloride for plague purposes.

Unroofing.—Mr. Atkinson had some experience of this in Bellary town. A hole was made in the roof, in the case of the flat mud roofs. Such roofs are dirty and harbour vermin,

but Mr. Atkinson thinks the thatched roofs are worse. He has seen rats in thatched roofs, but not in any mud roof. The other two gentlemen present have seen rats in mud roofs also.

Any form of complete unroofing would be most unpopular. Partial unroofing would do something to help ventilation, but would not be effective in getting rid of dirt and vermin.

Burning Bratties.—The Civil Apothecary has tried them at Harpanahalli. He used bratties with damp straw and tar. A thick black smoke was generated, but not much heat. No thermometer was used.

Mr. Atkinson used bratties and sulphur, in the case of disinfection for cholera. The results were much the same as in the Civil Apothecary's experiment.

The deponents remark that, with bratties used as in Mysore, it would be easy to get up a high temperature in ordinary houses, but that it would be difficult to completely close the poorer type of huts.

The system would be far more popular than the system of chemical disinfection. People would understand it and could be trusted to some extent to do it for themselves.

Great difficulty is now experienced, owing to the objections raised by the people (especially, the Lingayats) to having their "God's room" and cooking room chemically disinfected. Mr. Gopáláchári says that no such difficulties would be raised, in regard to the burning of bratties in those rooms.

There would be no difficulty in getting large quantities of bratties during the greater part of the year, but they should be stored in anticipation of the rainy season.

Exposure of Grain.—In cases of evacuation, all grain is exposed to the action of sunlight. Mr. d'Cruz has also had experience in exposing grain coming from infected localities to the sun. This was done in Chitwádigi, a village with a large market, forming part of the Hospet union. He found difficulties in getting coolies for the work and also in finding suitable sites. The measure was very unpopular and would always be so.

Mr. Atkinson and Mr. Gopáláchári have seen dead rats in grain. All are agreed in regarding grain as a possible source of infection: gunny-bags are also considered infectious.

Recrudescence, etc.—It has been observed that Madigiri, the mat-making quarter of Hospet, got first infected in three successive years, but the last outbreak commenced in a different quarter of the town.

The material for mat-making comes from Rámadrug and (more rarely) from Nandyal, neither of which localities are infected.

Mr. Gopáláchári remarks that, in 1903, special efforts were made to get at the history of the re-infection, but without success. Rats died, before the infection spread to human beings.

Now, rats are once more dying after an interval of four months and again no history of importation can be arrived at. Mr. d'Cruz, however, thinks that re-importation is the general cause of re-infection.

GROUP (A) (2).

Inoculation.—Mr. d'Cruz and Mr. Gopáláchári have been inoculated, but not Mr. Atkinson.

At Hospet, 400 cases were inoculated in 1899: since then, none have been inoculated. After 19 cases had been inoculated by Colonel King, one of the subjects developed plague. Three persons inoculated by the Civil Apothecary also developed plague, shortly after inoculation.

Attitude of the people.—The incidents just quoted had a discouraging effect. People at present do not care about inoculation. If they did get inoculated, it would be to escape the plague regulations.

Effects of Inoculation.—Mr. d'Cruz has known rheumatism, as well as high fever, supervene on inoculation. He thinks that, if rheumatism was in the system, inoculation might have the effect of bringing it out.

GROUP (A) (3).

Rats.—All are agreed that rats spread plague, and Mr. Atkinson and Mr. d'Cruz consider that they spread plague from one quarter of a village or town to another. No one has any experience of the use of tar and sulphuric acid as a remedy.

Attitude of the people.—Mr. Atkinson and Mr. d'Cruz think that the people would have no objection to measures for the destruction of rats. Mr. Gopáláchári is doubtful whether people consider them mostly as a means of infection or as a warning, but all are agreed that people do recognize the fact that they sometimes spread infection.

Other animals, etc.—Mr. Atkinson believes that fleas spread infection. He has seen them on cats and rats which had died of plague, sometimes in very large quantities.

Mr. Atkinson and Mr. d'Cruz have seen dead cats with glandular swellings (buboes). Mr. Gopáláchári has heard of monkeys at Humpi dying of plague.

GROUP (A) (4).

Plague Hospitals—are not popular, either in Bellary or Hospet. People have a vague fear of them and, moreover, they like to die among their relations.

The Hospet hospital is well managed and people do not mind it, when once they are in. Mr. d'Cruz cures more than 50 per cent. of the cases. He cured Mr. Gopálachári's cook; also a child found in a jaggery godown, which developed six buboes.

Private Hospitals.—A private hospital was erected for all castes last year by the vigilance committee. It worked for four or five months. The mortality was very high. The private practitioners were negligent. The guards were negligent or venal and the contacts were not kept from wandering about. So the hospital had to be closed and the patients were transferred to the Government hospital.

This year, they propose to erect four or five hospitals, but it is doubtful whether the attendance on the sick will be any better than last year.

Attitude of the people.—Mr. Gopálachári considers that people go to private hospitals in preference to Government hospitals, because they have their own doctors and their caste scruples are more respected and lastly because they really (though not nominally) are free to go and come. Mr. Atkinson's experience is much the same as regards Bellary, but he thinks the last reason the most important.

As regards Government hospitals, the caste difficulty could be lessened by having smaller wards, so that castes could to a great extent be separated. This would also be an advantage, from a sanitary point of view. Caste attendants would also have the effect of lessening the distaste of the people.

Native Private Practitioners.—There are many of these in Hospet. None of the gentlemen present consider them a respectable body of men. They trade on the credulity of the people and would lose all their influence, if they co-operated with Government in regard to plague cases. They were not found satisfactory, at the time when the private plague camp was working. Mr. D. Krishnamácharlu of Bellary is quite an exception. He can be relied on.

GROUP (B) (1).

The Observation Staff—require a good deal of watching and get no information as to plague cases, except through the karnam or reddy. To some extent, they are instrumental in making the village officers report cases, but local men and men holding some permanent appointment under Government would work better and would be able to get information easier. The present staff have no incentive to work well and nothing to lose, if they fail in their duty.

Pay.—The pay is too high for men of their qualities and attainments. The pay in rural tracts is too high, as compared with the pay in towns, with the result that the worst men congregate in the towns. Except for the pony allowance, there should be no difference between the pay of the inspectors in rural and urban circles.

Training.—Mr. Atkinson thinks that training in the district would give the inspectors all the practice they require and further observes that such training would give them local knowledge at the same time.

Mr. d' Cruz remarks that the men who come from Madras know nothing. He is in favour of appointing hospital assistants as plague inspectors, as they are professional men and would understand something of diagnosis and thus command the public confidence. Mr. Gopálachári agrees with this suggestion.

Village Patrol.—All the gentlemen present have had experience of villages into which outsiders were not allowed to enter. Even passportees are excluded. Mr. Atkinson's policemen have sometimes been kept out. Mr. d' Cruz gives the case of Barapur village, which was surrounded with a thorn fence; a taliyari was placed on guard at the only entrance.

Rewards—would be of no use either to private practitioners or anybody else. They would simply serve the purpose of blackmail and extortion.

GROUP (B) (2).

The passport-system.—Mr. Gopálachári thinks that a man going from one infected village to another infected village need not be passported. It is, however, observed by the gentlemen present that this suggestion would cause difficulties at the subsidence of an epidemic, unless discretion were allowed to the local authorities, as two villages may both be technically infected, though plague may have long ceased in the one village and may be raging in the other.

To declare a whole taluk infected would cause hardship to the villages which had succeeded in keeping the infection out.

Classes of persons should be more freely exempted, e.g., all officials and also respectable non-officials, like pleaders, who have to travel constantly. The exemption should be personal, not including servants.

The hours of observing passportees might be extended with advantage. Passportees should be examined for at least eight hours in the day. This would do away with a great deal of the inconvenience now felt.

GROUP (B) (3).

The Plague Police.—Mr. Atkinson thinks them little better than coolies. Mr. d' Cruz has also found them unsatisfactory.

Mr. Atkinson observes that there would be great difficulty in appointing any large number of permanent constables to plague duty, as even now it is difficult to get recruits to fill up permanent vacancies, but a few permanent constables (about 1 in 10, out of the whole force) might be promoted to the temporary grade of head constables and put in charge of the rest of the plague police. Mr. d' Cruz thinks that this would be a great improvement.

Discussion with the Hon'ble Mr. J. Andrew, I.C.S. (12th July 1904), at Guntakal.

GROUP (A) (1).

Disinfecting Staff—require careful watching, and it is very difficult to supervise them adequately. They seem to have very little knowledge and make silly mistakes. One inspector, when asked to disinfect a contact, made him rub himself all over with the disinfectant, *except the soles of the feet*, and was perfectly satisfied that the work was thoroughly and completely performed.

Unroofing—was practised at Métupáláyam. Nobody complained to me about this matter, while I was at Métupáláyam, though they complained bitterly of many other points in connection with the plague regulations.

Burning Bratties—would be understood by the people better than chemical disinfection and would also be more penetrating. Much depends on whether the temperature kept up would be such as to destroy the plague germ. Chemical disinfection cannot get into the crevices of the walls and floor, as ordinarily practised.

Exposure of Grain.—This measure was carried out at Métupáláyam. I heard of cases at Métupáláyam in which dead rats were found in grain. The grain was accordingly exposed to the sun. Grain is certainly a possible source of infection, through the chance of its having been contaminated by means of infected rats. The exposure of grain is a remedy which would be inapplicable in wet weather.

Recrudescence, etc.—I was informed of one case, in which the relation of a high official under the Mysore Government had a house infected in two successive years, though attempts at disinfection had been made and the floor had been dug up in the interval. There is a possibility of the second attack being due to the house having retained the infection in the interval.

Attitude of the people.—They do not understand the advantages of chemical disinfection, but might be trusted to appreciate the burning of bratties, this being a method that is within their experience. One of their great complaints was that the interior of their houses was rendered uncomfortable and spoiled by the use of the chemical disinfection. This would not apply to bratties.

Suggestions.—Bratties might perhaps run short; if this happened, charcoal (if available and cheap) might perhaps make a substitute.

GROUP (A) (2).

Inoculation.—I have had no personal experience of it in Coimbatore and have not been inoculated myself. So far as I can learn by conversation, it would appear that it is looked on with small favour, even by Europeans and by many members of the medical profession. I have known a friend of mine, on whom inoculation was supposed to have produced somewhat lasting bad effects.

GROUP (A) (3).

Rats—are a decided source of infection. The death of rats was a feature of the outbreak at Métupáláyam and the smell of dead rats was perceptible as we went our rounds on disinfecting duty. A method of exterminating them would be welcome.

GROUP (A) (4).

Plague Hospitals.—We had them at Métupáláyam and Coimbatore. Everybody went to them, who was directed to do so, though some objections were raised, specially amongst the Muhammadan community. I only had to deal with imported cases in Coimbatore.

The substitution of small blocks, containing one or two rooms, would meet some of the objections on the score of caste and would also have sanitary advantages; it would be worth trying, if the increase in expense was not too great.

GROUP (B) (1).

The Observation Staff.—One of my supervisors worked decidedly well, but some of the inspectors were quarrelsome, lazy and stupid and seemed to think that they formed a separate department and should not be found fault with or dictated to by the local authorities. Generally speaking, I had not very much opinion of the inspectors.

One of them addressed a letter to the Sanitary Commissioner through me, complaining that he was over-worked. This letter I declined to forward. Such an attitude is subversive of discipline.

One of the inspectors was found to be nearly useless in the district, as he only knew a little Tamil.

I would have preferred to have had permanent men from the ranks of the Revenue Department, as these men would have a sense of discipline and would be more in touch with the people; but it would probably be difficult to do this on a large scale, without impairing the efficiency of the Revenue administration. Local men would, I consider, be better than outsiders from Madras.

Pay.—Their pay is undoubtedly far too high, considering their education and training, even allowing for the unpleasant nature of the work; local men would probably be willing to accept the post at a more reasonable rate.

Duties.—I do not think that the rules as to the 5 and 10 miles radii should be as rigid as they are. Other matters have to be considered, the imminency of the danger, the density of the population and the amount of money which it is desirable to spend. It would be better if the local authorities had a freer hand and it is by no means certain that, after a certain point of organization has been reached, increase in efficiency is proportionate to increase in expenditure.

I cannot call to mind any case in which the observation staff, except at railway stations, succeeded in detecting anything on their own account. Their chief use consists in keeping the village officers in check; if they were withdrawn, there is the fear that the village officers would get slack.

If members of the Revenue staff were deputed for this work, they would keep the village officers in better control and would be more looked up to by the villagers, from whom they might be able to get information.

Training.—The District Medical Officer could give them more practical training on the spot than what they now get in Madras. In Madras, it is only by an effort of imagination that they can apply their training to the actual conditions under which they are to work: this needs a far higher degree of intelligence than these recruits usually possess.

The District Medical Officer might with advantage train men at intervals and keep them on his registers in readiness for an outbreak. During training, they might get a subsistence allowance.

This would be useful, in case of vacancies arising from time to time. Even if they were never used as sanitary inspectors at all, they might exercise a salutary influence on their neighbours, when plague broke out.

From the point of view of training, the deputation of hospital assistants to work of this kind might be the best arrangement of all. They would be able to diagnose cases and to some extent give advice and help in treatment and would thus to some extent win the confidence of the people. They are better educated than the present sanitary inspectors and they would not cost more. But I fear there are not enough of them.

Supervisors may with advantage be drafted from the higher subordinate ranks of the public service.

GROUP (B) (2).

The passport-system—seems necessary in towns and, so far as villages are concerned, it, at any rate, serves the purpose of keeping village officers alive to their duties.

I should not be in favour of declaring large tracts of country (districts or even taluks) infected. It would put the uninfected villages within those tracts to useless and unmerited hardship and would thus tend to throw additional odium on the whole system.

Something might be done as regards grouping adjacent infected villages together and treating them as an infected block; but, as the epidemic subsided in different portions of the block, the arrangement would have to be carefully watched and modified without delay, as circumstances demanded.

Railway examinations are of undoubted utility and it was chiefly through their agency that Coimbatore town was kept free of plague for so many months in 1903.

GROUP (B) (3).

The Plague Police.—At the time when I was in Coimbatore, only a comparatively small number of police were required. There were no complaints against them.

[I should like to add that my experience of plague is limited to three months in Coimbatore and that I left the district before that town had indigenous cases.]

Conference at Adóni (13th July 1904).

R. WAIT, Esq., Special Plague Officer for Adóni and Alúr Taluks (including Adóni town).
Mr. A. XAVIER, Civil Apothecary, Adóni.
M.R. Ry. T. RÁMA RAO Avargal, Tahsildar of Adóni Taluk.

GROUP (A) (1).

Disinfectants.—Perchloride of mercury, 1 in 1,000: 1 in 500 used for cow-dung floors and walls.

Cloths are boiled; in the case of valuable cloths, we simply expose them to the sunlight.

Disinfecting Staff.—They will not do their work properly, unless they are closely supervised. There have been complaints of dishonesty against them, but nothing has been proved.

Unroofing—is not practised in Adóni now. The Civil Apothecary saw some unroofing in Adóni in 1898 and the Tahsildar had a similar experience in Hospet in 1897. Mr. Wait has had it done on a few occasions, with the consent of the owner of the house, when the presence of a dead rat in the roof could be detected by the sense of smell.

Unroofing would be very desirable. The roofs harbour rats, vermin and dirt. Any such measure would be very unpopular.

Even in the case of partial unroofing, a small sum would have to be given (say, one or two rupees) for the time and expense of repairs.

Partial unroofing would not completely free the roof of dirt and vermin, but it would serve to ventilate the house.

Difficulties of chemical disinfection.—It is impossible to completely disinfect the roof, nor can the chinks and crevices in the walls and floors of the poorer class of houses be completely got at.

Burning Bratties.—The Tahsildar had experience of this in Hospet in 1897. The flooring was scraped up and bratties were then mixed with the flooring and burnt inside the house. The doors and windows were not shut up. Drains and verandahs were treated in the same way. Sometimes straw was used instead of bratties.

The method, as described in Mysore, would apparently be efficacious and would certainly be more popular than chemical disinfection. Natives sometimes use bratties themselves for disinfection and burn their corpses in that way. They would be willing to do the process themselves and the cost of many disinfecting coolies would be saved. They would like not having to move their furniture and cloths out of the house.

The small and cheap thermometer, described as being in use in Mysore, would be a great advantage, as compared with the ordinary thermometer.

Exposure of Grain.—This is practised, in the case of evacuated houses and houses in which there has been infection, if the grain is in small quantities. When the grain is in bags and in large quantities, the bag itself is exposed to the sunlight.

Grain might be a source of infection (from containing the excreta of infected rats and so forth), but the deponents do not think that, in practice, it is a source of infection as a rule. It is rather the gunny bags (especially empty ones), which are infectious.

Rats have sometimes been found in open bags or in bags which have been opened and tied up loosely. In such cases, the top layers of the grain are burnt and the remainder is desiccated by exposure to sunlight.

It would be a very difficult thing to carry out measures for the complete desiccation of all grain, even in large towns. To let the passport-issuing officers at toll-gates do this would be to open up a fruitful source of corruption and oppression.

Attitude of the people.—They do not think chemical disinfection much good. In fact, they regard it as a kind of *mantram* (religious ceremony). They could not be trusted to carry it out successfully without supervision.

Recrudescence and allied problems.—Mr. Xavier remarks that a damp cow-dung floor might be capable of nourishing the plague bacillus, but thinks that, in practice, recrudescence (so-called) is generally due to re-importation by means of human beings or rats.

None of the deponents have noticed any regularity in the places in which plague breaks out or the course along which it moves.

GROUP (A) (2).

Inoculation.—The Civil Apothecary was inoculated in 1902 and the Tahsildar in 1898. Mr. Wait has not been inoculated. Mr. Xavier thinks it beneficial; he has inoculated over 2,000 people and has given the results in a tabular form.

Attitude of the people.—It is not popular, and the only reason why people now go in for it is to escape from the operation of the plague regulations. Mr. Wait does not think it ever will become popular, until the immunity which it confers is found to be more certain and to last longer.

A campaign in favour of inoculation would not be likely to meet with much success.

Exemptions.—In the case of an inoculated contact, there is the risk of his spreading infection unobserved, by means of his cloths and baggage.

GROUP (A) (3).

Rats—are an undoubted source of infection. Mr. Wait and Mr Xavier think that rats might spread infection from one side of a village to another, but are doubtful whether they could spread infection from one village to another village, unless they were conveyed between the villages by human agency.

Attitude of the people.—The Tahsildar thinks that the people are alive to the fact that rats spread infection, but the other gentlemen present doubt whether they fully realize this. All are agreed that the people would welcome any method that might be devised for the extermination of rats.

Methods of destruction.—Tar and sulphuric acid does not destroy rats. It drives them away and in that way it might spread the disease.

The prescribed method is to use the tar and sulphuric acid round the affected tract, so as to drive the rats in. In practice, in order to effect this object, it would be necessary to set to work simultaneously all round the infected area and gradually narrow the circle. This would be very difficult and would need a large array of subordinates.

The fumes stop almost at once and the mixture dries up very quickly. In three or four days, the rats return to their former quarters.

The common-sense rat exterminator kills the rats. For this purpose, it is applied to bread. The rats sometimes go away and die in their holes and the result is very disagreeable.

GROUP (A) (4).

Plague Hospitals—are not popular. People prefer staying at home with their relations. Eighty-nine per cent. of the cases have died. This is due to their being so frequently discovered at an advanced stage of the disease. People notice the rates of deaths rather carefully.

People do not complain, when they have once got into the hospitals: those who have been there usually admit that they have been well and carefully treated.

Suggestions.—If the sheds were grouped in smaller blocks, it would decrease the unpopularity of the hospitals. This would make it possible to defer to caste scruples and, moreover, people who are sick like to be as much alone as possible. The small sheds would also be advantageous from a sanitary point of view, and the increase in cost would not be great.

Private Hospitals.—There are three such hospitals in Adóni, one for Lingayats, one for weavers and one for Muhammadans. They have not worked satisfactorily, and the private medical attendance is very poor.

Brahmans have not put up a hospital for themselves, as they have not been much affected by the disease so far.

People prefer the private hospitals, chiefly because the supervision is laxer than in the Government hospitals, so that they can come and go more freely. It is the relations rather than the patients who like the private hospitals.

Native Practitioners—do not attend the Government hospitals in Adóni, though they could do so if they chose. In one or two cases, they attended patients in the Hospet Hospital, but it was not the rule. They are a class of people of no great respectability. The Tahsildar observes that he would employ a Government doctor, if he were to get plague.

GROUP (B) (1).

The Observation Staff—do not work well, unless supervised. They detect cases by means of their peons in the towns and by means of the reddis in the villages. Some kind of staff is necessary, to keep the reddis up to the mark. The staff have no influence and no local knowledge and have to be interminably watched.

Their Training and Recruitment.—The training would be better and more practical, if it were managed in the district. What they now get is purely theoretical training.

From this point of view, the deputation of hospital assistants for this work would be a great improvement. Sanitary inspectors have no skill in diagnosis: they could only tell a bubonic case of plague and not even that, unless it were in an advanced stage.

The hospital assistants should be men of some status and then they would be respected by the people. The third grade should be the lowest from which a man should be deputed for plague duty. The class of hospital assistants now put on plague duty (as passport-examining officers) are raw hands and are stupid and useless.

In any case, the men selected should, if possible, be men with permanent appointments and should have some local knowledge. Even an Union clerk or a schoolmaster would be better than the outsiders we get now.

Their Pay.—The present staff is far too highly paid. So far as their sanitary duties are concerned, an ordinary maistry could do them quite as well. For cholera duty, men were obtained at 10 rupees a month and they performed their duties quite satisfactorily.

Hospital assistants in rural tracts should get a pony allowance of 10 or 15 rupees a month, in addition to their pay. They must, of course, be required to keep and use a pony.

Their Duties.—Neither circle nor disinfecting inspectors can be taken off their special work, as the rules now stand. A hard and fast rule seems unnecessary in such matters. They can be shifted about in the hot season, but, before the circles can be reduced, Government has to be addressed through the Sanitary Commissioner. There are frequent references for further information and this causes delay. If such changes could be made at the discretion of the Collector, things would work better.

Rewards—would be of no use, in the case of private practitioners. They live by trading on the credulity of ignorant people: if they were known to be helping Government, they would lose all their popularity. Rewards to private persons are not recommended. It would lead to abuse. Mr. Xavier observes that it would be something like the starting of a secret service.

GROUP (B) (2).

The passport-system.—The deponents think that difficulties would arise, if a district were to be declared infected as a whole, as it is necessary to protect one part of a district against another, and this the passport-system tends to do, however imperfectly. A group of villages might with advantage be declared to constitute a single infected block, but this would have to be revised, according to the immediate circumstances of the case, from time to time. Such a system would have to be within the control of the local officer, as the delay caused by reporting would be fatal.

There is doubtless some corruption in connection with passport-issuing offices. This goes on, even at the gates of the big towns, though not to any great extent.

GROUP (B) (3).

The Plague Police—do not work well and are absolute ruff-raff. All are temporary men and there is no discipline amongst them. A good deal depends on the supervision of the inspectors. Inspector Abdul Karim in Hospet kept his men up to the mark. A back-bone of permanent police constables would be an improvement.

Conference at Madras (14th July 1904).

S. D. PEARS, Esq., President of the Madras Municipal Commission.

Captain T. S. ROSS, I.M.S., Health Officer, Madras Municipality.

M.R.Ry. V. BHÁSHYAM MUDALIYÁR Avargal, Superintendent of Passports (as regards Group (B) (2) only).

H. K. WARREN, Esq. (Messrs. Best & Co.); this gentleman's views on the passport-system are embodied in the present Conference. He did not give evidence on any other point.

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury; 1 in 1,000: in the case of earthen floors, a solution of 1 in 20 of carbolic acid.

Carbolic acid may not be quite as good a sterilizer as perchloride of mercury, but the experiments seem to work out quite as well. The carbolic acid would not be so much neutralised by the materials of the floor.

[Note by Captain Ross.—The actual cost of one quart of perchloride of mercury solution (1 in 1,000), as made up at the Madras Municipal Stores, is 1½ pies and that of one quart of carbolic lotion (1 in 20) is 1 anna.]

Old and dirty clothes are burnt and compensation is given. Other clothes, even the valuable ones, are steeped in the perchloride solution and then exposed to sunshine.

A steam disinfector would no doubt be better.

Disinfecting Staff.—All are certificated men and form part of the permanent municipal staff. Mr. Pears and Captain Ross believe strongly in the principle of having local men and permanent employes for plague work. People dislike being interfered with by strangers. If

need arose for additional hands, they would prefer to put their permanent men on plague duty and have temporary men for ordinary work, rather than employ temporary men for plague work.

Unroofing.—In the case of an utterly dark house, a few tiles are taken off, but, as a rule, the house that has to be operated on is of too substantial a type to make this possible. In case of partial unroofing, liberal compensation is given in accordance with the area unroofed.

The object is to let the building have a certain amount of light and ventilation. The operation has never been carried on on a large enough scale to cause discontent. Roofs have a tendency to harbour rats.

Difficulties of chemical disinfection.—Disinfection of this type is confined to the walls and floor; everything in the house which is not burnt is disinfected, but there is difficulty in effectually performing the operation, so far as the poorest class of houses is concerned. Chemicals are almost useless on an earthen floor.

The walls are white-washed the next day, but this would not by itself result in their sterilization.

Grain.—The practice is to destroy any grain found in the course of disinfection. Hitherto, this operation has only had to be carried out on a very small scale.

Attitude of the people.—The more educated people have some faith in chemical disinfection. The others look on it as a thing to be submitted to.

People would prefer bratties and would understand them better. Chemicals leave an earthen floor in a nasty smelling state: bratties would apparently be free from this objection.

Infectivity of Patients.—Mr. Pears and Captain Ross do not consider nursing in a plague hospital to be dangerous, from the point of view of infection. The hospitals are kept clear of fleas and every attempt is made to keep rats out.

GROUP (A) (2).

Inoculation.—Mr. Pears was inoculated in 1898. Captain Ross has not been inoculated. Captain Ross has inoculated 600 persons and does not think there is any danger in the process, if it is done by picked men and if care is used. None of the persons whom he operated on got anything worse than the usual fever for a few days. If the operation is carelessly done, it is very dangerous. No statistics are available, as regards the results of inoculation in the city.

Attitude of the people.—Neither Mr. Pears nor Captain Ross think that anything in the nature of a campaign in favour of inoculation would at present have much success in Madras. The protection is only for six months; if it were for five or ten years, people would be more interested. Again, if plague broke out in Madras, people might become keen, but at present they are apathetic and don't want to have the trouble (and possible risk) of being inoculated again and again, on the chance of plague eventually breaking out.

An outbreak would, of course, be the worst condition under which to perform the operation.

Inoculation of Contacts.—Probably, even in the case of a person incubating for plague, inoculation would, on the whole, have a good effect. This is in fact the case with regard to vaccination and small-pox; but, if such a person got plague, people would at once put it down to inoculation. So, from this point of view, it would be well that contacts should not be inoculated.

A contact, even though inoculated, does not cease to be a source of infection to his neighbours, through the medium of his clothes and baggage.

GROUP (A) (3).

Rats—are probably a source of infection, but there has been no experience in this matter in Madras. [A letter printed in appendix VII gives an account of the campaign against rats in Madras City between 1898 and 1902.]

Any experiment in the direction of exterminating rats would be worth a trial and there seems no reason why it should be unpopular.

Methods of destruction.—Tar and sulphuric acid is used for hospitals. It does not kill rats, but it drives them away. It should not be used in the course of an epidemic, as it might spread the disease.

GROUP (A) (4).

Plague Hospitals.—There are two hospitals open now. They are not popular. It is observed that most of the people who go to them die. Last year, there were nine cases, out of which eight died. Moreover, people like dying in their own houses and with their own people. There have been no complaints of discomfort in the hospitals.

Native Practitioners.—People are allowed to have their own private doctor, if they wish to have him.

The qualified native practitioners would give us help and are independent, but the unqualified men are of no assistance and would lose their practice, if they gave information.

• *Private Hospitals.*—There are none at present, but there have been meetings of the members of the various communities on the subject, and private hospitals would probably be erected, if plague actually broke out.

GROUP (B) (1).

The Observation Staff—mostly consists of members of the permanent staff: the remainder are certificated inspectors and hospital assistants with or without a permanent post. They work well and are well-known to the people in their wards; employment of the permanent staff for this duty is also found to be economical. There are no complaints of dishonesty or extortion. The hope of being taken on as permanent employes in the sanitary staff operates as a strong incentive to good work.

In connection with the Sembiyam plague cases, a temporary staff was employed and was found to be a regular rabble.

Duties and Control.—The members of the staff can be appointed and their services dispensed with at the discretion of the President absolutely.

Training.—Many of the hospital assistants employed have certificates as sanitary inspectors. The others learn their work by doing it.

[I may note, in this connection, that I inspected one of the passport offices in Madras. The work is carried on without any scriptory work to speak of, as the passport-examining officers are also the officers who trace out the defaulters. The system may work well in Madras City, where all the staff are local men, and it certainly saves writing, but it trusts too entirely to the energy and honesty of the employes to be a suitable model for up-country adoption under existing circumstances.]

Regarding my note on the passport-examining office, Captain Ross wishes me to add that there is a large amount of scriptory work in the office. I have not inspected the Health Officer's office, which I presume is the office referred to.]

Rewards—are uncalled for in the case of qualified native practitioners and would be useless in the case of unqualified men.

As regards rewards to private persons, they would not be of much use. People fear their neighbours too much to report cases of plague openly.

Fear of the plague leads to the authorities receiving many anonymous communications. The Sembiyam cases were found out in this way. False information is sometimes given (also anonymously) through spite.

Even if rewards were offered, the information, when given, would probably still be given anonymously.

GROUP (B) (2).

The passport-system.—Mr. Pears, Captain Ross and the Superintendent of Passports consider the system a most useful one. There have been 65 cases of imported plague in Madras City and the discovery of the bulk of these cases is due to the passport-system. Reliance is placed on the inspection of trains at Perambur and Bitragunta. If a man gets down at intermediate stations, he is passported and evasion is very difficult. The roads are not watched. There is no attempt to keep an accurate census-register of the city, with reference to in-comings and out-goings, by means of the plague staff; it would be impracticable.

Mr. Warren observes that, apart from personal inconvenience, he has never heard of the passport-system affecting trade injuriously. If any serious injury were caused to trade, he would be likely to have heard of it in general conversation or in business. He is also of opinion that, if plague came into Madras, it would cause a serious dislocation of trade. He would, therefore, say that, in so far as the passport-system has kept plague out of Madras, its adoption has been in the interests of trade.

Mr. Warren does not think that the passport-system has the same moral effect that it had when it was first stated. He believes that evasions are frequent. He instances one dealer in skins, who tells him that he systematically evades the passport-rules by stating that he is going to Pondicherry.

Suggestions.—Europeans and Eurasians travelling first class need not be passported or examined. They ordinarily employ a qualified doctor, when they fall ill, so that no harm can ensue by such an alteration in the rules. Apart from these persons, exemptions may be granted, after due enquiry, to native gentlemen who have to travel habitually. Servants should continue to be passported.

If Europeans cannot be put outside the scope of the passport-rules, the rules for exemption should be liberally worked in their favour.

Europeans are sometimes a little violent in their dealings with the native inspection staff. One inspector at Perambur asked for a revolver to deal with Europeans.

Mr. Warren comments on the personal inconvenience of being aroused at Jalarpet in the middle of the night and on the needless additional inconveniences involved in having to show one's ticket. He observes that this seems needless, in cases where the traveller admits that he has come from a plague-infected locality. The further detention at Perambur is also inconvenient.

Mr. Warren observes that the hours of inspection (7 to 10 A.M. and 5 to 7 P.M.) are inconvenient, especially for persons in the skin and hide business. He would prefer that the hours of inspection should be in the middle of the day.

The other gentlemen present consider that the existing hours would be preferred by the bulk of the members of the public affected.

GROUP (B) (3).

The Plague Police.—These are only used for Perambúr station (one head constable and four permanent constables).

Discussion with Captain W. J. Niblock, I.M.S., Madras (16th July 1904).

GROUP (A) (1).

Disinfectants used.—For houses, perchloride of mercury, solution of 1 in 1,000. New cloths exposed to the sun simply; valuable cloths steeped in solution of phenyl (1 in 25). Ordinary clothes burnt.

Unroofing.—Partial unroofing practised in Karáchi, in the case of one-storied buildings. Has the advantage of letting in light and air. Roofs were not found to be very dirty in Karáchi.

This was not a specially unpopular measure. People raised no particular objection to it.

Fire.—*Vide* above, as regards cloths. *Vide* below, as regards grain. As regards houses—*vide* the following extracts from my evidence before the Plague Commission (Volume II, pages 177 and 178).

"12446. You had some experience of plague in some other villages, had you not?—Yes, in the village of Reri. This village was situated four miles from the camp and contained about 500 inhabitants. In April, before there was any infection of the village, I warned the Patel not to allow any runaways into his village, and he very carefully followed that advice. There were four Banniahs' shops in the village. Two of the shops were owned by five partners, all men aged between 20 and 35. They also owned a shop in a small village called Sharafi. These Banniahs had two servants—young men—and all were in the habit of going to Karáchi, to the Joria Bazaar, to buy provisions. On the 21st May, one of the servants was brought to the camp, suffering from plague, and he died in three days. The other servant developed plague in Sharafi on the 23rd May and died on the same day. Both servants had returned from Karáchi on the 19th May, after having stayed three days and three nights in the Joria Bazaar, which was the worst infected part of Karáchi at the time. On the evening of the 24th May, four of the partners were admitted to the camp hospital suffering from plague. The fifth ran away, but was subsequently captured by the police and was found to be suffering from plague. Three of the men died. The police locked up the shops. One dead rat was found in the shops. There were no other persons living in the shops. I visited Reri on the morning of the 25th (*i.e.*, the next morning) and found the shops in the most filthy state, *dirty clothes being mixed up with grain and other eatables*. No dead rats could be found, after a most careful examination, nor were any discovered in the village at any subsequent time. The two other Banniahs' shops were very dirty, but had no connection with the former; they were rival firms. I ordered the Banniahs in the other shops to evacuate them at once and go and live in huts outside the village. This they did and there carried on their business as usual. There was no appearance of infection among the other Banniahs and therefore we did not disinfect them. I wrote to the District Magistrate for permission to burn the infected houses and their contents. On the 27th May, two cases occurred amongst the Mussalmans, in huts quite distinct from one another and a long way from the Banniahs' shops. They were both residents of the village and had not been to Karáchi for months. One was a boy and the other was a girl—not relatives. They were at once removed outside the village, along with the persons who lived in the same huts. On the 28th, having received permission from the District Magistrate, I had the shops and their contents (with the exception of cooking utensils, weights and scales) burnt. The other infected huts were also disinfected thoroughly and all clothing, etc., disinfected or burnt.

"12451. Will you give us a similar account of your experience there?—Asu village is not such a good case. It has about 500 inhabitants, chiefly Mekranis. They are very dirty. Plague broke out amongst the Banniahs, the first case being on the 25th April. I was unable to localise the hut in which the case occurred, as the patient had been removed, during the night, outside the village. About 11 other cases occurred, some of which were taken to camp, all Banniahs. It was confined to the Banniahs. Although those Banniahs supplied the village, none of the Mekranis took the disease and they were constantly going in and out of the shops.

"12452. Where did the Banniahs replenish their stores from?—From Karáchi. A number of the cases that occurred in the village had actually come from Karáchi. We could not keep them out.

"12453. What measures did you take?—On the 3rd of June, a case was discovered in a Banniah's shop, which I suspected before as being the source of the mischief, but could not until then prove it. The owner of this shop owned two others close to it. I removed all occupants of the three huts to camp at once. These were about 20, and I had all their kit taken to camp, where it was thoroughly disinfected. All dirty articles, boxes, etc., along with the huts, were burnt as they stood, the roof having been thrown on to the floor and set fire to. No further cases occurred in either."

This, where it is practicable, is the most effective method of disinfection. It completely cleared the disease out of the two villages in question.

Disinfecting staff.—There was no special staff for disinfecting work in Sind, except the trained coolies. They worked under the direct supervision of a member of the Indian Civil Service or of the Indian Medical Service.

For general purposes of plague administration, we had the services of the sepoy, hospital assistants and revenue and police subordinates; but I would never trust any subordinate to perform disinfection, without my own personal supervision.

Once I paid a surprise visit to a house said to have been disinfected and found a lot of filthy rags lying in the corner. Obviously, the time and trouble spent in disinfecting the house had been simply wasted in this instance.

Attitude of the people.—They had no objection to chemical disinfection and some of the more educated had some faith in it, but they could not have been trusted to do it properly themselves without supervision. People have an unwarranted idea that the action of cow-dung is antiseptic. Even one's own subordinates have not really an intelligent appreciation of the process—*vide* the instance given under the last head.

Leaving the house wet after chemical disinfection might cause a certain amount of annoyance, but in practice the people were not, apart from this, allowed to re-occupy the houses immediately after the disinfection.

Difficulties of chemical disinfection.—It is very difficult (practically impossible) to really thoroughly disinfect the poorer type of houses chemically. There are the irregularities of the floor and walls: the roof is difficult to get at. The perchloride is also in a large degree neutralized by the dirt.

Further, the action of the perchloride is to coagulate albumen and this will frequently have the effect of forming a kind of protective sheath round the bacillus and protecting it from the further action of the disinfectant. Ordinary surgical experience has shown me that this is very likely to occur. This circumstance greatly detracts from the value of chemical disinfection, when applied to the poorer and dirtier type of native houses.

Grain.—When we had any suspicion of grain, we burnt it. This is the safest way. Grain would be likely to convey infection, through the medium of rats or their excreta, etc., or through dirty clothes being mixed up with it.

The instance of Reri given above illustrates these points and is, in my opinion, an instance in which grain was the source of infection for the village.

Burning Bratties.—I have had no experience of this. The Mysore method, as described, sounds effective. The question could, however, be set at rest in all probability by direct experiment, *i.e.*, by placing cultures of the bacilli near one of the paraffin thermometers, while the bratties were being burnt, and by seeing whether they were destroyed thereby. Some such experiment has actually been made, in order to test the efficacy of hydrocarbon.

It would add to the efficacy of the process, if some of the floor were dug up and spread in layers, alternately with a layer of the bratties.

The process would be probably more popular and more generally understood than the process of chemical disinfection. The killing of vermin would be a great point in its favour.

Recrudescence.—The question is a bacteriological one and must be considered to be still *sub judice*. *A priori*, there is no reason that I know of why the germs should not be supported by the organic matter contained in an ordinary native floor. Until the contrary is proved, the safe course is to assume that the bacillus will live on indefinitely under such conditions and also to assume that it will penetrate below the surface of the floor or wall.

Instances of probable recrudescence.—The case of Karáchi city came within my personal experience. Nine months elapsed between the first and second epidemics, and the direct cause of both these epidemics was found to be importation from Bombay.

Both these epidemics began in the Banniah's quarter and spread in exactly the same way from the same centre and by the same routes.

Between the second and third epidemics, there was an interval of a few months. The third epidemic started all over the city at once. There was no history of re-importation and no reason to suspect it.

The different quarters, in which this epidemic broke out, were miles apart from one another, so that there would have been no time for rats to carry the disease. The people could not well have been the source of re-infection, having regard to the fact that the epidemic broke out *simultaneously* in the various parts of the city and having regard to the fact that the people in the various quarters had no connection whatever with one another.

In these circumstances, the third epidemic at Karáchi seems to be a genuine case of recrudescence on a very large scale.

Channels of infection.—Infection may take place through the mouth, probably the chief channel for infection in the case of the pneumonic form of plague, but more generally comes through the skin.

The feet are a common source of infection, but not perhaps as common as is generally assumed. It is the inguinal glands that are affected as a rule, rather than the femoral glands. Infection arising from the feet would affect the femoral not the inguinal glands.

I would suggest the following explanation for this. Natives are fond of scratching themselves and do not keep their finger-nails clean. Many natives have eczema or itch round the waist. Scratching this would afford a ready channel for the infection, and the inguinal glands would be affected by this means. I believe that inoculation of the disease is commoner by this way than by the feet.

In children again the cervical glands are commonly affected. These are in communication with the scalp, and we know that children frequently suffer from eczema and other skin diseases on the head. Here, again, scratching the part affected with a dirty finger-nail might be a source of infection.

Infectivity of Patients in Hospitals.—My experience in plague hospitals has convinced me that attendance on a plague patient is hardly attended with any danger, if proper precautions are taken. Infection, as remarked above, comes chiefly through the skin, and most means by which infection could be conveyed through this channel are sufficiently counteracted by the ordinary precautions taken in a well-managed hospital.

In Karáchi, there was only one case in which any of the nurses, attendants, etc., contracted plague, and it is believed to have been contracted in a hut outside the main building. The probable cause of infection was that the flooring of this hut had retained the infection and dust was blown up from the floor by the wind and infected the nurse. The hut had got an ordinary sand floor, instead of (as should always be the case) an impermeably smooth floor of cement or tiles.

Infectivity of Convalescents.—Captain Cornwall and I tested the blood of many plague patients, with the view of discovering whether there were any bacilli in the blood. We never found any, except in patients who died not long afterwards. Professor Gaffky made similar experiments and also obtained negative results.

This result is such as might be expected, *a priori*, as bacilli in the blood would show that the septicæmic stage of the disease had been reached and that death was imminent.

In these circumstances, experiments tending to show that the blood of a convalescent can harbour plague bacilli must, in my opinion, be accepted with caution. Doubtless, if it were so, the patient might continue to be a source of infection, while convalescent or even after complete recovery.

Desirability of scientific investigation.—The point just touched on, as well as many other points in connection with the disease, stand in urgent need of bacteriological investigation, but, at present, opportunities and inducements for such research are lacking. The Plague Research Laboratory at Bombay seems to confine itself almost entirely to prophylactic work.

Climatic conditions.—No generalization seems possible at present in regard to the climatic, thermal or meteorological conditions, under which the bacillus is most favourably or unfavourably affected. From these points of view, the disease appears to be absolutely capricious.

Sanitary conditions.—Experience in Karáchi showed that the disease began and spread and flourished most in the dirtiest parts of the town. The Parsees again (a relatively clean and sanitary community) were comparatively free from the disease. So my experience lends no support to the view that the plague bacilli are unfavourably affected by insanitary surroundings. *Vide* the following opinion expressed on the subject by Mr. R. Giles, then officiating as Commissioner in Sind (page 135 of the Plague Commissioner's report, volume II).

"11228. By some direct disinfection?—There was not the faintest doubt that the ill-ventilated houses, where the people were crowded, got the plague far the worst; it was quite apparent."

GROUP (A) (2).

Inoculation.—I have not been inoculated myself and have no personal experience of the process.

GROUP (A) (3).

Rats—are a source of infection and might carry the infection from one quarter of a village to another. In fact, I have heard of rats going in droves from one quarter of a village to another at the time of an epidemic and have no reason to doubt the veracity of my informants.

Rats and Fleas.—This is a bacteriological question and one that needs very thorough and careful enquiry. Many vague stories are told about rats and fleas, but they should be carefully sifted or received with caution.

Mr. Giles has himself seen rats lying dead of plague, with dead ants in swarms round them. The fact is interesting and suggests the inference that the ants may have also died of plague.

Method of destruction, etc.—The common-sense exterminator sounds very good. I have not had personal experience of this or any other method.

Tar and sulphuric acid would have the effect of frightening away rats rather than killing them and might spread plague in this way.

The method of exterminating rats by communicating disease amongst them might with advantage be made the subject of experiment in India. Favourable or unfavourable experiments in other climates and amongst different fauna cannot be accepted as conclusive, so far as India is concerned. The conditions, even in different parts of India, may present differences, which may be material.

GROUP (A) (4).

Plague Hospitals (Plague Camps).—People objected to the inevitable inconveniences in regard to camps (detention, separation from their homes and friends, etc.), but said nothing against the arrangements. The people were very amenable, when once we had got their confidence.

In the Malir detention camp, people were separated off by castes and were provided with caste attendants, as far as possible. A portion of the camp was separated off and fitted up with some luxuries. People had to pay to be sent to this portion of the camp (one rupee or eight annas a day), and the arrangement was very popular.

With any subordinate left in complete charge, the arrangements in a camp might easily become very slack and the inmates might have just cause for complaint. Constant supervision is absolutely necessary.

Private Practitioners—were not allowed in the plague hospital. I took all the patients myself. There were no complaints in regard to this.

They were an unsatisfactory class of men and frequently worked against the authorities. I had to prosecute some of them for giving false certificates, etc.

GROUP (B) (2).

Passports.—If the thumb-marks of the passportes were taken, it would be an excellent means of preventing fraud and very simple. The following extract from my report shows the circumstances under which it was introduced in the Malir camp in 1898.

"So far as I am aware, only three persons in possession of Malir camp certificates developed symptoms of plague up-country. In one of these cases, there was room for strong suspicion that the patient had obtained fraudulent possession of a pass belonging to another man, but unfortunately we had no accurate means of proving this or of identifying the man. In order to prevent the repetition of such an occurrence, the Commissioner in Sind recommended that each person's pass should bear the impression of his thumb in ink. In accordance with this, beginning with the last week in May, every detention certificate issued from the camp carried the ink impression of the bearer's right thumb. This system was found to work excellently, and no persons ever objected to their thumb-marks being thus taken."

GROUP (B) (3).

Plague Police.—We had permanent police to help us, but I preferred the sepoys. Sepoys worked excellently under the command of a non-commissioned officer. They got extra pay during this duty.

Discussion with Captain J. W. Cornwall, I.M.S., Deputy Sanitary Commissioner (late Health Officer, Madras Municipality), Madras (19th July 1904).

GROUP (A) (1).

Disinfectants.—Perchloride of mercury (solution of 1 in 1,000) used for houses. Carbolic acid was not found as easy to work as Perchloride.

In Sind, the clothes were usually boiled, but sometimes steeped in a solution (1 in 20) of carbolic acid; silks, etc., were exposed to the sun.

In Madras, rags were burnt and all other clothes treated with Perchloride.

Unroofing and treatment by Fire.—Unroofing not resorted to in Sind: in the villages, the houses (roofs and walls) were mostly tatties and these were burnt, leaving nothing but the poles standing. As a matter of efficiency, there is, of course, nothing like burning; it is the best method for first cases of imported plague. The roofs in Sind were quite as dirty as those in Madras.

Difficulties of chemical disinfection.—Chemical disinfection is efficacious, when it can be properly carried out. It is exceedingly difficult to get at the walls and floor of the poorer class of houses. In first imported cases, one can devote personal attention to each house and see that the method is properly carried out, but it is difficult to secure efficiency, when the thing has to be done on a large scale and at a high rate of speed.

Burning Bratties.—I have had no experience of this. A direct experiment would be the best way of testing its efficacy. Rags covered with bacilli could be placed in various parts of a room, the bacilli being introduced artificially on to the rags. The question is whether the temperature would rise uniformly all over the room, in cracks in the wall, etc.; directly you deal with matter lying on a solid substance, you have to reckon on its power of conducting heat.

I don't think it would be necessary to dig up any portion of the floor. It is extremely improbable that the bacilli would penetrate below the surface of a hard mud floor.

Exposure of Grain.—In Sind, only small quantities had to be dealt with and they were usually spread out in the sun. Grain must be treated in this way, if dead rats are found in it. There is, of course, the possibility of grain in which dead rats were not found having none the less been contaminated; but this is not very likely. I have not had any experience of grain as a source of infection in a village; my experience in Sind was that clothes were the more usual cause of infection. Bringing away the clothes of a person who had died of plague was a frequent source of infection. There was a celebrated case, in which infection was conveyed by clothes sent many hundred miles away from Bombay.

Recrudescence.—*A priori*, there is nothing improbable in the plague bacillus finding nutriment for an indefinite time in an ordinary earth and cow-dung floor, and I am inclined to think that, in some cases (though by no means in all cases) of re-infection, this is actually the case. The way in which plague recurs in the same place year after year and gets worse and worse seems to favour the theory, and in many cases re-infection would seem to be brought about by seasonal conditions, apart from re-importation.

In Karachi, there was a re-infection after many months. Plague broke out in many quarters of the city almost simultaneously. It would be difficult to explain the facts of the re-infection of Karachi City, on the assumption that there is nothing in the theory of recrudescence.

Channels of infection.—I have seen many cases of plague but have not seen one case of true internal plague. I believe that the general source of infection is external, so far as bubonic plague is concerned.

Infectivity of Patients.—Bubonic plague is hardly infectious at all, unless the bubo is cut or until the septicæmic stage is reached and the man is moribund. A man might recover from a mild onset of septicæmia and he would then, even when convalescent, be mildly infectious, supposing that the disease could be transmitted by suctorial insects.

Putting aside this very rare case, the ordinary history is that the bubo gradually subsides, the infection dies away and the blood and fæces do not become infective at all.

Experience by no means supports the view that a patient suffering from bubonic plague is a source of infection. The action of the bacilli, in the case of enteric fever, is not a fair analogy. Barring accidents, such as cuts and abrasions, hospital work is not particularly dangerous, except for the risk involved in bending over pneumonia patients.

Pneumonic plague is very infectious. I have known of three large families having been wiped out, the infection being passed on from relation to relation.

I performed some microscopic experiments on the blood of plague patients and only found the bacillus in moribund cases. In Hong-Kong, they claim to have found the bacillus in every kind of case and at every stage, but I am sceptical as to this, as far as is permissible without personal work in this direction of recent years.

Opportunities for research.—I have made no experiments in this Presidency. We are not allowed to make experiments or even to obtain cultures of the bacillus. There was an order in the matter, shortly after the Vienna accident.

It is a pity that no experiments can be made. Seven years have elapsed and we know practically nothing about plague. Mere experience, without research, teaches nothing at all. Local research could be carried out under far more favourable conditions out here than at home.

Not one but half a dozen men would have to be put on special duty and given a free hand, if anything is to be elicited in the way of research.

Climatic conditions.—There is no reason to suppose that the conditions (of climate, temperature, etc.) are such as to render any particular tract of country (say, in India) immune from plague. There seems, for example, nothing in the climatic condition of Madras City to render it immune.

Sanitary conditions.—Dirt may favour plague, but I doubt whether it does so to any great extent.

People, who live an ordinary, sanitary, cleanly life, do not run much risk of catching plague.

Attitude of the people.—I don't think that the people in Sind had any belief in chemical disinfection. In Madras, I think they appreciate it a little more. They have no very active belief in it, but are glad to see their neighbours' houses disinfected, though they would not like having their own done.

People could not be trusted to carry out the process of disinfection efficiently for themselves.

GROUP (A) (2).

Inoculation.—I have not been inoculated. I would be inoculated, if I were in a situation and state of health, which rendered me exceptionally liable to plague, not otherwise. Inoculation seems to afford a considerable degree of protection.

In Madras, I inoculated my servants and, in general, about 200 or 300 people; this was in 1898. There has been no inoculation to speak of in Madras since then.

Effects.—There were some bad effects in Karachi, but this was due to carelessness on the part of the operators or the laboratory staff.

I had one case of inoculation, which nearly led to death. This was the fault of the subject, who was told to keep quiet but, instead of doing so, went to a marriage feast, over-ate himself and then tried to correct the effects by a large dose of opium.

Attitude of the people.—People will sometimes be keen on inoculation. There is a wave of enthusiasm, and people get to think that to be inoculated is the right thing.

In the Punjab, the experiment of inoculating the vast majority of the population was being put energetically in hand and apparently would have had considerable chances of success, had it not been for the failure of the Research Laboratory to send out sufficient and proper material.

No particular steps are taken in this Presidency to bring inoculation before the people.

Inoculation of Contacts.—The inoculation of a person incubating for plague might have the effect of considerably lowering his powers of resistance. Experiments have been made, in the case of *Typhoidal* vaccine, and show that the patient's powers of resistance are lowered. It is not certain that the immediate effect of ordinary vaccination is not to lower the system. But all such analogies must, of course, be received with caution.

GROUP (A) (3).

Rats—are probably a source of infection. I have seen many dead rats in godowns in the course of epidemics, sometimes desiccated.

Attitude of the people.—They were not afraid of rats in Sind and had not realised that they were a source of infection. Even the administration were at that time accustomed to treat rats as a warning rather than a source of infection.

Methods of destruction.—Rewards for their destruction are perfectly useless. Thousands of rupees were wasted in this way in Madras City and there were as many rats at the end as at the beginning. It would be very difficult to effectively clear villages of rats, as they would come in again from the fields.

GROUP (A) (4).

Plague Hospitals—were very unpopular in Sind at first, but became more popular, as they became better known. People objected to English treatment and foolish rumours were circulated that the object was to kill them and so forth. Native treatment was allowed in the caste hospital. I think this is the best way.

Private Hospitals—are best for the middle classes, who are not educated enough to appreciate English treatment and yet too well off to be content with anything they can get. For the more enlightened and for the very poor, our hospitals are best.

GROUP (B) (1).

The Observation Staff.—In Madras City, we worked with the municipal staff, assisted by certificated sanitary inspectors and hospital assistants for the passport work.

The passport-examining office staff used also to undertake the work of hunting up defaulters. The staff of an examining office would consist of one, two or three men, according to exigencies. In cases in which the passport staff could not trace out a case of default, the services of the municipal staff would be obtained and, in the last resort, the police. There was no separate observation staff. The system worked well in practice.

[This is practically what is done now, so far as my inspection of Madras City showed me.]

The original municipal staff formed the nucleus of the observation staff and their knowledge of the town was an important point in securing the success of the system. In any town (for example, Calicut), you are sure to get far more work out of the permanent staff than out of temporary men.

Training and Recruitment.—I frequently examine batches of men for selection as temporary sanitary inspectors and I find it very difficult to get a sufficient number of suitable men

Many of the people who apply are either very young or are old men, who have failed in some other branch of life—as schoolmasters, frequently. Some are good, but many are by no means the stamp of men one would select, if there were any choice.

Even the men who come for the certificate course are frequently not up to the mark physically. It is not an attractive life and there are elements of risk in it; that is probably the reason why better men do not present themselves.

Rewards.—Native doctors are not good, and no system of rewards would make them help us. They have no code of honour and no rules amongst themselves. I don't think the system of giving rewards to private persons would be of any use. Most of the information we get is anonymous, probably coming from neighbours. [Vide Group (A) (1).]

GROUP (B) (2).

Exemption from Passport Rules.—I am in favour of the exemption of the better class of Europeans and Eurasians—say, those who travel first class—from the operation of the passport rules. It would reduce needless annoyance now caused to a class of people who are perfectly capable of looking after themselves.

GROUP (B) (3).

Plague Police.—We employed some plague police in connection with the outbreak of plague at Sembiam. They required close supervision. I once visited a passport-issuing office, where there was supposed to be a writer and a constable, and found the place deserted.

Discussion with G. W. Dance, Esq., I.C.S., Saidapet (19th July 1904).

(Mr. Dance confined his remarks almost entirely to the passport-system.)

GROUP (B) (2).

The passport-system, if well worked, is an excellent system and has helped to keep plague out of Madras, but it can only be effective, when worked judiciously and in such a way as to enlist the sympathies of the native population.

Arkonam is a case in point. There were 10 or 12 cases of plague in January or February. As late as April (and I think May also) the town and station were still on the infected list and European passengers from Madras to Conjeeveram *via* Arkonam and stopping the night at Arkonam were passported. Further, natives going straight through Arkonam were made to take out passports. This is simply vexatious.

The same argument applies to Coonoor. Ootacamund passengers, going straight through to Madras, were made to take passports at Coonoor, though Ootacamund was off the infected list and Coonoor had been free from actual plague for two months before.

Sembiam again was declared infected after a single case, with the result that the Collector had then and there (without the exercise of discretion) to entertain a large staff and adopt in all its minutiae the procedure laid down in the Plague Regulations, whatever the local circumstances of the case might be.

If the passport-system were worked with more intelligence and flexibility, natives would be quite ready to see its utility and would be the first to help us in enforcing its provisions, as they are really afraid of plague, but, when the system is worked oppressively and mechanically and in defiance of the facts, the people are put against it. They try to evade and small blame to them!

I have instituted a system of reminders to my subordinate officers in the matter of intimation lists, when they don't come back to me in proper time. Every passport has thus to be accounted for. In this way, I hope to be able to secure promptitude in the disposal of passport work all over the district.

I would not be inclined to recommend the exemption of Europeans from the operation of the passport rules, on account of the ill-feeling it would be likely to provoke, but the exemption of respectable Europeans and Eurasians could not cause any possible harm in itself.

I must add also that the plague rules generally should be more elastic. The local officers should be allowed to use their own discretion within certain limits. They should not, for instance, be obliged to organise ambulance corps and observation corps, etc., merely because a village has been declared infected. They should be allowed to hold such preparations in abeyance if there is no likelihood of any need for the services of such a corps.

If the passport-system were confined to really infected areas, it would be easier to exercise an effective control over the passport-holders.

First Conference at Trichinopoly (20th July 1904).

C. G. SPENCER, Esq., I.C.S., Collector.

Major T. FFRENCH, late Special Plague Officer, Hosur.

M.R.Ry., T. V. ANNASWAMI MUDALIYAR Avargal, Rao Sahib, Chairman of the Trichinopoly Municipality.

GROUP (A) (1).

Disinfectants.—Perchloride of mercury (salt solution of 1 in 500) for houses. Clothes were steeped in a solution of perchloride (1 in 1,000). Phenyl was used for flushing drains.

Unroofing.—For the first three months after the outbreak in Hosur in 1898, Mr. Spencer and Major Ffrench used to unroof entirely, but the then Plague Commissioner, Mr. Buckley, was not in favour of this; after that, they used, as a rule, only to do it only in strips or squares.

Major Ffrench considers that unroofing, to be effective, should be done completely. The roofs in Salem district were very dirty and dead rats and snakes were found in them, especially in Tiruppattur. They were sometimes in a dry and mummified condition and must have been dead for months.

Complete unroofing would be very unpopular and would cause some hardship, especially in the rains. When the roofs were completely taken off, compensation was given, in the case of grass roofs and in the case of the very poor. This would have to be done always, but it is not believed that the expense would be very great.

Difficulties of chemical disinfection.—Perchloride is efficient, if it is properly worked in with brushes. Major Ffrench does not believe in any form of Chinese pump. The metal in the 6-rupee pump corroded quickly.

The ordinary type of hut is very difficult to do completely. Careful supervision is required. In any case, the chemical disinfection does not touch the roof. That should be removed, before the chemical disinfection is commenced.

Burning Bratties.—Mr. Spencer and Major Ffrench had some experience of the Hyderabad method (kiln-building) and found it entirely useless and very expensive and dangerous to the workers. The Mysore method, as described, sounds more promising.

Bratties are used for cremating and also, in Hindu houses, for destroying bugs and mosquitoes. Natives would understand and appreciate the use of bratties for disinfection.

Mr. Annaswami Mudaliyar states that a cart-load of bratties could be got for 2 or 3 rupees. There would be no difficulty in procuring a large supply of bratties in Trichinopoly.

Recrudescence, etc.—Mr. Spencer and Major Ffrench believe that infection could linger for some months in a badly-disinfected house. As a rule, they traced some source of re-importation (real or imaginary) in cases of re-infection, but they know of some instances in which villages had been badly disinfected and in which plague broke out on the return of the inhabitants to the village. Major Ffrench suggests the possibility of the bacillus continuing to exist under the surface of the floor and being brought to the surface eventually by scraping.

Exposure of Grain.—Oil-seeds probably would retain infection. Mr. Spencer and Major Ffrench have, in infected villages, come across jars of grain with rat-droppings in them. In the case of big jars, it is not believed that anything but the top layer would be infective. With this exception, they believe in the necessity for complete desiccation of grain in evacuated houses, and such was their practice in the Hosur taluk. The practice was to expose it for three days to the sun. At first, some grain was burnt, but this was a very unpopular measure and involved large compensation being given. Hides are sent in large numbers from infected areas to non-infected places at great distances, such as Madras. Yet infection has not been set up. Government have steadily refused to hamper trade by prohibiting transport of grain and other articles and it is considered that the result has justified the decision.

It would be impossible to adequately deal with grain coming to shandies from infected localities. If this were an important source of possible infection, it is difficult to see why Madras City has never been infected in that way.

Attitude of the people.—Villagers submit to chemical disinfection but don't believe in it: they would prefer the burning of bratties: it would appeal much more to their senses.

GROUP (A) (2).

Inoculation.—Major Ffrench has been inoculated, but not the other two gentlemen. Major Ffrench and Mr. Annaswami Mudaliyar have a favourable opinion of the process, but not Mr. Spencer.

Results.—Major Ffrench nearly died, as the result of inoculation, having sickness, fever and head-ache in an acute form for three days. A doctor, inoculated at the same time, had acute spasms, his legs being drawn up, as if he had been poisoned with strychnine. Major Ffrench believes that these results were attributable to carelessness on the part of the apothecary, who performed the operation, *i.e.*, not properly sterilizing the needle.

Major Ffrench considers it very dangerous to inoculate during an epidemic. Many people, who were inoculated during an epidemic at Matigiri, died of plague shortly afterwards.

Attitude of the people.—None of the deponents consider that an inoculation campaign at present would have much chance of success. That in the Punjab was foredoomed to failure.

GROUP (A) (3).

Rats—are a decided source of infection. The following case came under the notice of Mr. Spencer and Major Ffrench. Matigiri is four miles off Hosúr. It was infected and Major Birdwood (the officer in charge of the Remount dépôt) noticed that rats were disappearing from Matigiri. Precautions of the utmost stringency were being taken, with the full co-operation of the Hosúr villagers, to keep Matigiri people out of Hosúr. Then a case of plague suddenly occurred in a Brahmin's house in Hosúr. The tiles were removed and dead rats found in the roof. There was no other history of infection and the case strongly suggests the inference that rats had conveyed the infection from the one village to the other. Both gentlemen believe that rats can spread plague from one village to another. They have frequently seen dead rats or traces of rats in country roads far from houses.

Mr. Spencer has seen rats that live in the fields in the hot weather and come into houses in the cold weather. This is a possible source of re-infection.

Methods of destruction.—Mr. Spencer and Major Ffrench used at first to dig up the rat-holes, when disinfecting houses, but found it impracticable to do this completely. Afterwards tar was poured down the holes and the holes were blocked up, but it was difficult to block up all the holes.

If rats are driven away they may spread the disease. A cat may get plague itself. Rewards are very little use. Mr. Annaswámi Mudaliyár remarks that almost all the residents of Trichinopoly have rat-traps.

Rats and Fleas.—Major Ffrench is sure that fleas spread plague. He has frequently seen dead or dying rats covered with fleas. It was on one such occasion that a temporary inspector said, looking at the fleas, "See the microbes running away!" He has never seen fleas on rats which had been dead for any length of time. Fleas might disseminate plague, just as mosquitoes do in the case of malaria.

Other Animals.—Squirrels get plague. Mr. Spencer has known of rat-snakes being found dead in the same house where a staggering plague-stricken rat was found and suggests that the rat-snake may have eaten a sick rat. A dead cobra was also seen in the course of disinfection. Major Ffrench has seen a monkey dead of plague. Mr. Spencer notes that a dead donkey was found in an infected and unroofed house at Jibi. The death of two horses at Mattagondapalli, from what the stock inspector, Civil Veterinary department, certified to be anthrax, was followed by an outbreak of plague in that village, the first case being that of a girl who had been playing near the dead animals.

GROUP (A) (4).

Plague Hospitals.—There were plague hospitals at Hosúr and Matigiri. They were pukka, tiled, cemented floor buildings, according to regulations. In outlying villages, small isolated huts, with a lane between, were found most useful. Tents were also found very useful for the ambulance staff and for isolating contacts, when a fresh village got infected before sheds were built.

When once the patients got into the hospitals, they did not mind them so much. The nurses were very good to them. They liked having separate huts. People don't like seeing other sick people. Much depends on the care taken by the individual doctor in charge.

There were no private hospitals in the Hosúr division. There were many private health camps.

Native Private Practitioners.—Mr. Spencer and Major Ffrench are not in favour of allowing private doctors into the Government hospital. Mr. Annaswámi Mudaliyár thinks that, in Trichinopoly, people would prefer to have the Government doctor. Patients were entirely treated by Government doctors in the Hosúr camps.

GROUP (B) (1).

The Observation Staff.—Mr. Spencer and Major Ffrench found that the Hosúr staff worked well, on the whole, under supervision. After six months they got used to their work and surroundings and the people got used to them: after a year, they became very efficient in detection. In the beginning, the people would have preferred revenue officers, but this did not last. There were complaints against them but only one such complaint can be said to have been proved. Mr. Annaswámi Mudaliyár finds that, in Trichinopoly, they work fairly well and says that people will give them information, though only one or two of them are local men.

Major Ffrench would like to have retired native officers as supervisors. Mr. Annaswámi Mudaliyár would like retired European non-commissioned officers. Mr. Spencer found the salt officers on the whole satisfactory and also thinks that a Sub-Magistrate would probably do well. The great point, whether in the case of supervisors or overseers, is to have a hold on them. The pay of the inspectors is, in the opinion of all the gentlemen present, too high now, and it is considered that 50 rupees, including everything, would be enough.

• When there was a difficulty in getting revenue subordinates, pensioners and schoolmasters might be got with advantage.

Attitude of Villagers.—Mr. Spencer and Major Ffrench found that the villagers did a good deal to keep out plague for themselves. In Krishnagiri, where a vigilance committee was formed, funds collected and watchers posted on every road, they did this very systematically and thereby kept plague out of the town for four years. This movement strengthened the hands of the Government a good deal.

Rewards.—None of the gentlemen present consider that any assistance could be got from native practitioners. They are an inferior class and could not be relied on. Mr. Spencer had one private doctor prosecuted for concealing a case. Mr. Annaswámi Mudaliyár remarks that, if he got plague, he would go to a Government doctor.

GROUP (B) (2).

The passport-system.—It would not be safe to issue one passport for a whole family. No separate passport is issued for infants in arms, and further than this it would not be safe to go.

Mr. Annaswámi Mudaliyár remarks that the transmission of intimations is greatly delayed and suggests their being transmitted free by the railway telegraph.

[I may note, in this connection, that I examined the passport-examining office at Trichinopoly. Defaulters' lists and lists of persons alleging change of residence are made out daily and promptly dealt with by the circle staff and higher authorities.]

Second (Railway) Conference at Trichinopoly (21st July 1904).

F. F. SMITH, Esq., Agent and Manager, South Indian Railway.

T. J. McCLOUGHIN, Esq., General Traffic Manager.

Dr. F. G. OLIVER, Superintending Physician.

Dr. H. W. McCULLY HAYES, District Medical Officer.

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury, a solution of 1 in 500 or 1 in 1,000, according to the degree of dirtiness of the houses. Cloths steeped in perchloride of mercury. The more valuable cloths exposed to the sun simply.

Unroofing.—All tiled roofs are removed completely, even in wet weather.

Treatment of Grain.—This has never been dealt with hitherto. Now, the Collector of Tanjore has issued a circular (A, appended) to the effect that grain should be exposed to sunlight before delivery. The Medical department of the railway consider that grain should be treated in this way to render it innocuous.

Mr. Smith and Mr. McCloughin observe that this would cause considerable inconvenience. If desiccation of grain is to be insisted on, it should be done at the station at which the grain is delivered to the company.

The rule might be that a competent officer of the district should have to grant a certificate to the effect that the grain had been dealt with to the satisfaction of the plague authorities, and the Railway Company could then refuse to receive any grain unaccompanied by such a certificate.

Dr. Oliver and Dr. McCully Hayes are of opinion that grain is a possible source of infection, in so far as it is liable to contain the excreta and droppings of rats, etc.

Recrudescence.—Dr. Oliver and Dr. McCully Hayes agree in considering it safest to assume that a house might remain infected for many months and that a cow-dung floor might afford sufficient nutriment for the plague bacillus. The plague germ is fairly resistant.

The whole thing is a matter for experiment.

Infectivity of Patients.—An ordinary sufferer from bubonic plague can hardly be considered infectious. Attendants at hospitals escape infection by keeping themselves in a good bodily condition and taking the usual precautions.

The recent Hong-Kong investigations seem to show that the blood of a plague patient may contain bacilli, even before the septicaemic stage is reached. Neither Dr. Oliver nor Dr. Hayes remember any experiment in which bacilli were discovered in urine.

It seems possible, on the analogy of enteric fever or diphtheria or scarlet fever, that the patient might retain infection, even after convalescence.

If plague were conveyed by suctorial insects, the patient's infectivity would be largely increased.

Channels of infection.—Dr. Hayes thinks that the sources of infection in the bubonic type of plague are mostly external—the hands and feet. At the same time, no positive inference can be drawn from the position of the glands affected. If the hand is the source of inoculation, the axillary gland is affected, but the converse does not hold true. Dr. Hayes observes that

many natives have skin disease of the scrotum and suggests that the infection may frequently come through scratching that portion of the body.

It is very doubtful whether infection would be conveyed through an eczema. Unless it were of the mildest type, its own micro-organisms would be sufficient to protect it from invasion by the plague bacillus.

Dr. Oliver thinks that, arguing from analogy, the chief source of infection would be the nose.

Sanitary conditions.—Plague is a dirt-disease. People who live an ordinary cleanly life on the European model are very unlikely to contract the disease. It is people who live in-door lives (Banniahs, etc.) who get the plague more than people whose work lies chiefly out-of-door (coolies, etc.).

Climatic conditions.—There seems no justification for the assumption that any particular place or climate is immune from plague.

GROUP (A) (2).

Inoculation.—The protection is not complete and it is not worth while to spend any considerable amount of time, energy or money on its popularization. Dr. Hayes, however, lays stress on the moral effect produced.

Results.—A case has been noted in which a patient had pains in his joints for some time after inoculation. Mr. S. became subject to severe attacks of rheumatism, head-ache, nervous pains, etc., supervening on inoculation. This was six years ago and the symptoms still continue. [Dr. Oliver subsequently notes that the connection of these effects with inoculation cannot be considered certain.]

Inoculation of persons incubating for Plague.—Dr. Oliver considers that, if a man was inoculated, while incubating for plague, it would increase the severity of the attack. The analogy is with anti-typhoid inoculation and not with vaccination.

GROUP (A) (3).

Rats—are probably a source of spread of infection.

Methods of destruction.—Tar and sulphuric acid was used at Kadiri station (Cuddapah district) and the latest report is that the rats have disappeared. This method might result in the spread of infection, if the rats were infected, the result being not to kill them but to drive them away.

No rat-poisons have been tried, but Dr. Hayes has heard of the juice of the common milk-hedge (*Euphorbia*) as an efficacious poison for rats and can speak to this from experience.

Any means that might be employed to destroy rats during an epidemic might have the effect of spreading plague. It is suggested that a dead rat is particularly infective, as the bacilli may be expected, by analogy, to make their way to the outside of the dead rat, thereby spreading infection. Thus, an European in Bangalore contracted the disease through handling a dead squirrel: the infection may, in such a case, have found its way to the outside of the squirrel and thence to the patient's system, possibly through an invasion of the skin.

Other Animals.—Dr. Hayes has known an authentic case of a dog with plague—*vide* also the instance of the squirrel given above.

GROUP (A) (4).

Plague Hospitals—are unpopular amongst the people, like other hospitals. The relative popularity of such hospitals depends largely on the calibre of the native subordinates at the head of them.

Dr. McCauly Hayes attended a meeting at Kadiri, in which complaints were made to Mr. Coleridge, the Revenue Divisional officer, but the person who brought the complaints had to admit that there were no proofs of them. The impression left on the deponent's mind was that the complaints were groundless.

GROUP (B) (2).

The passport-system.—In so far as the passport-system succeeds in giving the authorities immediate intimation of each case of plague as it occurs, its continuance is desirable.

It is very doubtful whether any system of passporting is necessary, in the case of Europeans and Eurasians taking first-class ticket. Such persons always call in qualified doctors in case of sickness. [Dr. Oliver dissents—*vide* appendix VI (B).] Servants should, of course, continue to be passported.

To furnish every man with a certificate of identification from the head of his village might assist in identifying persons for the purposes of the system, but it would give considerable trouble and might lead to fraud and forgery. Thumb-marks would be a means of guarding against fraud.

Mr. McCloughin suggests that vigilance committees might be entrusted with the working of the passport-system in villages. He also suggests that the sending on of intimations by a telegraphic code (using the Government wires, when possible), instead of simply sending on the intimation forms (which may be delayed), would be a great improvement.

Conference at Salem (22nd July 1904).

R. B. CLEGG, Esq., I.C.S., Collector of Salem.

Captain W. H. TUCKER, I.M.S., District Medical and Sanitary Officer, Salem.

F. J. RICHARDS, Esq., I.C.S., late Special Plague Officer, Tiruppattūr and Hosūr.

M.R.Ry. T. N. RAMACHANDRA RAO Avargal, Tahsildar of Hosūr.

M.R.Ry. E. VENKATASUBBAYAR Avargal, late Tahsildar of Hosūr.

M.R.Ry. V. NILAKANTA MUDALIYAR Avargal, Vice-President of the Hosūr Taluk Board.

GROUP (A) (1).

Disinfectants.—For houses, perchloride of mercury, solution of 1 in 1,000. Cloths either boiled or steeped in perchloride for a considerable time. Valuable cloths simply exposed to the sun as a rule.

Unroofing.—When the houses have been actually infected and the roofs are thatched, they are completely taken off and burnt. In the case of other small houses (whether tiled or thatched), partial unroofing is resorted to.

Complete unroofing, beyond the cases to which the operation is now applied, would be impracticable. It would be unpopular and very expensive.

As regards partial unroofing, it secures a free current of air, though it does not do much in the way of disinfection. No compensation is given for partial unroofing.

Mr. Nilakanta Mudaliyar thinks that roofs are not a source of infection. The other gentlemen present observe that the roofs of the poorer class of houses are dirty and harbour rats, squirrels and vermin. The lofts, which are untouched by chemical disinfection, are also possibly infective, being plastered periodically with mud and cow-dung.

Difficulties of chemical disinfection.—Chemical disinfection is not complete, as it is now done. The floors of the ordinary type of hut are greasy and full of cracks and fissures and also full of organic matter, which would have the effect of weakening the action of the chemical applied to them. The grease, etc., prevents the chemical from properly permeating into the floor.

Further, chemical disinfection at the best of times requires constant supervision and it does not touch the roof or lofts of the houses (*vide* above).

Captain Tucker further notes that the effect of the perchloride might be to coagulate the albumen contained in a dirty floor and that this might occur in local areas containing germs. The germ would then be protected.

Burning Bratties—is practised at Matigiri in the Remount Dépôt. The best method of discovering the efficacy of the process would be by an experiment *in situ*.

The burning of bratties would be more popular than chemical disinfection. People in Mysore do it for themselves and their views have to some extent spread across the border to the adjoining tracts of the Salem district.

The Hindu gentlemen present consider that there would be great difficulty in most villages in getting a sufficient number of bratties to carry on the operation on a large scale, though they say that there is a large amount of the material available in Hosūr, etc. Carts would also be difficult to procure for its conveyance. Mr. Clegg considers it altogether impracticable to get bratties in sufficient quantities at short notice and observes that disinfection must be promptly carried out.

Bratties are at present used for burning corpses and for fuel and (occasionally) for disinfection.

Exposure of Grain, etc., to sunlight—is carried on as a part of ordinary disinfection. As regards shandies (markets), it would be impracticable to discover and desiccate all the grain coming from infected areas. Any steps in this direction would be equivalent to the stopping of the shandies themselves.

Grain containing dead rats would be infective. Whether it would otherwise be infective by reason of possible droppings of rats, etc., is more doubtful and raises the question of recrudescence.

Captain Tucker and Mr. Richards consider that gunny-bags are probably a serious source of infection and should be desiccated. In Vániyambádi, they used to be boiled. Mr. Clegg, however, thinks that to desiccate gunny-bags containing grain would be as impracticable as to desiccate grain.

Vániyambádi is considered to have been infected in 1902 by means of either grain or gunny-bags or rats contained therein.

The Disinfecting Staff.—All are agreed that the disinfecting staff requires supervision and only works well in the first few cases: they require to have some one standing over them.

Attitude of the people.—They think nothing of chemical disinfection and could not be trusted to do it for themselves. In Hosūr (being on the border of Mysore), they might be disposed to look upon the burning of bratties more favourably.

Recrudescence.—Captain Tucker observes that the experiments hitherto made on the subject suffer from the defect that they have not reproduced the natural conditions. *A priori* there is no reason why recrudescence should not occur in the case of cow-dung floors. Many other disease-germs are such as could recrudescence under favourable conditions.

A definite interval of nine months has been noticed between the infection and re-infection of certain towns. This suggests recrudescence, but the rule is not universal.

In Vellore, Captain Tucker noticed that the same quarters and even the same houses were re-infected in many cases year after year. Recrudescence is more likely in big towns than in villages.

Mr. Richards has never seen a case in which re-infection was not introduced by re-importation. He suggests that rats rather than recrudescence may be the cause of the subsequent spread of infection in this or that direction.

Captain Tucker observes that there is reason to suppose that the plague bacillus would not remain entirely on the surface of a floor.

Remarks.—The points just discussed and many others in connection with plague seem to need prolonged bacteriological research, if they are to be really settled.

Infectivity of patients.—Plague is not a highly infectious disease. In bubonic cases, the infection is practically localized in the bubo. Septicæmia only occurs at a very late stage of the disease and is generally fatal. In a case of recovery after septicæmia, the patient may remain for sometime mildly infectious, supposing that suctorial insects could transmit the bacillus.

The plague bacillus has been found in the body of the ordinary rat-flea by Captain Liston, I.M.S., of the Bombay Research Laboratory; a similar result was obtained in Hong-Kong.

Climatic conditions.—The spread of the disease does not seem to be favourably or unfavourably influenced to any noticeable extent by the climatic conditions of any given locality.

It tends in some parts of the country to recur in the cold weather. This may be due to the fact that, at that season, people sleep huddled up together in-doors and on the floor.

Sanitary conditions—*vide* above. People who live cleanly and sanitary lives are not likely to be attacked.

Sources of infection.—Infection generally comes from external sources. Captain Tucker noticed that, in Vellore, the cervical glands were much affected: this might perhaps be due in some cases to infection from the scalp (eczema), but it might also come from infection inside the mouth (tonsils).

Mr. Richards noticed that there was always an abrasion of the skin, in cases in which disinfecting coolies were attacked by plague, and he noticed that the position of the gland affected was always that which might have been expected, if the abrasion had been the source of infection.

Captain Tucker observes that it is possible for a well to spread an epidemic. In Ambūr (North Arcot district), infection was traced to wells adjoining a cess-pit, and plague broke out in an abdominal form, which was for some time mistaken for cholera. Mr. Clegg confirms this by a similar experience on his own part at Vániyambādi.

GROUP (A) (2).

Inoculation.—Mr. Nilakanta Mudaliyār and Mr. Venkatasubbaiyar have been inoculated, but not the other four gentlemen present. Three thousand people were inoculated at Matigiri last year and none of them got plague. It is observed, however, that these people are looked after very carefully and are in general not so liable to infection from outside as ordinary villagers.

Attitude of the people.—Captain Tucker thinks that something more might be done to encourage inoculation, but the native gentlemen present doubt whether a campaign in favour of inoculation would have any success. Mr. Clegg and Mr. Richards think that it might have a bad effect on ordinary plague administration.

Results.—Mr. Clegg observes that the operation must be performed by a good man. Mr. Nilakanta Mudaliyār is not in favour of the process, as it leaves the patient too weak. He remarks that he has known of a case of asthma having been cured by inoculation.

Inoculation of Contacts.—There is danger in this. It depends on whether the patient is or is not incubating for plague. If he is, the severity of the attack might well be increased by the inoculation. In the case of typhoid, the attack would be precipitated by the analogous process.

The great reason why people submit to inoculation is in order to escape from the passport-system. At the same time, it has to be observed that the inoculated person does not thereby cease to be possibly infectious to his neighbours by means of his cloths and baggage.

GROUP (A) (3).

Rats—are carriers of infection, even from one quarter of a village to another. This was found to be the case in Hosūr and Krishnagiri: they even carried the infection to the hamlets near Krishnagiri, a furlong or two off.

The gentlemen present, however, do not accept the account of the infection of Hosūr from Matigiri, given by Major French in the Trichinopoly Conference. They found the infection to have been brought by cloths in that case.

Other Animals.—Mr. Clegg has noticed that monkeys will emigrate from an infected locality and Captain Tucker has noticed the same thing in the case of squirrels.

Methods of destruction.—Tar and sulphuric acid mostly drive the rats away. Mr. Richards tried to draw a cordon across the town of Krishnagiri, by treating rat-holes with tar and sulphuric acid, and so drive the rats away from the uninfected quarters and out of the town, but the plan was unsuccessful.

Captain Tucker draws attention to Danysz's method of communicating a disease among rats and observes that it has been tried in France with satisfactory results.

All the gentlemen present, except Mr. Nilakanta Mudaliyār, agree that it would be a good thing to destroy rats, but Mr. Nilakanta Mudaliyār considers them useful as a warning. Mr. Richards remarks that rats breed so fast that they must be destroyed completely or not at all.

GROUP (A) (4).

Plague Hospitals—are very unpopular. This was partly due, in the opinion of Mr. Nilakanta Mudaliyār, to defects in management in Hosūr, as the people were not properly looked after and the medicines and treatment were not proper. People were also brought to the hospitals too late.

All are agreed that money should be spent more freely than at present, if matters are to be improved. Separate wards would enable the different castes to live separately, and this also would be advisable from a sanitary point of view. Better buildings of a more permanent nature are also advisable.

Mr. Nilakanta Mudaliyār, however, observes that, whatever is done, the necessary restrictions will always render the hospitals unpopular.

Private Hospitals—are not required by the people here. There are none in the district.

Private Practitioners—are a very ignorant class of people. Captain Tucker saw one practitioner cut open a bubo from a plague patient and wipe the knife on his cloth. A man like this would be capable of spreading plague to any extent.

All the Hindu gentlemen present would go to a qualified practitioner, if they had plague, but the ignorant classes have great faith in the native doctor.

GROUP (B) (1).

The Observation Staff.—Mr. Clegg considers that they work fairly satisfactorily as a whole: the native gentlemen present think that they get their information entirely from the munsif, but Mr. Clegg considers that they have other sources of information.

Captain Tucker, from his North Arcot experience, is disposed to consider the average man—not altogether satisfactory—as far as the work in rural area is concerned. He suggests the advisability of employing as many hospital assistants as is possible in each circle, who would be more skilled in diagnosis. The scheme as it stands at present requires improvement only in this matter of *personnel*. [Captain Tucker adds that this remark only applies to rural areas—emphatically not to municipalities, where they are most certainly of use.]

Mr. Richards thinks that all the work that they do in municipalities could be done equally well by peons. In rural tracts, he would greatly enlarge their jurisdiction. Mr. Nilakanta Mudaliyār thinks that very little of their work is done by personal enquiries.

Their Recruitment.—All the gentlemen present think that a permanent staff would be a great improvement on the staff in its present condition. Mr. Clegg and Mr. Richards remark that this is only practicable, if the permanent staff of the district is increased, and suggest the desirability of treating some of the plague appointments as permanent and pensionable. If this were done, vacancies caused by the appointment of permanent revenue subordinates on plague duty could be permanently filled up and this it might be possible to do.

A further means of popularizing the plague services would be, in the case of a man doing good work and being eventually given a permanent appointment, to treat his plague duty as permanent service for the purpose of a pension. The prospect of a pension is a great incentive to hard work and good conduct. The Tahsildars remark that their clerks would like such billets, if they were permanent.

Permanent appointments in the plague staff should be open to men of any department—Revenue, Police, Subordinate Medical Service and so forth.

Pay.—Rs. 45 or 50, including everything, would be a sufficient pay for circle inspectors in rural tracts, Rs. 25 or 35 in towns. This should include *everything* and should necessitate the keeping of a pony in rural tracts.

Training.—What is wanted is practical training, and this could be got in the district. Mr. Clegg observes that the method of training in the district would be the best, if a District Medical Officer had experience of plague and was a first-rate man; it would not answer with everybody. A month's training would suffice. It should be more or less on the lines now adopted

in Madras, but more practical. Some of the training should be in an infected village. A trained reserve of Revenue or other District Subordinate Officers is absolutely essential.

Captain Tucker lays emphasis on the necessity for giving the recruits a sounder knowledge of diagnosis than they now possess. At present, they cannot be trusted to diagnose with any approach to correctness any case of suspected plague they may come across.

Supervisors—might with advantage be called Plague Deputy Tahsildars. A pay of Rs. 125 (including all allowances) or a pay of Rs. 100 and travelling allowances is the least they can get, if a proper class of men is to be got.

Captain Tucker and Mr. Richards think them mere go-betweens under existing arrangements. They are in favour of limiting their number, not giving them any local jurisdiction and putting them as assistants to the plague officer, when there is one. Mr. Clegg does not agree with these suggestions and considers the existing system preferable.

Special Plague Officers.—Whenever there is a serious outbreak of plague, the presence of a Special Plague Officer is absolutely essential, and he should have a more limited jurisdiction. The frequency with which such officers are shifted and removed renders continuity and efficiency in plague policy very difficult to obtain. Efficient superior supervision is the essential thing.

Other suggestions.—The circle system is the only sound system for purposes of observation. Cordons have always been found a failure. But elasticity is requisite in matters of detail, and rules such as that relating to the 5 miles and 10 miles radii must be regarded merely as suggestions. The matter of making and unmaking circles again is one which may well be left to the discretion of the head of the district. Unless the Collector is allowed to act in these matters on his own discretion, the delay caused by intermediate references causes loss of money and impairs efficiency.

Rewards—would be of no use, in the case of native practitioners. They would lose their practice, if they reported cases of plague, nor are they a class to whom it would be any use to attempt to give instructions.

Rewards to private parties would serve no purpose but that of spite. Neighbours give information, as matters stand, especially where enmity exists.

GROUP (B) (2).

The passport-system—is not much use, as between village and village, but the system has to be looked at as a whole, and it would be difficult to separate off any particular area from the sphere of its operation. To treat a whole taluk as infected would be unjust to the uninfected villages and would increase the number of passports, rather than otherwise. Mr. Nilakanta Mudaliyar thinks the passport-system altogether useless. The other gentlemen present have no special improvements in the system to suggest.

GROUP (B) (3).

The Plague Police.—There have been no special complaints, so far as this district is concerned. They generally obey orders. The Tahsildar of Hosur remarks that they are largely made up of men, whose services in the regular force have been dispensed with.

The pay of the plague police should be the same as that of the regular force.

Conference at Kurnool (26th July 1904).

A. M. SLIGHT, Esq., I.C.S., District Judge of Kurnool (formerly District Magistrate, Bangalore).

R. RAMACHANDRA RAO, Esq., Collector of Kurnool.

J. T. EVERS, Esq., Assistant Surgeon in charge of the District Medical Office, Kurnool.

QADIR NAVAZ KHAN BAHADUR, Deputy Collector, Kurnool Division.

M.R.Ry. D. SULAAYAKAN PILLAI Avargal, Plague Supervisor, Pattikonda Taluk (Permanent Sanitary Inspector, Ootacamund).

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury, a solution of 1 in 500 or 1 in 1,000, according to the degree of dirtiness of the house. Mr. Slight had experience of phenyl and other disinfectants in Bangalore, but there also perchloride was finally adopted.

Cloths are ordinarily steeped in a solution of perchloride (1 in 500), the more valuable being exposed to the sun.

Unroofing—not practised in this district. Partial unroofing was practised in Bangalore. Neither Mr. Slight nor Mr. Evers believes in it.

All are agreed that complete unroofing on a large scale would be valuable, but is impracticable and far too costly. In the present type of houses, complete destruction is the most satisfactory treatment, compensation being awarded.

Difficulties of chemical disinfection.—Mr. Slight remarks that trained supervision is necessary. In Bangalore, Military officers were employed on this duty and one of them was asked by a member of a Plague Commission what he was using. He thought that it was perchloride of mercury, but the smell made it evident that it was something in the nature of phenyl. Mr. Evers also emphasizes the necessity for supervision.

In the poorer type of houses, it is very difficult to get the solution into the holes and crevices and the dirt would to some extent neutralise the action of the disinfectant. Under such conditions, the process can hardly be completely successful.

Further, chemical disinfection does not touch the roofs, which may be considered infective, inasmuch as they harbour rats and vermin. Mr. Evers remarks on the number of men employed in demolishing roofs in Bellary who, within his experience, developed pneumatic plague.

Burning Bratties.—Bratties are used for fuel and for disinfecting purposes. Their cost would be from Rs. 1½ to 2 per cart-load. People would probably prefer the use of bratties and understand it better than chemical disinfection. It would, however, be difficult to procure bratties in any quantity and the price would probably go up. It is difficult even now for the people to get enough for fuel.

Exposure of Grain to sunlight.—This is carried out as part of the ordinary process of disinfection, but no steps are taken to ascertain and deal with grain coming from infected areas.

Grain coming from infected areas and containing dead rats may be infectious, but cannot be considered so otherwise. It would be impossible to deal with the grain coming into shandies, but grain coming by railway comes on a large scale and might be disinfected.

Mr. Evers observes that Ootacamund is supposed to have been first infected by grain. The servant of a cartstand-keeper got the first case: there was, however, some suspicion that there was already plague in Ootacamund at the time.

Mr. Ramachandra Rao notes a case, in which some thieves, who had broken into a house and stolen some grain, developed plague. The grain was believed to have been the cause of the infection in this case.

The Deputy Collector notes a case in which a Komati carried some grain from Madhigiri (an infected village) to another village 2½ miles off. It was stored in a relation's house and rats died and plague finally developed in that house. Enquiries were made and grain was held to have been the cause of the infection.

The Disinfecting Staff—don't take much interest in their work, unless they are closely supervised. Even European supervision must be skilled as well as honest and energetic (*vide* above). The disinfecting staff tend to get lazy and indifferent and trust too much to their coolies.

They are required to get through a certain number of houses in a given time and this tends to make them careless.

Attitude of the people.—They don't object to chemical disinfection, if it is done with regard for their caste prejudices and with due respect to property. They don't object to their cook-rooms being treated, any more than the rest of the house.

Recrudescence.—Mr. Evers observes that, *a priori*, there seems to be nothing against the theory of recrudescence in an imperfectly disinfected house.

Mr. Ramachandra Rao observes that, of the 17 villages infected in this district in 1902-03, only one was re-infected in 1903-04, though 14 new villages were infected. This seems to be against the theory.

GROUP (A) (2).

Inoculation.—All the gentlemen present, except the Deputy Collector and the Supervisor, have been inoculated. All believe that the process confers a relative immunity, nor do they believe that, as a general rule, the effects are bad.

Mr. Evers inoculated about 1,000 people in Coimbatore, at the commencement of the epidemic. Certain schools were first inoculated, after which there was a general demand for inoculation. There has been no inoculation in the Kurnool district.

Attitude of the people.—An attempt to popularize inoculation would not be favourably received. The popular idea is that inoculation causes leprosy and impotence. The educated classes have heard of the disaster in the Punjab. Mr. Ramachandra Rao observes that, if ½ anna or 1 anna were charged for inoculating each case, it might make it more popular. People believe in what they have to pay for.

Inoculation of Contacts.—Out of the 1,000 people inoculated by Mr. Evers, 14 got plague within a few days and four of them died. The inoculation of contacts is to be deprecated. If they get plague, it may be put down to the process, which may really increase the severity of the attack, though Mr. Evers's figures, taken by themselves, would tend to show the contrary.

GROUP (A) (3).

Rats—are a source of infection. The Deputy Collector and the Supervisor have known rats travel about a mile between two villages and have seen them dead in open country remote from houses. It is believed that they would spread infection from one quarter of a village to another up to a distance of a mile or so.

Methods of destruction.—Mr. Slight observes that rewards were tried in Bangalore, but were found useless and given up. Mr. Evers remarks that tar and sulphuric acid drives away the rats, but only temporarily. He further remarks that the mixture, when used in the authorised proportions, dries up and hardens very quickly.

GROUP (A) (4).

Plague Hospitals.—Mr. Slight had large plague hospitals in Bangalore; they began by being very unpopular and continued more or less so all along. Mr. Evers's experience in Ootacamund was much the same, though the unpopularity was removed to some extent by better management.

One element of popularity is to put the hospital near the town. When it is a long way off, wild rumours begin to circulate.

Private Practitioners.—Mr. Evers remarks that the people should be given their option in the matter of treatment. If this is done, they first go to their own doctors and afterwards apply for European treatment. Mr. Slight and Mr. Rámachandra Rao observe that the difficulty is to get the native physicians to come to the patients.

None of the gentlemen present would trust native doctors, nor would any of the Hindu gentlemen present call them in if they were attacked with plague.

Mr. Qadir Navaz would take no treatment, native or European, if he were attacked with plague.

GROUP (B) (1).

The Observation Staff—are not, on the whole, a satisfactory body of men. They are inefficient, indifferent and often corrupt. [A list of 11 men punished out of the 34 men employed is printed in Appendix VII.]

Recruitment.—This is the effect of their being outsiders, not knowing the district and having nothing to fear from public opinion. It would be a great improvement, if they could be procured locally and could be recruited from the ranks of the subordinates in permanent employment.

Training.—Such training as they require could be given them by the District Medical Officer. It would be of a practical nature and would be a saving in the matter of travelling allowance.

Pay.—For Rs. 50, including everything, we could, in the manner suggested above, get a better class of men than we get now. A schoolmaster in the employment of the Kurnool Taluk Board got admitted to the Madras class and was appointed on Rs. 70, first in the Salem district and then in Kurnool, where he made a good deal of money in addition to his salary.

Control.—A man is turned out in one district and then sent for employment in another district. This is a very bad system. Collectors have now arranged amongst themselves not to employ such people, but they still manage to elude the local authorities sometimes.

The Collector's orders should be final in this matter, subject, if necessary, to an appeal to Government through the Sanitary Commissioner on professional matters. Professional questions, however, very seldom arise or can arise.

Supervisors—might with advantage be called Plague Deputy Tahsildars or Special Deputy Tahsildars. This would have a certain effect on the people.

Special Plague Officers.—The Collector observes that the appointment of a special plague officer is very necessary, when an epidemic breaks out. It is only in this way that evacuation and the other necessary remedial measures can be promptly applied. [The Collector wishes to add that, if a proper officer be chosen, the system would tend to economy in the long run. Prompt evacuation means an immediate subsidence of the plague; late evacuation scatters the men and other villages get infected, eventually entailing a good deal of expenditure; for prompt evacuation we want a superior officer.]

Corpse Inspection.—Endeavours are made to see all dead bodies in cases in which the circumstances surrounding the death are suspicious.

Mr. Slight observes that this measure was very unpopular in Bangalore. The other gentlemen present observe that, so far as this district is concerned, the people will call the authorities in to see the corpse, for fear of the case being treated as one of plague. This acts as a sufficient deterrent without prosecutions. Of course, if people can dispose of the corpse secretly, so as to avoid inspection and everything else, they would like to do so: this is not very difficult to do.

GROUP (B) (2).

The passport-system.—The Collector, Deputy Collector and Supervisor think that cases of false personations are very rare in this district, but Mr. Evers does not agree with this view.

As regards taking thumb-impressions, it is observed that it would be difficult in practice to detect false personations in this way, except by an elaborate system of registration:

GROUP (B) (3).

The Plague Police—are mostly bandy-drivers and the like. Coming without money and having to wait till the end of the month for their pay, they naturally fleece the people. Talayaris would do better.

If a certain proportion of them were permanent men, it would be an improvement.

The Collector comments on their ignorance, giving, as an instance, the case of certain constables who came from Pattikonda without passports, thereby violating the plague rules.

Conference at Anantapur (1st August 1904).

E. SCOTT, Esq., I.C.S., Collector of Anantapur.

E. P. WALSH, Esq., I.C.S., Head Assistant Collector, Penukonda.

M.R.Ry. M. NÁRÁYANASÁMI PILLAI Avargal, Head-quarters Deputy Collector.

M.R.Ry. P. ADIMÚRTHI RAO Avargal, First-grade Pleader and Chairman of the Anantapur Municipality.

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury, a solution of 1 in 1,000 ordinarily. Clothes soaked in the same solution. Valuable cloths simply exposed to the sun.

Mr. Scott is inclined to believe, after experiment, that, in exceptional cases, hydrocarbon would be of use. A thermometer was hung on the wall of the hut during the experiment and when examined later was found to register 150° F. It would probably have registered a higher temperature, while the process was going on. The experiment is of too dangerous a character to make it possible without careful supervision.

[Note by Mr. Scott.—The Agent, Madras Railway, could supply 300 gallons per month, at 2 annas a gallon, delivered at the Gas House, Central Station, Madras. Landed at Guntakal, it would probably cost 6 to 8 annas a gallon.]

Unroofing.—Partial unroofing has been adopted, in the case of houses with thatched and mud roofs. No compensation was given. It is observed that partial unroofing has the effect of ventilation and would lower the temperature of the interior of the hut thus opened out—at least this would be the effect for the greater part of the day.

Mr. Walsh has had experience of complete unroofing in the Hosúr division of the Salem district. He regards complete unroofing as the only useful method. No compensation was given in the case of tiled roofs. He notes that there was a frightful mortality among the coolies who took part in the unroofing of tiled houses. They cut their hands with the tiles and subsequently contracted plague, probably through the cuts caused in this way.

Difficulties of chemical disinfection.—Judging by results, it is considered that chemical disinfection has done a lot of good. It is noted, however, that it leaves the roofs untouched and roofs are possible sources of infection through the medium of rats, etc. Rats, mice and squirrels live in the roofs of the houses in this district.

Mr. Walsh doubts whether mud huts can be said to be disinfected at all by the use of chemicals. All are agreed that the irregularities in the surface of the floor and walls make it impossible to disinfect such houses thoroughly and that good results cannot be obtained without an amount of supervision over the subordinate staff which it is found impossible to give in practice.

It is further observed that any form of disinfection, which does not kill rats, etc., tends to drive them away and thus spread plague.

Exposure of Grain to the Sun.—There are many underground granaries in this district. They may be a source of infection, owing to dead rats, excreta, etc. No case can, however, be recalled, in which the infection of a village was traced satisfactorily to grain. It is further observed that, if this were a common or likely source of infection, Madras would certainly have been infected from Bombay.

Grain is exposed to the sun as part of the ordinary process of disinfection, but no attempt is made at present to trace out and disinfect grain coming from infected sources, whether by road or railway. It would be very difficult to carry out any such operation in regard to shandies.

As matters stand, the local authorities close markets in or about centres of infection. It is believed that this measure does some good.

The Disinfecting Staff—don't work satisfactorily; their work, as a class, is not thorough, though there are exceptions. In Kalyandrug, Hindupur, etc., it was found that rubbish and cloths were left in the house, during and after the process of disinfection of the house, thereby rendering the disinfection useless. The Head-quarters Deputy Collector believes, as the result of definite instances that have come under his notice, that the staff sometimes intentionally do their work badly, as the cessation of plague would mean loss of employment to them.

Attitude of the people.—They don't ordinarily believe in chemical disinfection, but they submit to it. The more educated classes are beginning to believe in it. They will sometimes ask for chemicals for disinfecting purposes of their own accord.

Burning Bratties.—The Head-quarters Deputy Collector has done this in the case of about 200 houses in the division under the advice of Dr. Chalke, the late District Medical Officer. The bratties were spread two or three deep all over the floor and the doors, etc., shut up. It is believed that in most cases the house operated on could be and was rendered air-proof. The bratties were not heaped up at all. No thermometer was used. The house was shut up for about three hours. The Deputy Collector cannot say whether the roof was affected, but does not think that vermin were destroyed.

The process would probably be popular and would be better understood than the present system. People even now use bratties in their houses, with a view of smoking out mosquitoes, etc.

There would be difficulty in getting bratties in the large villages, but not in the small villages. In many cases, the people might be induced to supply the bratties themselves. They did so, as regards all the villages described above.

The disinfecting staff would require a great deal of supervision to induce them to do the work properly. It is rather a lengthy and troublesome process and the disinfectors would have to use vigilance in order to see that the bratties were not stolen but used for disinfection. The Chairman notes that the process should be confined to mud floors, as it would split the Cuddapah slabs, in houses in which slabs were used for the flooring.

Recrudescence, etc.—All the gentlemen present think it probable that the germs may lie dormant and re-appear after an interval of some months. Mr. Scott notes that the recurrence of plague in the same or adjoining villages in successive years is a marked feature of this district and favours the theory of recrudescence: Mr. Walsh has not noticed this feature to the same extent in his division.

The Head-Quarters Deputy Collector favours the theory and thinks that a disturbance of infected articles may cause the germs to recrudescence. The people of Kalyandrug, on the recurrence of plague, moved over to Gopalaballi and remained there more than three months. There was no plague there. Then they moved back into Kalyandrug. Plague thereupon broke out in Gopalaballi. There was, so far as the deponent knows, no re-importation of plague from outside to account for this.

Another instance is that some of the people of Uravakonda, on plague breaking out in their quarters, moved over to a temple 7 miles off. They remained there five months. Then one of the men returned to Uravakonda. Plague thereupon broke out in the temple. The deponent is sure that there was no fresh importation of plague from the outside in this case. He believes that in both cases the disturbance of articles preparatory to departure caused the disease to recrudescence.

GROUP (A) (2).

Inoculation.—The Municipal Chairman was inoculated in 1898. None of the other gentlemen present have been inoculated. Mr. Scott is not strongly in favour of inoculation, but has no objection to inoculation provided it is made *compulsory*. [Mr. Scott adds in a demi-official letter:—"If it is desirable on medical grounds that individuals should be inoculated, so 'advisable that Government becomes anxious that as many should be inoculated as possible, then it should be compulsory. Otherwise it should not be introduced at all. The inoculation of 5, 10 or 15 per month is useless and merely means much expenditure with no result. District officers have no time to waste in encouraging people to get inoculated, and, with the 'ideas the people have in regard to inoculation, it is hopeless to expect any results from mere 'encouragement'".] Mr. Walsh does not think it necessary for Europeans. Neither of the Hindu gentlemen present would be inoculated willingly.

Popular opinion.—There has been no inoculation in the district since 1898. In that year, Mr. Macleod made strenuous efforts to promote it, but no enthusiasm was aroused. Some 60 or 70 people were inoculated.

Popular opinion is that the protection is not sufficient and that the process causes general debility. The Hindu gentlemen present cannot give any specific opinion on the point, but they are inclined to share this opinion, which is held generally, even by educated Hindus.

All the educated members of the community know of the recent accident in the Punjab, and the people would get to hear of it, if a campaign were started in favour of inoculation. No such action is recommended.

GROUP (A) (3).

Rats—are a source of infection and might spread plague from one quarter of a village to another. Rats came from Janatanahalli (an infected village) to the plague-camp one or two furlongs off. A house-rat was found dead in the camp. Disinfection was at once resorted to, but plague broke out in the camp a few days later. It looked as if the rats were the cause of this.

Mr. Walsh came across a dead rat in the compound of the Sub-Collector's bungalow at Hosúr, half a mile away from the nearest village infected at the time. It would be desirable to destroy rats during the process of disinfection and still more so as a precautionary measure

(before plague broke out at all) in localities threatened with plague. Any method for their destruction would be welcome. The Deputy Collector believes in traps.

Attitude of the people.—The people know that dead rats are a symptom of a coming epidemic or at any rate that they imply disinfection. They don't realize how infectious they are: they will handle dead rats. They frequently quit their villages, when rats die in their houses.

It is doubtful whether people would welcome the destruction of rats as the removal of a source of infection or whether they would prefer that they should remain as an useful means of warning. In any case, they would offer no resistance to any measures on the part of Government for the destruction of rats. In an ordinary way, they trap and kill rats themselves and some of them keep cats for the same purpose.

Other Animals.—Three cats have died in the town, since the outbreak of the present epidemic. One was in the Municipal Manager's house and another was in the house of one of the Collector's clerks. They were not carefully examined, but the bodies were at once removed and burnt.

GROUP (A) (4).

Plague Hospitals.—There are none in this district. Mr. Walsh states that they were unpopular at Hosúr, owing to no special causes, except the general objections to isolation and restriction. People raised no special complaints, once they were in them.

GROUP (B) (1).

The Observation Staff.—Mr. Walsh considers that they sometimes detect cases, apart from the village officers. The other gentlemen present consider that they rely entirely on the village officers for information. Mr. Scott observes that they frequently report cases as plague, when they are not really so: it is noted, however, that they cannot be expected to diagnose in the same way as hospital assistants.

Many of them do their work efficiently and conscientiously. As regards the remainder, vague charges of dishonesty are often made, but they have not been substantiated. The Chairman uses men of his own staff for observation purposes and finds that they do their work well.

Recruitment.—Hospital assistants would be cheaper and more reliable and would be better suited to the work of an observation staff. There are great advantages in having men with a permanent appointment, as one has a hold on them and they have something to lose.

One or two permanent clerks are now employed on this duty. It is not easy to fill up such vacancies in this district. If the whole or a part of the plague staff formed a permanent department, such vacancies would be easier to fill up.

At present, many of the staff are men who have failed in other departments. Mr. Scott knows of a case in which an applicant for a peon's place was given the post of temporary sanitary inspector.

Training.—All the gentlemen present think that the staff could be trained locally in such a way as to make them perform their duties efficiently. They should have seen and dealt with at least one case of plague practically as a part of their training. It would be a good thing to have some of the permanent subordinates trained locally, apart from the immediate demand for their services, in order to constitute a trained reserve.

Pay.—Mr. Scott and Mr. Walsh think that 60 rupees, including everything, would be the lowest pay on which efficient men could be obtained. They should be required to keep a pony for this. It should be understood that, on reversion to the ordinary line, they would not necessarily have a claim to an equally highly paid appointment. The Deputy Collector thinks Rs. 35, plus 10 or 15 rupees as pony allowance, would be enough.

GROUP (B) (2).

The passport-system.—The delay in notifying infected villages makes it necessary to act illegally, if the notification is to do any good. If the local officer waits for the publication of the notice, the villagers will by that time have decamped without passports and will be able to spread infection unobserved. A notification published (by beat of tom-tom or otherwise) in the village should be sufficient publication and all unnecessary formalities, which tend to cause delay, should be dispensed with. The passport-system in itself is considered by all the gentlemen present to be a good system.

Mr. Scott observes that the penalties for any breach of the passport rules should be very heavy and that there should be a minimum penalty.

Mr. Walsh suggests that it would be a great improvement, if the kurnam were authorised to sign passports in the absence of the reddi (munsif). At present, when the reddi is absent from the village on Government business for several days together, there is no one to examine the passportes, unless they follow the reddi all over the taluk.

The Chairman observes that there have been instances in which the examining officer (hospital assistant) has been unable to perform his duties efficiently, especially when it involved the examination of sick women. He suggests that the sanitary staff should also be empowered

to examine passportees. Mr. Scott considers that the sanitary staff could not safely be entrusted with this duty and that, if the hospital assistant is overworked, the only remedy is to give him an assistant.

[I may note, in this connection, that I examined the Anantapur passport-examining work in company with Mr. Scott this morning (2nd August 1904). There is at present no check on the statements of those who say they are going to other places. Their statements might with advantage be checked by the observation staff, information being sent of such cases, just as is now done in the case of defaulters. The work of checking defaulters is carried out under the supervision of the Chairman. It was not possible to check it minutely, as the Municipal office was being examined by the Examiner of Local Fund Accounts, but, from the papers available, it would appear that the checking work is done promptly. The information as to defaulters is now being sent in yardast form. If a daily list of defaulters were sent in the usual printed form, it would lighten and systematize the work. It would also facilitate check, especially if the submission of a *daily* list (or *nil* statement, if there were no defaulters) were insisted on. The passportees who announced an intention of changing their residence could, as explained above, be included in this list, which, in these circumstances, would seldom be a blank one. These matters are engaging Mr. Scott's attention.]

GROUP (B) (3).

The Plague Police—have been very unsatisfactory. They constantly absent themselves without leave and are under no proper control. Mr. Scott has, however, drawn up rules in regard to their duties and discipline, which, it is hoped, will have satisfactory results.

They are the lowest members of the literate class. Two of them have been convicted for house-breaking. There have been cases of the plague police examining passports illegally, and the permanent police have been guilty of the same practice. The object of such illegal actions is presumably a corrupt one.

Conference at Guntakal (3rd August 1904).

M.R.Ry. D. S. AMIRTASWAMI PILLAI Avargal, Assistant Surgeon in charge of the Anantapur District Medical Officer's office.

Miss F. C. SEQUIRA, Nurse on Plague duty, Guntakal Railway Station.

Mr. J. F. GIBSON, Assistant Surgeon in charge of the Guntakal Inspection Station, Guntakal.

M.R.Ry. A. S. PONNUSWAMI AIYAR Avargal, Tahsildar of Gooty.

M.R.Ry. J. JAGANNAYAKULU NAYUDU Avargal, Tahsildar of Hindupur.

M.R.Ry. V. CHENNAPATI RAO NAYUDU, Deputy Tahsildar of Uravakonda.

M.R.Ry. M. CHENGAL RAO Avargal, First-grade Pleader and Chairman of the Gooty Union.

M.R.Ry. K. SABAPATI Avargal, Merchant and Chairman of the Uravakonda Union Panchayet.

GROUP (A) (1).

Disinfectants used.—Perchloride of mercury, solution of 1 in 1,000 for cement floors and 1 in 500 for earth floors. The District Medical Officer has had experience of the use of dilute sulphuric acid (a solution of 1 in 50) in Guntur (Kistna district) and thinks it preferable to perchloride for treating cess-pools and more economical. He proposes to introduce it in the Anantapur district. He is not aware of the results of any laboratory experiments in regard to it.

Carbolic lotion is used even now for disinfecting the person—a strength of 1 in 100. Ordinary cloths are steeped in a solution of perchloride (1 in 1,000): valuable cloths are simply exposed to the sun.

Unroofing—has not been practised in this district. The District Medical Officer has had experience of partial unroofing in Kollegal taluk (Coimbatore district). Partial unroofing is considered good, on account of the ventilation afforded. It does not greatly affect the rats, vermin, etc., with which roofs in this district are infested.

Unroofing, whether complete or partial, would be very unpopular in this district, and compensation would have to be given, even in the case of houses only partially unroofed. A rupee for each house, of which a square yard was taken away, would be sufficient.

In the case of tiled roofs, no compensation is called for, but there are hardly any roofs of that description in this district.

Difficulties of chemical disinfection.—It is difficult to carry this process out satisfactorily, in the case of the poorer type of huts, and the dirt tends to neutralize and weaken the disinfecting solution. Moreover, the process does not touch the roofs, which are considered to be a possible source of infection (*vide* above).

Burning Bratties.—The Tahsildars of Gooty and Hindupur and the Deputy Tahsildar of Uravakonda have taken part in experiments of this description. The bratties were not heaped,

but spread 2 or 3 deep all over the floor. They would not burn without considerable difficulty and kerosine-oil had to be continually added. It was July and there had been rains recently, but the bratties are believed to have been fairly dry. The experiment lasted half a day, the actual time taken in burning the bratties being two hours. It was necessary to be continually going in and out to attend to the bratties, and this would keep the temperature down. No thermometer was used. Great care had to be taken to keep the posts of the walls from being burnt. The Collector, Mr. Aziz-ud-din Sahib and the District Medical Officer, Mr. Chalke, were present. Straw was mixed with the bratties in some cases. The discontinuance of the process was recommended as a result of these experiments, and Mr. Chalke ordered accordingly. It was he who had originally directed the experiments.

The owners supplied the bratties themselves. They could only be induced to do so with great difficulty. They disliked the process and would have preferred the ordinary chemical disinfection. The Gooty Tahsildar does not think that the process could ever be made popular in this district. It was calculated that it would cost 1½ rupees to disinfect an area of 20 feet by 20 feet.

Exposure of Grain to the Sun—is practised here as an ordinary part of the process of disinfection. In a general way, no attempt is made to find out grain coming from infected areas to the local shandies and to treat it by exposure to the sun, but, in Hindupur, all grain coming from Mysore and other infected areas, whether it came by road or by railway, was dealt with by the authorities, the sacks (not the grain) being exposed to the sun. It is agreed that this amount of disinfection would not be complete. It is believed, however, that it was of some use and helped to keep plague out of Hindupur till December, various villages in the taluk having been infected from September onwards. No difficulty was experienced in carrying out the measures, but it gave a good deal of trouble to the local merchants. The Tahsildar of Hindupur thinks that the measure might be practicable elsewhere in the district, if it were confined to disinfecting the gunny bags.

Infection from Grain.—The Tahsildar of Gooty observes that the infection in Uravakonda was believed to have been started by grain, inasmuch as it broke out in the bazaar shops and no other source of infection could be traced, in spite of all possible enquiries being made. The infection was reported at the time as being due to grain.

Dr. Gibson has heard of many cases in which infection was found to have originated in railway goods sheds, though no instance has ever come under his personal observation. The Tahsildar of Gooty notes, from his own personal experience, that many persons who measured out the grain got plague and died of plague. This was in Uravakonda.

The District Medical Officer recalls a case which occurred in a Mussalman shop in the Kollegal taluk. Potatoes were kept on a tray in the shop. One morning, about half-a-dozen dead rats were found on the tray. There were two boys looking after the shop. One of them, a Hindu, refused to touch the rats and left the shop. The other, a Mussalman boy, remained and removed the rats. The Hindu boy escaped, but the Mussalman boy caught the disease and died.

The Disinfecting Staff—want a good deal of supervision. They understand their work well enough, but they are lazy and easily won over by the people. They do not do their work properly. In Hindupur, it is said that there was a recognised list of prices—ranging from 1 to 5 rupees—for not disinfecting houses. The District Medical Officer has heard of this rumour and the Tahsildar of Hindupur thought it of sufficient importance to report on it.

Attitude of the people.—Most educated people (merchants and brahmans) believe in the process, but not the lower classes. Even the educated classes only want the solution *sprinkled* and don't like its being *thoroughly* done.

Their great objection is to the sanitary staff coming into their houses and disarranging their things. They don't know what a Sanitary Inspector will do and are afraid of their things being damaged. They would much prefer being allowed to disinfect by means of their own men. They don't like people of a lower caste than themselves entering their "god's" room.

In spite of all this, the people have never offered any active resistance to disinfection. Their attitude has always been one of submission.

Recrudescence.—The Tahsildar of Gooty does not believe that there are any cases of re-infection without re-importation. He suggests, as an argument against recrudescence, the fact that, though disinfection is admittedly incomplete, so many villages escape re-infection for many years. Hindupur village remained uninfected for five years after the first plague epidemic.

The District Medical Officer instances Gooty as a case in which recrudescence was the probable source of re-infection, there being no history of importation. He observes that there is no *a priori* reason why the plague bacillus should not flourish for a long time in the conditions obtaining on the floor of an ordinary native hut.

GROUP (A) (2).

Inoculation—was practised in this district in 1898, when Mr. Macleod was Collector and Mr. Chalke, District Medical Officer. The Tahsildar of Gooty (then Tahsildar of Anantapur)

used to procure subjects. None of the eight deponents present have been inoculated, except the District Medical Officer and the Tahsildar of Gooty.

Attitude of the people.—It was hard work to induce the people to be inoculated. They have never liked the process. Some 200 or 300 were inoculated on that occasion and there has been no inoculation since then. None of those present, except the Tahsildar of Gooty, think that a campaign in favour of inoculation would meet with any success.

Very few people know of the recent distster in the Punjab, but there are vague rumours among the people tending to discredit the process. They say that it shortens life and causes impotence.

Two relations of the Gooty Chairman were attacked with plague, 1½ months after being inoculated. One of them died and the other recovered. These facts and what he has heard otherwise have led this gentleman to regard the process with disfavour.

Inoculation of Contacts.—The District Medical Officer considers that, even in the case of a person incubating for plague, inoculation would have the effect of rendering the attack less severe.

GROUP (A) (3).

Rats—are an undoubted source of infection, even from one village to another. Puliki, a village in this district, was surrounded by infected villages, though it escaped itself. A dead rat was found in the village. The people immediately left the village and the usual remedial measures were adopted, with the result that the people escaped from the disease. In this case, it is to be presumed that the rat must have become infected from one of the surrounding villages. Another village, Malapuram, offers an exactly similar instance.

It has been noticed this year that the town rats have emigrated from infected villages to the fields, causing immense damage to the cotton crops. These rats could easily spread the infection amongst the field rats.

[In this connection, I have included in Appendix VII a copy of a report of the Tahsildar of Gooty, written early last March and giving an account of the suspicious circumstances attending the death of some rats in Gooty town. The epidemic did not break out in the town, until more than four months later.]

Methods of destruction.—There has been no systematic attempt made in this direction. People in Hindupur town keep rat-traps pretty generally and are encouraged to do so. Tar and sulphuric acid is useful for driving away rats. If used generally at the time of an epidemic, it might have the effect of spreading plague.

A campaign against rats would be an excellent thing, but it should be carried out in the off-season, rather than in the plague season, for fear of the rats scattering and spreading the disease.

People keep cats a great deal all over the district, in order to kill the rats.

Attitude of the people.—Even the most ignorant classes know by this time that rats spread infection. Not only the people in whose houses the rats fall but also people 10 doors off will desert their houses. Anantapur town is a case in point. They do not inform the authorities that rats have been found, but run away stealthily, leaving their houses and shops locked up.

The people as a whole would approve of a campaign for the extermination of rats, but they hold the cat sacred and would object to its being killed.

Other Animals.—The District Medical Officer and the Gooty Tahsildar know of authentic instances of cats having died of plague. Instance of monkeys and squirrels having been similarly affected have come to light. The monkeys wander about from village to village and enter houses; they are a regular nuisance. It is observed that instances of their getting plague are by no means common, which seems to show that they cannot be very susceptible to the disease.

GROUP (A) (4).

Plague Hospitals.—There are plague hospitals at Gooty and Anantapur. [Mr. Scott observes that they cannot be considered to be plague hospitals, properly speaking: they are simply isolated huts.] They are very unpopular. The people, whether educated or uneducated, object to being isolated and not being allowed to treat themselves.

The District Medical Officer thinks it best that they should be given the option of calling in their own doctors; in practice, the private doctors generally neglect them and they have either to treat themselves or call in the Government doctor.

It is observed that the same shed should never be used for a succession of fatal cases. People strongly object to being put into sheds in which other people have died. The cement flooring, when there is one (it is not usual in this district), may be disinfected and retained, but the material of the hut should be burnt.

Patients don't like staying in the hospital for one month after convalescence and it is difficult to keep them isolated all that time. The District Medical Officer, however, considers that they should be detained for the prescribed period, as they may continue to be infectious.

by means of their excretions, blood, etc. Mr. Gibson suggests that this might be determined by microscopic experiment. The District Medical Officer observes that the people would never allow any such experiment to be made on them.

Private Practitioners.—are not a good class of people. They are mostly quacks. The Uravakonda Chairman would call in a private doctor, if he were attacked with plague, as private doctors are sympathetic, whereas Government doctors would at once enforce the Plague Regulations. The other gentlemen present would employ a Government doctor if they were attacked with plague. The people have great confidence in their native doctors. There are no private practitioners in this district. They are not wanted. The system of Government hospitals is worked very loosely in Gooty town and practically amounts to nothing more than ordinary evacuation. Home segregation would be even more popular.

GROUP (B) (1).

The Observation Staff.—They require the help of the Village officers for the detection of cases. Even in big towns, they rely mostly on the village service. Even so, most of the cases in the present epidemic only came to light after the death of the patient. This is because the Circle Inspectors are new to the place and the people. Local people would be able to get information better.

A Sanitary Inspector was prosecuted last year for extortion, on enquiries made by the Tahsildar of Gooty. The evidence was that he obtained money by threats. He got off, owing to the complainant (a female) withdrawing from the case. Both the Chairmen present have heard rumours of dishonesty and bribe-taking. Such cases are difficult to substantiate and people are afraid to come forward and substantiate their complaints. The Inspectors have to be punished for inefficiency, not dishonesty.

Their Pay, Recruitment, etc.—Fifty or fifty-five rupees ought to be enough for their pay and allowance, all told. Permanent Government servants would be more satisfactory than outsiders, as they would have something to lose and would have some fear. Even a clerk on 15 rupees, deputed to the work, would do better than the present staff. Hospital assistants would do better for disinfection work. The District Medical Officer, however, remarks that there would be difficulty in finding enough of them for the work.

Rewards.—Private Practitioners are not a class who could be of any use to the authorities (*vide* above), nor would a system of rewards make them useful. They would be boycotted if they give any information to the authorities. They always interpret a case of plague as something else, while the patient is sick. When he has recovered, they are quite ready to claim it as a successfully-treated plague case.

Examination of dead bodies.—This is resorted to in cases in which any suspicion is entertained as regards the cause of death. The authorities have, as a rule, met with no opposition in carrying out this measure. If the people don't consent, they know that the case will be liable to be treated as one of plague, and this is found to be a sufficient inducement.

In the case of one Muhammadan, who refused to allow the dead body of a female to be examined, the case was dealt with as if the case had been one of plague. Even with this fear before them, the Musalman community would never consent to their females being examined by any male, even a Medical Officer. They would have no objection to a female examining the corpse.

GROUP (B) (2).

The passport-system.—There is no difficulty in getting correct addresses in villages, but in towns, people give wrong addresses and it is very difficult to find this out. The Hindupur Tahsildar suggests that they should be required to produce a surety for the correctness of the address given. The Gooty Chairman remarks that this would be a source of annoyance and the District Medical Officer observes that it might lead to fresh malpractices.

The Gooty Chairman suggests that the reddis might be allowed to sign passports in towns as well as villages, as people have to put up with great annoyances, being detained at the hospital for two or three hours together. The District Medical Officer does not consider that reddis could safely be entrusted with this power and thinks that the proper remedy is to give the hospital assistant some help when he is overworked.

The Gooty Chairman considers that, though the objects of the passport-system are desirable and though it is necessary that arrivals from infected areas should be known and under some sort of surveillance, yet the passport-system entails an unnecessary degree of annoyance to individuals. The other gentlemen consider the system, taken as a whole, a good system.

GROUP (B) (3).

The Plague Police—are a very bad set of people, worse than the Inspectors. They allow the people they are guarding to commit illegal acts, if they are given a small consideration. They come from a low class of the people.

A small rise in their pay would be useless. The regular police are not much better than these are. The talayaris would do the work much better than the police.

The Tahsildar of Gooty, however, recalls a recent case in which a reddi and talayari were convicted of theft, though they got off on a technical point on appeal.

Conference at Ootacamund (10th August 1904).

C. M. MULLALY, Esq., C.S., Collector of the Nilgiris.
Major F. J. CRAWFORD, I.M.S., Civil Surgeon, Ootacamund.
Captain P. C. GABBETT, I.M.S., District Medical Officer, the Nilgiris.
E. F. HANDCOCK, Esq., Chairman of the Ootacamund Municipal Council.
G. H. COLEMAN, Esq., Chairman of the Coonoor Municipal Council.
C. T. SALDANHA, Esq., Special Plague Officer, Ootacamund town.
The Reverend FATHER BIOLLY.
M.R.Ry. A. N. VENKATARAMANAIYAR Avargal, Deputy Tahsildar, Ootacamund taluk.
M.R.Ry. V. K. KRISHNAIYAR Avargal, Deputy Tahsildar, Coonoor taluk.
M.R.Ry. M. R. BALASUBRAHMANYA AIYAR Avargal, Supervisor, Ootacamund taluk.
M.R.Ry. T. DHARMALINGAM PILLAI Avargal, Supervisor, Coonoor taluk.

GROUP (A) (1).

Disinfectants.—For houses, a solution of perchloride of mercury, 1 in 1000. Cloths in Ootacamund town are steeped in a solution of carbolic acid (1 in 50) or perchloride (1 in 1,000). In Coonoor, cloths are usually treated with boiling water, and people in general prefer this. One method is as good as the other. Valuable cloths are simply exposed to the sun.

A big steam disinfecter was in use in Ootacamund town (cost £500). The great objection to its general use in the district is that it is not portable.

A smaller portable disinfecter would be invaluable for use on the hills—much on the principles of the disinfecter used at Naples. It is believed that one could be obtained at a cost of about Rs. 3,300.

The damp on the hills renders this a particularly suitable form of disinfection. Badagas frequently have only one cloth, and the steaming process would restore it to them fit for use after the operation.

Unroofing.—Mr. Mullaly had a good deal of complete unroofing done in the Gudalur division, e.g., in the case of thatched houses and grain godowns. Captain Gabbett has gone on the principles of unroofing houses where there was evidence of rat-infection. In connection with the recent case at Ilitorai, Rs. 250 has been spent for work done in the way of removing tiles. In Ootacamund taluk, holes have been made in the walls of Badagas' huts to let in ventilation, but complete unroofing has not been resorted to.

All are agreed that complete unroofing is advisable, where there is evidence of rat-infection. Compensation is necessary and in the case of the very poor it has usually been given. Mr. Mullaly considers unroofing impracticable in the case of pukka houses. Captain Gabbett does not consider partial unroofing of much use in any circumstances.

The Coonoor Supervisor remarks that 10 dead rats were discovered by means of the unroofing operations in Ilitorai.

Digging up floors.—Mr. Mullaly observes that a very large number of dead rats were unearthed, when digging up floors in Gudalur, Ootacamund, Coonoor, Kotagiri, Karteri, etc. In such cases, the excavated mud is burnt and the remainder of the floor treated with perchloride and tamped in again.

The process is efficacious, but involves a great deal of trouble: the whole floor has sometimes to be dug up and the rat-holes may even extend into adjoining houses. Houses with cement floors cannot be treated in this way unless the owner consents.

Burning Bratties, Straw, etc.—None of the gentlemen present have had any experience of burning bratties. It is observed that it would be very difficult to get bratties for the operation. Bratties are used as manure on the various estates and are too valuable to be burnt. The Badagas use wood for the purpose of fuel, not bratties.

Burning straw was tried at one time in Ootacamund, but was given up, being found useless.

Treatment of Grain.—In Ootacamund town, grain, which is suspected to come from infected areas—that is to say, at present, practically all grain—is exposed to the sun. There are open sheds set apart for the purpose: by exception, rice is not exposed. Great inconvenience is experienced by the people, who complain that the grain is spoilt.

Mr. Saldanha has never found a dead rat in the course of the operations: Major Crawford draws special attention to this, as illustrating the uselessness of the measure.

* Captain Gabbett has not had grain exposed in Coonoor, as he found that the difficulties were very great and the advantage gained not large enough to make it worth while. He cannot say that grain would be infective merely from containing the excreta, etc., of the rats, but thinks it possible. He notes that a very large number of outbreaks centre in grain shops, which are infested with rats as a rule.

Mr. Mullaly draws attention to his plague narrative for November 1903. He suggests that granaries with cement floors be built for grain in towns. It is suggested by Major Crawford and Mr. Handcock that it would be difficult to render any granary rat-proof. All are agreed that retail grain shops are found in practice to be a source of infection; they need careful watching.

Difficulties of chemical disinfection.—Chemical disinfection cannot be guaranteed to be successful when we are dealing with mud huts. It is impossible to completely disinfect a mud floor. Captain Gabbett was told of a case at Wellington in which evacuation was not resorted to and infection occurred on several successive occasions, though the house had been disinfected after the occurrence of each case.

The Disinfecting Staff.—requires careful supervision. Inspectors cannot be trusted to carry out the process efficiently by themselves. The Supervisor cannot be on the spot at every stage to see what is being done, still less the superior officers. There is a great deal of carelessness in the way the chemicals are mixed.

Attitude of the people.—They realize that evacuation is a good thing, but are not equally confident in regard to disinfection. They grumble at disinfection, but they offer no active resistance to it. Some of the more educated natives will ask for disinfectants. The population could not be trusted in a general way to carry out the process themselves without supervision. This of course applies to the native population: the planters do their own disinfecting work.

Recrudescence.—The Medical Officers present do not consider that a germ could survive under the conditions existing in an ordinary mud floor. The germ is not a saprophyte and cannot live unless maintained by a living organism. Moreover, it would be killed by the ordinary micro-organisms with which a native floor is crowded. It has been demonstrated that a saprophyte cannot exist in putridity.

It is not easy always to give the origin of re-infection, but, because we find no evidence in some cases, we are not therefore justified in assuming that there was no external and positive cause for the re-infection.

Sources of infection.—Pneumonic plague is far more infectious than bubonic plague. Rats generally get the infection as a septicaemia. This may arise from the source of infection being food, but this is a question that needs scientific investigation.

The Ootacamund Tahsildar and Supervisor state that disinfecting coolies, within their experience, have always been attacked by the *bubonic* type of plague.

Infectivity of Patients.—Bubonic plague is only mildly infectious. Relatives remain in the same building with the patient and hang over him and yet they don't catch the disease. Even at the septicaemic stage, the disease is not really very infectious.

Major Crawford and Captain Gabbett would consider that convalescents were infectious, arguing from the analogy of other diseases, e.g., scarlet fever and enteric. They draw attention to the fact that the infectivity of convalescents has only recently been demonstrated in the case of enteric. The question of the infectivity of plague and other diseases during convalescence needs further investigation.

Major Crawford thinks that analogy is against the theory of chronic plague. He observes that infection would, in the natural course of events, destroy itself, while performing its work of forming toxins. Captain Gabbett observes that this process might take a very long time.

Climatic conditions.—don't seem to make much difference. The plague germ could apparently flourish in any climate.

Sanitary conditions.—Insanitary conditions would be undoubtedly favourable to the infection springing up. The comparative immunity of Europeans is largely due to their generally sanitary habits.

GROUP (A) (2).

Inoculation.—Major Crawford and Mr. Saldanha have been inoculated. None of the other nine gentlemen present have been inoculated. Last year, Major Crawford inoculated a large number of natives in Ootacamund, chiefly the servants of Europeans. Captain Gabbett had the serum ready, but no one came forward to be inoculated.

Major Crawford subscribes to the general views in its favour and is in favour of pushing it as much as possible. He is of opinion that, if it were generally resorted to, it would be sufficient by itself to stamp out an epidemic. He does not accept the view that it would tend to bring out any disease that might be latent in the subject.

Captain Gabbett is not keen on it. He admits that it affords a certain measure of protection, but thinks that, if an officer is known to be an enthusiast in regard to inoculation, his general influence will be injured. It is no use risking the more effectual remedial and preventive measures for the sake of inoculation.

Attitude of the people.—They don't like it. They think it causes general debility and has a tendency to bring out any disease that may be latent in the system.

Inoculation of Contacts.—There seems no special objection to this. Judging by analogy, the effect should be to make the attack milder. The great objection is that, in the case of one of the subjects getting plague, everyone would say that it was the inoculation that had given it to him.

The Ootacamund Supervisor found that, in Salem, inoculation conferred a special immunity on disinfecting coolies. The Tahsildar of Ootacamund found, as the result of his experience in Ootacamund, that the disinfecting coolies who were said to have been inoculated before they arrived from Madras died just as much as any other coolies.

GROUP (A) (3).

Rats—are a source of infection from one house to another house and from one quarter of a village or town to another quarter. There are many cases on record in which rat-infection has preceded human infection in villages, but to get at the real source of infection is not easy. The Ilitorai case is an instance in point.

Attitude of the people.—Most people would be glad to have the rats destroyed, although they wouldn't do it for themselves: some people, however, would like to have the rats left alive as an useful warning. In any case, they would offer no active resistance to measures for the destruction of rats.

Rats and Fleas.—Major Crawford considers that the weight of evidence is against the rat-flea theory. Captain Gabbett observes that Captain Liston is doing some work on the subject and is sending for fleas to be obtained from rats dead or dying of plague. Captain Gabbett has seen rats dead or dying of plague surrounded by fleas.

Methods of destruction.—Tar and sulphuric acid merely drives the rats away. Rewards have been offered, but without result. The common-sense rat exterminator was used a year ago. It kills the rats, but does not burn them up as advertised. Any good method of destroying rats would be most welcome.

Other Animals.—Mr. Mullaly instances the case of Mr. Marjoribanks's mongoose, which got plague. The Ootacamund Supervisor saw dogs and cats with the disease in Hosūr (Salem district).

GROUP (A) (4).

Plague Hospitals.—There are hospitals at Ootacamund, Wellington, Coonoor, Kotagiri Pykara and Gudalur. They are fairly popular. Much depends on the officer in charge of them for the time being. At first, they were decidedly unpopular, but kind and careful treatment has brought people round.

Major Crawford and Mr. Handcock think that the Ootacamund Hospital is too far (two miles) from the town. Major Crawford thinks that 100 yards would be a large enough distance. Mr. Mullaly and Captain Gabbett observe that to have the hospital too near would raise difficulties in the matter of control.

The various castes are housed separately, so far as this is found possible. A house was taken up for brahmins in Ootacamund town.

Private Practitioners—would be allowed in the Government hospitals, if the people wanted them, but they don't want them.

In Coonoor, the railway station butler is a private practitioner and a respectable one. He has a hundred cases on his books. Mr. Hadfield, the late District Forest Officer, has an enormous private practice in Ootacamund in plague and other illnesses. As a class, private doctors are not respectable. The people are gradually coming round to European treatment.

Captain Gabbett thinks that the authorities might make some use of this class of people. He has found the refreshment-room butler mentioned above of use, and overhauls his register of patients periodically. He suggests that all members of this class should be made to keep books.

The other gentlemen present don't think that these men would be able to give Government any assistance. They can't be relied on and many of them, being unable to read or write, couldn't keep books.

Mr. Coleman observes that many of them sell poison in large quantities, e.g., mercury, and suggests the desirability of some control being exercised over them in this respect.

GROUP (B) (1).

The Observation Staff—work fairly well as a class and are necessary as a check on the village officers, who could not be trusted by themselves.

Father Biolly thinks it would be better, if local people were employed in preference to strangers. They would know the people better. As an incentive to the village officers to report cases, he suggests their being granted a reward for each case they report. Mr. Handcock observes that, under such conditions, a village officer, whenever his enemy fell sick, would have an extra inducement to report the case as one of plague.

Their Recruitment.—All are agreed that hospital assistants would do the work well and command the respect of the people. The question is whether their services could be obtained. There is even now a difficulty in recruiting them and their prospects are not very good. Major Crawford remarks that he is constantly receiving complaints from the hospital assistants who are posted to duty on the hills: they want to revert. Their pay is less than that of plague inspectors on similar duty. A hospital assistant should get as much pay as any one else on similar duty, if not more.

All are agreed in thinking that a certain proportion of the plague staff might with advantage be made permanent. The principle of a permanent staff has already been recognized in other branches of the subordinate Sanitary Department.

Their Training.—All are agreed that practical training in plague work (not of-course in general sanitation) can be better done at the district head-quarters than in Madras. Training of a similar nature might with advantage be made part of the training of the subordinate Revenue staff also.

Their Pay.—Rupees 35, plus Rs. 15, plus 1/3 (hill allowance), is enough pay for a rural circle inspector, all told. Mr. Handcock thinks that, even within Municipal limits, a pony allowance is necessary for the circle inspectors: Mr. Saldanha thinks that this might be left to the discretion of the Special Plague Officer.

A plague allowance is not considered generally necessary, though Mr. Mullaly thinks that, in the case of inspectors whose work is exceptionally onerous and risky, some discretion might be allowed in this matter.

[Mr. Mullaly's views, as regards the future of the observation staff, are printed in Appendix VII.]

GROUP (B) (2).

The passport-system—is considered to be a very difficult system to work properly. Passport-issuing officers can be easily evaded, even those in the neighbourhood of Ootacamund town. Seventy-five per cent of the passportees who absent themselves from examination are reported not to be traceable.

Mr. Mullaly and Captain Gabbett believe that the passport-system does some good and instance Madras city to show that, sometimes at any rate, it produces undoubtedly good results.

Major Crawford, on the other hand, has little faith in the passport-system and observes that a number of persons who say they are going to other places probably don't go. He has known even Europeans to be up to such dodges. Mr. Saldanha states that efforts are made to verify all cases in which passportees announce an intended change of residence. Mr. Coleman thinks it very difficult to verify or disprove such statements on the part of passportees.

GROUP (B) (3).

The Plague Police—do very little work either in Ootacamund or Coonoor. The Assistant Superintendent of Police keeps their control in his own hands. In one instance, an Ootacamund plague constable refused to carry a letter and the Assistant Superintendent upheld his action. Mr. Saldanha considers that friction of this kind is the result of divided control. He objects to having to submit his recommendations in regard to the punishment and transfer of the plague police to the Assistant Superintendent of Police and thinks that he should have undivided control over them in matters of discipline. The other gentlemen present do not consider that it would be practicable to have the control of the plague police transferred to the Special Plague Officer.

Mr. Coleman gives an instance of one of the constables in Coonoor town, who levied black-mail and then bolted for fear of the consequences.

APPENDIX VI-B.

SUPPLEMENTARY NOTES COMMUNICATED BY WITNESSES WHO WERE PERSONALLY EXAMINED.

N. S. BRODIE, Esq., I.C.S.

GROUP A (1).

(a) Yes. A very important matter. Disinfection *plus* evacuation seem to be the great remedies for the disease, when it has once appeared.

(b) No. See B (1) (e).

(c) All depends on what disinfectant can be used, for determining which, careful experiment with *cheap* disinfectants seems necessary.

(d₍₁₎) (I). For towns, chemical disinfection, thoroughly carried out, and desiccation by sunlight, by unroofing the houses in paracheris and very badly infected quarters.

(II) Chemical disinfection and desiccation by sunlight. The latter, without chemical disinfection, is, in my opinion, of little use.

(e) Very difficult to say, without careful scientific experiments. Plague does appear and recrudescence sometimes, but, owing to the difficulties in the way of tracing the history of the germs, it is impossible to say, with any certainty, whether it has been re-imported or not. Even when it can be proved that it was not re-imported by human beings, there is no guarantee that it may not have been re-imported by rats, though I do not believe that rats, as a whole, travel far from the localities in which they were born. It seems to me probable, judging from analogy with other bacilli, that the plague bacillus, under unfavourable circumstances *as to growth*, will assume the so-called encysted form and remain dormant for an indefinite length of time, until, by any accident, it is placed in surroundings favourable to its re-development. This would, if true, account at once for the re-appearance of the disease in houses which have not been properly disinfected chemically at the commencement of the cold season, even though they may have been unroofed and deserted during the hot weather. The germs contained in the sputa and excreta of plague patients deposited in the hut would become encysted, as food and moisture failed them. On the return of the inhabitants, if any of these germs got into an abrasion of the skin or were eaten with food, they would be in favourable conditions for development and would proceed to develop accordingly. It seems to me that this is a point which should be more carefully investigated by experts than it has been hitherto. From my observations on caterpillars in Calicut, I learnt that there is a very deadly disease of the same class as plague which affects them and which certainly lies dormant for long intervals of time. It first appeared in my breeding cages in December 1901. Every one of the caterpillars attacked died. I then disinfected the bottles with glacial carbolio-acid and did not use them for several months. About July 1902, I tried them again and, although the young larvæ were healthy enough for a week or two, the same disease broke out again, just as they were reaching maturity, and cleared off the whole brood. I can only account for this by supposing that some of the germs escaped the carbolio acid or escaped out of the bottles altogether and lay dormant in the dust of the table or the floor. When the caterpillars were placed back in the same place, some of the germs may have been swept up, by the leaves used as food being placed on the table, or may have been picked up, by the muslin covers of the bottles being also placed in contact with them. Anyhow, it is clear they remained dormant somewhere for over six months. Here, there could be no question of re-infestation, as the second brood was reared from the eggs laid by a totally different species of moth.

GROUP A (2).

(a) This depends on the view taken as to the efficacy of inoculation. Personally, I am in favour of it and should like to see it encouraged in every way. The statistics furnished by Captain Robb speak for themselves, in my opinion.

(I) Example is the best form of persuasion, and I don't know what more can be done. But it would be a good rule to insist on all Government servants being inoculated, at all events in large towns, on the occurrence of an epidemic of such virulence as to render such a step advisable in the opinion of Government. The Collector might be empowered to make such a recommendation, when he considered it necessary.

(II) The performance of the operation should be entrusted only to men who have had some training in it under a competent medical officer and who are not below the grade of civil apothecary. Undoubtedly, it requires a man of some intelligence, who can be trusted to be careful about sterilizing all his implements, etc.

(b) Yes. Otherwise, one of the strongest inducements would be taken away.

(c) Of course, if he is a contact of a plague patient, he may still carry about germs on his person and clothing and be as dangerous as any other contact. Moreover, he is not unlikely to contract plague himself. So contacts ought not to be exempted from the passport rules.

(d) I think the degree of protection afforded is very considerable and that, if properly conducted, there are no risks. Of course, a man of weakly constitution or enfeebled by long illness ought not to be inoculated, nor a man suffering from a secondary syphilis or diabetes. The extra strain put on the constitution by inoculation might easily do him serious harm. But this has nothing to do with the "risks" attendant on inoculation, which I consider to be practically *nil*, always provided that the operation is properly conducted by a man who knows what he is doing and that the serum itself is all right. That it affords a large amount of protection is borne out by the figures here:—out of 1,129 inoculated, only 14 seem to have contracted plague and, of these, the only seven whom we know anything about contracted it within the first ten days, so that they probably had plague, before they were inoculated. Of these 14, only 4 died and 3 of these developed plague within the first five days, so they almost certainly had plague well developed before inoculation. Even these 4 out of 14 is a very small percentage of deaths for a disease that normally carries off 80 per cent.

GROUP A (3).

(c) Rats undoubtedly are largely responsible for the spread of plague, especially within a town or village. Transported in grain, they may also carry it great distances from the original centre of infection. I doubt if they usually carry it from village to village in this district on their own four legs, unless of course the villages are very close together. They have their own haunts and don't wander far from them. When they actually get plague, they probably do wander, but only for a few hundred yards, as the disease is very quickly fatal to them and soon deprives them of the power of locomotion. But, if plague can exist in the encysted form or be blown about by the wind, it is obvious that a dead rat, dying in a field and not chemically disinfected, will give rise to millions of germs, which other rats may, on the return of the inhabitants to an evacuated village, devour and so give rise to a fresh epidemic. Hence, if the rats, healthy and otherwise, in an infected locality, could be totally destroyed, it could be no harm and might be productive of great good. If totally destroyed, rats would not come back for a long time, and every day adds to the chances of dormant germs being destroyed by natural causes.

GROUP A (4).

Already fully discussed.

GROUP B (1).

(a) Since I came to this district, it has, I think, worked well. All depends on the staff. A good inspector will frequently detect a case of plague in time to save a village from serious infection, whilst an incompetent man may have plague going on under his very nose and never discover it. In Palladam, the exertions of the supervisor brought to notice the outbreak in Kallapalayam, before it became serious.

(b) I don't think expenditure can be reduced in this district. But we do not make any attempt to keep up the staff required by section 56 of the Plague Regulations, which would be utterly ruinous. A great deal depends on the intensity of the epidemic, the nature of the locality, the time of year, etc. Where the plague is bad and the country liable to fever, a greater number of inspectors should be employed than in a comparatively open and healthy country. Again, when a district is recovering from a severe epidemic, as the Coimbatore taluk is here, a much larger number of inspectors is required than in a taluk, such as Satyamangalam, where only imported cases have occurred and there has been no outbreak. In fact, in such a case, I do not think a plague inspector is required at all. In any case, the maximum area which can be given to one inspector is a revenue inspector's firka, and even that is perhaps rather a large charge. If you give him a large charge, it is practically a waste of money, as, in endeavouring to get over the ground in his charge, he will simply neglect his work. I think money devoted to strangling out the plague, where it has once got a foot-hold, is well spent and that this can only be accomplished by entertaining a large staff.

(c) I think the present pay is about the least you can get good men for. The pay of temporary sanitary inspectors in charge of observation circles might be reduced to Rs. 35, if men holding permanent appointments in the district were trained and put into them. A pony allowance is always necessary. I do not quite understand the last question. No extra allowance is made to the ordinary revenue staff during plague nor is any required. I would strongly advocate the employment of men holding permanent appointments in the ordinary office of the Collector as temporary sanitary inspectors, but they should be given the full pay and allowances of the appointment and not the scale given to men under the Civil Service Regulations, as if they were on deputation. There is no reason why men of this class should be treated worse than mere outsiders, who have no stake in the district and over whom the plague officers have very little control for that very reason. I am sure that, if the rules in the Civil Service Regulations on this point could be relaxed, there would be a great increase in efficiency. This applies to all classes of special appointments connected with plague, to clerks and assistant

sanitary inspectors as much as to temporary sanitary inspectors. I would also advocate relaxation of the rule, which prescribes that certificated sanitary inspectors alone can do general disinfection. Considering the difficulty of always obtaining certificated men, I think temporary men holding permanent appointments might well be promoted to these posts, when emergency requires. They should of course be trained in the Sanitary Commissioner's office.

(d) (I). Very useful. In fact, indispensable.

(II). Yes.

(e) I have obtained the sanction of Government for deputing some clerks from the Huzur and Taluk offices to undergo training in the classes held by the Sanitary Commissioner every month and have got some men trained. Some of them have recently been deputed as circle inspectors in Palladam, owing to the dangerous spread of plague there, and the result of the experiment must be awaited. The only obstacle in the way of success is the Accountant-General, who objects to the clerks in the office, subordinate to those selected for training, getting promotion during the training period and who also will not allow the men, after training, to draw the same pay and allowance as raw hands imported from outside. Naturally, the scheme is not popular with the clerks in the office in these circumstances, as the work is very trying and rather dangerous and men are unwilling to be deputed for the work for such a mere additional pittance. The period of training is, in my opinion, too short and should be raised to one month in the case of men already in permanent employ (who would of course be selected as good and intelligent men) and two months in the case of outsiders. I don't think the District Medical and Sanitary Officer could find time to give them the necessary training. Assistant sanitary inspectors might, however, be recruited direct from the taluk and other establishments (Salt, etc.) and trained for a month or two in practical work under experienced certificated inspectors. As suggested by Mr. Fotheringham, outsiders, who did specially good work, might afterwards be given posts in the revenue line, the age-bar being relaxed.

(f) European supervision is specially necessary for plague work, and I should like to have a great deal more of it. The cost, of course, is prohibitive. Only men already in Government employ should be entertained and they must necessarily be men of some experience already on good pay. Low class Europeans and Eurasians would be worse than useless.

(g) to (l) Already discussed.

(m) Not as a rule. Of course there are "bad hats." But complaints against the observation and preventive staffs are few and generally false. If a man is strict, of course there will be complaints and, if he is tactless as well, there will be more.

(n) Apparently it is in this district. Exceedingly few complaints have been made and none of these proved true. The passport-issuing officers alone are undoubtedly corrupt.

(o) Hardly at all, as far as clothes are concerned. But many of them have learnt the utility of keeping outsiders at a distance. Unfortunately, public opinion has little force in this country and, when private interests clash with public ones, the latter invariably go to the wall. If the monegar or the principal men in the village have relations in another village, where plague has broken out, their first impulse is to take these relatives away to their own village, with their clothes, etc., and no one dares to say them nay. Of course, no one in such a case is passported and, if plague breaks out among the new arrivals, it is carefully concealed, until the whole of the new village has become saturated with it. As time goes on and instances of this sort are multiplied, a sense of self-preservation may drive the other villagers to complain or may induce them all to sacrifice even their relations' interest to their own, but that stage is very far from being reached at present.

(p) Certainly not. I doubt if they will ever learn that *sámán* may carry plague. The outbreak recently in Okkiliapalayam was entirely due to some villagers carrying away some dirty clothes from a hut in Chettipalayam, which village had only recently a very severe attack of plague and was evacuated. A villager of Okkiliapalayam had some relations in Chettipalayam, who died of plague and, on returning to his own village, rather than sacrifice these clothes, he surreptitiously removed them, before the hut was disinfected. Result, a severe outbreak in Okkiliapalayam.

(q) Certainly. It is in this direction that the only hope of checking plague with a small expenditure lies. I don't think more can be done than is being done.

(r) Very desirable. But it should be worked by the villagers. Once make it official and it becomes a gang of robbers, who would be detested and thwarted in every way by the villagers.

(s) I do not see how it can be reduced. Nothing is spent, except on inspectors and on disinfection, both of which are essential, if plague is to be stopped. Passport stations and clerks exist no doubt in some places and, though the expenditure on them is far in excess of what it should be, yet they are a necessary evil, so far as I can see.

GROUP B (2).

(a) Undoubtedly. The system at present is defective in every way, but I confess I have racked my brains in vain for a satisfactory solution. Some system, however bad, seems to be a necessity. The railway passport-system alone may be considered honest and effective,

probably because the station-master either issues passports himself or is at hand to check malpractices. Even then, there are numberless cases of men avoiding passports. But the road passport-system, both in towns and villages, is utterly rotten. For towns, more supervision over the passport clerks is wanted and might be obtained by putting active and reliable native officials of the Tahsildar class in charge. What is wanted is a really good native detective officer, a man who could disguise himself in various ways and watch the passport clerks and constables, without being himself seen. He could also catch bandies and travellers outside the passport stations and ascertain whether passports had been granted to them or not. Unfortunately, unless he were constantly changed, he would soon become so well known that his exertions would be of little use. However, the suggestion might be tried in taluks, where many large villages and towns employing passport clerks exist, and he could travel from one to another, making surprise visits. For villages and rural areas, a few inspectors of this stamp would also do much good, but the cost, I fear, is prohibitive. Many other suggestions have been made to me, but I cannot see that they would be of any use. One is that, in towns, a well paid official with an office should be constituted in some central part and that all persons leaving the town should be required to obtain a passport from him. The passport clerks at the frontier stations should then be required to call on every person to produce his passport and turn back those that had none. I fail to see how this would improve matters, however, as the clerk would, just as at present, pass anyone who paid him a bribe and turn back the rest. The only improvement would be that the clerk would not write passports and so they might be better written and be more accurate as regards names and addresses. Another proposal is to post a guard, not only on the roads, but all round the town at intervals of a few yards, so as to prevent any one escaping by the fields, as they constantly do at present. This would, I fear, merely multiply the number of bribe-takers. Unless a patrolling officer, as indicated above, was appointed to detect offenders, it would be of little use, but no doubt it would be an improvement, if such an officer also were appointed to check the guard. The passport-system is, however, doomed to failure in the near future, whatever be done, owing to the increasing prevalence of giving false addresses. This applies to the railway system as well as the road system. It is impossible to expect the passport-issuing officer anywhere to know everybody in the town, and the dodge now is to go to some one who is unacquainted with the traveller, give a false name and address, take a passport and then go somewhere else, as far as possible from the destination given. The passport-examining officer gets the triplicate, finds that no one of the name resides in his jurisdiction and, if the scheme has been worked with ordinary skill, all attempts at tracing the man naturally fail. The risk of detection is so small that this scheme is bound to become more popular every day.

ADDITIONAL QUESTIONS.

GROUP A (1).

(e_i) Already discussed under A (1) (e). Note that I do not suppose that the plague bacillus could "flourish" in the floor of a hut without the support of a living organism, if that means "develop" and "spread". I think, however, it might surround itself with an indurated cell wall and remain dormant for a long time, until conditions favoured re-development. Great heat, such as the direct rays of the tropical sun, might kill it, even then, and so the desiccation of grain is probably of use.

GROUP A (2).

Figures already discussed.

GROUP A (3).

(d_i) Already discussed. If the plague germ can live at all outside of a plague patient, it strikes me that wind may also convey it for considerable distances. Although relatively heavy, its weight must be microscopical, compared with the particles of sand, which are every day blown along the roads and, in this way, I have no doubt it can be conveyed considerable distances.

(f) No case that I know of positively. Dead rats and plague patients are usually reported together.

GROUP B (1).

(i_i) Yes.

(i_{ii}) The law at present requires considerable modification. Except in Municipalities, it is of course impossible to insist on every dead body being shown to a medical officer before burial and, when, as usually happens, a plague corpse is buried or burnt before the plague inspector gets to know of it, there is nothing but surmise to go upon. The corpse may have been a plague corpse, but, on the other hand, it may not (section 47 of the Plague Regulations only makes punishable the concealment of a case of plague or fever with glandular swellings or, in an infected area or amongst contacts, of acute affections of the lungs, convulsions in children, abortion in women and sudden death in the aged). But, beyond the evidence of those specially interested in concealing the cause of death, none is procurable in a court of law. When the

corpse is disposed of, the last possible evidence has gone. It seems most essential to modify the law in some way, so as to compel villagers to give early information, which may lead to the detection of a plague case. The suggestion which occurs to me is to empower the Collector to notify that, in any particular area, usually a taluk, all householders, etc., shall be bound to notify to the village head (or other nearest officer of the revenue or medical department) or other person empowered by the Collector in that respect all cases of sickness of whatever kind and all deaths immediately on their occurrence and, in the case of deaths, shall not bury or burn or dispose of the corpse in any way, till twelve hours after the death or until the village head, etc., have seen it and have given permission for its disposal, whichever happens first. The village head should be bound to report the case at once to the nearest plague officer and, if he has any suspicion, should not allow it to be buried, etc., until the twelve hours have expired or until the plague officer has seen it. Village heads can at least be easily trained to detect buboes, and many cases of bubonic plague, now concealed, would thus be brought to light.

GROUP B (1).

(i) Might be tried and could do no harm. Notifications in the District Gazette are much prized by the ryot and might be given freely for good detective work. They cost nothing. Monetary rewards should not exceed Rs. 10 and should be given with discretion.

GROUP B (3).

(a) Already discussed and suggestions noted. The employment of none but temporary hands is bad for discipline and everything else. At least 10 per cent. ought to be permanent police officials. If Mr. Fotheringham's suggestion to make him Assistant Superintendent of Police in regard to them could be adopted, it would undoubtedly work an improvement.

(b) No. In fact, we want more.

A. FOTHERINGHAM, Esq., I.C.S.

GROUP B (1).

(a) The suppression of plague in Coimbatore town was a natural result, I think, of the general exodus. This exodus took place in December and, although the plague raged till about the end of January, still it had less to feed upon. Certainly, the drop in the cases was sudden (from over 30 to under 20 per day) and this cannot be written down to the credit of the staff.

The suppression of plague in the taluk must, on the other hand, be credited to the staff, inasmuch as they carry out the work of evacuation. The most striking instance is Chettipalayam, with 13 cases between 19th March and 20th April, when the evacuation took place, a fourteenth case on 25th April (the incubation period going back before evacuation), a fifteenth case (a disinfection cooly) on 3rd May and no more till after re-occupation.

Detection work is not good in the taluk. From 1st April 1902 to 21st July 1904, out of 291 cases, 104 were found out before death and 187 after. In the town, the work is naturally better.

(b) The staff is distributed according to my schemes, which I personally do not know how to approve. Colonel King's circles of 100 and 50 square miles (these are the figures he has just used in a letter to the Collector) are to my mind too large for efficiency. So, to my mind, we have not reached the point when efficiency and economy cease to be antagonistic factors.

(c) I think the pay all round is too high. It is absurd to pay a Supervisor more than a Deputy Tahsildar and then to ask him to work under him. The pay of the inspectors is out of all proportion to that of revenue inspectors. But we don't get the right men, except as supervisors. There are two faults to be found with the system. One is that, in plague matters, promptitude is so necessary in matters of considerable expenditure that a great deal has to be done in anticipation of sanction. The result is that there is always some difficulty or other with the Accounts Department and this affects even the pay-sheets of the inspectors, e.g., in the matter of the entertainment of a new peon, some days after his predecessor absconded ("want of sanction" being urged), or in the matter of transfer of coolies from one section to another. The result is that pay is often late and often more complicated than executive officers, only temporarily employed, can understand. But the more serious fault is that no really good man will be tempted by a purely temporary billet. The only way to get proper men is to assure them that the age limit and educational qualifications will not affect them, after service on plague, when seeking employment in other branches (by preference, executive branches, e.g., the Public Works Department or the Survey). I also believe good men could be found in permanent service, willing to do plague work temporarily on higher pay, if the rules allowed such men to draw the full pay of the higher appointment. It is impossible for me, while quarrelling with the system of recruitment as a whole, to attempt to say how much pay and allowances would be necessary to attract men on my system, with its different basis for recruitment.

Pony allowance I think is inevitable, unless the same were given substantively and ponies ordered to be kept without allowance.

I have no experience of Coimbatore before infection and cannot compare extra allowance during plague with the smaller allowance in its absence.

(d) Plague was almost stamped out by the 30th April. But, since that date, 17 villages in the taluk have been infected or re-infected. If the staff had not been kept on, the trouble over these villages would have been increased enormously. At least, we could only have hoped for new men being appointed to fill the places thrown vacant and the new men would not have known the ground.

(e) No remarks.

(f) One European Special Plague Officer for town and taluk; one Eurasian Supervisor among five.

(g) On the whole, the staff are as satisfactory as can be hoped for from temporary men. In the Municipality, I think they (excepting of course the passport clerks) compare favourably in conscientiousness and efficiency with what is usually found among municipal servants. This is, I think, due to their proximity to myself. In the taluk, everything turns on the supervisor, who is the highest officer who can exercise a thorough check.

(h) No. They are not heart-whole in the policy. They do not encourage inoculation by example. For their own convenience, they will even exempt shop-keepers from orders of evacuation and they knew nothing of sanitation in their homes. The constables (including enrolled K.Ds.) are the worst.

(i) The only suggestion I have to offer is that of aiming at rewarding conscientious and efficient men with reasonably good permanent posts.

(j) Yes, but not as a means of reporting them.

(k) The village officers are supposed to register all strangers stopping in their villages. 25 per cent. of such cases or more are detected by the circle inspectors. This is only an instance of the uselessness of the overworked village staff, but it goes to the root of the matter.

(l) Answered at the Conference.

(m) One man was nicknamed "Tamerlane", but he was got rid of.

On the whole, proof of misconduct against the plague staff has been rare, and my experience is that the head of the village, when unwilling to acquiesce, has usually too powerful a backing for the inspector, unless the latter is supported by his superiors. In the town, this does not apply and a good deal of misconduct was suspected and rumoured.

(n) No.

(o) to (r) Answered at the Conference.

(s) No. The plague staff serves a secondary purpose in encouraging and enforcing sanitation, apart from my arguments already given and telling on this point.

GROUP B (2).

(a) The great defect in the passport-system is that no special provisions are made for men, living in uninfected areas, but constantly travelling backwards and forwards to infected areas. Thus, for instance, the rustics who gather firewood to sell in Coimbatore, bringing in their loads once or twice a week, practically live under passports. Such people are of course the centre of danger to the tracts where they live, but the system of eternally passporting them, recovering the passports and re-passporting them entails tremendous labour and hampers the clerks. I would suggest a permanent passport for such people, say for 100 days at a time, offering them, as an inducement to take it out, the right of only being observed on alternate days.

(b) and (c) No elaborate precautions are possible on the railway, where punctuality is everything. In fact, throughout plague measures, elaboration must be sacrificed to promptitude. The "accounts" department, which is a monument of elaborate precautions, does not pretend to be prompt, but, in plague, the reverse rule must apply. I therefore think that nothing should be even attempted.

ADDITIONAL QUESTIONS.

GROUP B (1).

(t), (u) Discussed at the Conference.

(i (ii)) All dead bodies are seen in the town. In the taluk, the inspector is left pretty free on this point and held responsible for detecting an outbreak or the premonitory symptoms of one.

(i (iii)) I don't know.

GROUP B (3).

Discussed at the Conference.

SUPPLEMENTARY POINTS.

I. I have noticed considerable confusion on various occasions, arising from the use of Revenue villages for plague purposes. Such villages are the natural form of address to be written on passports, but, for preventive and observation purposes, we are concerned only with the village headman's jurisdiction as one unit and with the actual groups of houses as another unit. I think a rule should be laid down that no village headman's jurisdiction should be divided between two or more circles and that, in *expresses*, the actually infected group of houses (or hamlet) should be referred to in the serial number, not the Revenue village. The logical conclusion would be that the Revenue villages should be replaced by hamlets in the gazette, but this would be cumbersome and would not be of any use to the passport clerks, who must act on information comprehensible to the Postal Department.

II. I enclose reports from four Supervisors, regarding the evacuation of toddy and arrack shops and post offices (*vide* Appendix VII). Mr. Locke says he experienced no difficulty, but I am generally aware that, in Chettipalayam, the post office was not evacuated for a clear fortnight after the rest of the villages.

I attribute the difficulty to the rules of the departments about permission for fresh sites and I think general information, conveyed to the heads of the departments and by them downwards, would put an end to the difficulty. At present, however, prompt action is impossible. The same applies with less force to the Police, which has a local authority with considerable powers. Tardy punishment does not help prompt action.

Unroofing.—One anna per square yard is the figure.

Difficulties of chemical disinfection.—"Scrubs" are actually in use in this taluk.

Recrudescence and the allied problems.—I was asked to narrate the circumstances attending the outbreak at Karamadai in May last. At the time of the conference, all that had been discovered was that the village had been free, when the epidemic was raging in the surrounding villages, and that the first two cases were a bandyman and the circle inspector's peon, both occurring when the neighbourhood was free. Subsequent enquiries, when the alarm always attending the discovery of plague by the officials had died out, now show that the disease was imported from an infected village in Palladam taluk by the bandy-men. The interest in the matter accordingly dies out.

The case of Orattukuppai is, however, interesting. The inhabitants of Chettipalayam were made to evacuate about the 20th of April. The last case in the village occurred on the 3rd of May, being one of the disinfection coolies. On the 3rd of June, I gave the order to re-occupy, which involved, as a preliminary, the disinfection of *saman* in the field huts. One Arumugam Chetti, who had removed to the neighbouring village of Orattukuppai, visited a field hut and removed gunny bags from it to Orattukuppai, while this field disinfection was going on. On the 14th, plague broke out in Orattukuppai, involving three neighbouring houses before evacuation, including the one where Arumugam Chetti was living. This affects the point of infection remaining alive for more than a month in the field huts, although innocuous there, but virulent as soon as removed into a pukka house.

Disinfecting apparatus.—The common pump (Messrs. Thompson & Co., Calcutta), costing Rs. 14, lasts about three weeks and thus works for about Rs. 20 per month, the wages of less than two Madras coolies. But it does the work of three or four coolies; I only "complain" of it, because I believe a cheaper pump could be made locally by an intelligent craftsman, but I don't look on it as unsuitable to the work or as costing more than a cooly, because so short-lived. The sepoys, needless to say, used it much more efficiently than the coolies, and I do not think more than two can usually be supplied to a section of 25 men, because most of the men are too clumsy either to make the most of it or to make it last as long as possible. It also does good work, owing to the force of the water, in the matter of getting into chinks, etc.

Plague Hospitals.—The French nuns were volunteer nurses and there were professional nurses before. But the credit must be given to the volunteers, in my opinion.

Plague Police.—I have talked over my suggestion of making the Special Plague Officer an additional Assistant Superintendent of Police with the District Superintendent here. He says that enquiries into their misbehaviour, as reported by the inspectors, whether truly or not, are a great nuisance and can hardly be done satisfactorily by the ordinary staff. But my point is, not the inability of the police officers to suddenly find time to exercise discipline over an immense army of recruits, but the importance of promptitude in plague matters and the natural tendency to insubordination among temporary men, if they feel that it requires a complicated process to get them punished. The proposal is open to the serious objection that it is quite inconsistent with the scheme of choosing a fixed percentage of the men from the regular police force, but this scheme is only applicable, when the regular police force has under normal circumstances men to spare and when an epidemic does not mean an increase of crime.

CAPTAIN J. J. ROBB, I.M.S.

GROUP A (1).

(d) As regards sun-light, it is the best natural means we possess, but there is the great objection of unroofing the houses and the expense therein incurred. Could this however be overcome, it is of the greatest importance to my mind in any form of disinfection. I have very little faith in the efficacy of small holes in the roofs.

As regards chemicals, perchloride of mercury and chloride of lime are, I think, the best, the latter being best on account of cheapness. This is the only safe means of disinfecting clothing, unless steam apparatus be supplied.

GROUP A (4).

(b) By having caste wards and having servants of different castes for the different wards. Under this head comes the suggestion of native doctors attending their own cases. I am very strongly against this, as it would be absolutely impossible for a District Medical and Sanitary Officer to control a camp, had he not direct control over the men working under him. Besides, native doctors are at present quite ignorant and untrained, have not the remotest notion of sanitation or antiseptics and (to be of any use) would have to live in the camp, which, of course, would not pay them. For, if they lived in the town, the hospital assistant would naturally object (and also perhaps the patients) to treat any urgent case among their patients. If it were found necessary to have them (which it is not, I am glad to say, at present), I would suggest that they be trained in ordinary antiseptic principles and in disinfection by the Assistant Surgeon, under supervision of the District Medical and Sanitary Officer for (say) a fortnight and then be taken out and shown the practical work in the camp. As regards paying them for reporting cases, I am not at all in favour of this, as I fear they hardly know plague when they see it, and the hospital assistant would be put to endless trouble, correcting wrong diagnosis of the native doctor, who would only wish to earn the reward.

GROUP B (1).

(c) The present pay (Rs. 70 to Rs. 75) is too high. The pay of a hospital assistant, who is a passed candidate and has undergone a course of four years' training in a Medical College, is only Rs. 25, rising to Rs. 45 after ten years' service. The temporary sanitary inspectors, who are trained for plague work for a period of a fortnight, are given Rs. 40, *plus* Rs. 30 allowances, when put in charge of observation or preventive circles in rural areas. Their qualifications are very poor and many of them have no status, position or education, to make them respected by the people. It is an anomaly that these men should get more pay and allowances than a hospital assistant, who is in every respect their superior. The case of certificated men, who have undergone a six months' course in hygiene, is different, but Rs. 75 is too much for them. I would suggest the following:—

	Pay.	Allowance.
	RS.	RS.
(1) Certificated Sanitary Inspectors in charge of observation Circles.	45	7
(2) Certificated Sanitary Inspectors in charge of preventive Circles ..	45	10
(3) Temporary Sanitary Inspectors in charge of observation Circles.	25	5

(e) Improvements urgently required. The staff should be men of some education and should have to undergo a course of six weeks to two months, conducted by the Sanitary Commissioner. They should be instructed in hygiene (especially the practical side) and in the Plague Regulations and the Plague Inspector's Manual.

They should, under no circumstances, be granted certificates, if they do not show intelligent *practical* work at their examination. They should be able to disinfect thoroughly and explain the reason for so doing.

Men of this class would, I think, be most desirable and, if well taught in ventilation and sanitation, would prove of great assistance to medical men in general.

GROUP B (2).

(a) Passports are at present issued indiscriminately to all persons leaving an infected or notified area. It seems unnecessary to issue passports to persons travelling from a notified to an infected area or from an infected to an infected area, provided the areas are of equal degree of infection, as obviously it would be necessary to issue passports to a person travelling from a badly infected village to one which has only a few cases. Greater discretion might be made in notifying railway stations, as people leaving by those stations are given passports, whether they come from infected places or not, and hence the number of passport holders in a place like Coimbatore comes to be enormous, sometimes as many as 400 in one day. The natural remedy here is to give passports at the village or place from which the person is travelling and so do away with the railway passports to some extent, as then it will be unnecessary to notify a railway station close to an infected place.

ADDITIONAL QUESTIONS.

GROUP A (2).

	No.
(e) Total number inoculated	1,129
Number of plague cases among inoculated	14
Deaths among inoculated	4

Dates of plague cases among the inoculated.

	RESULT.
1 attack—day of inoculation	Died.
1 „ 3rd day after inoculation	„
1 „ 5th „	„
2 „ 6th „	Recovered.
1 „ 8th „	„
1 „ 10th „	Died.
7	

Other seven cases not recorded, but they all recovered.

R. NÁRÁYANA AIYAR, Esq., I.C.S.

GROUP A (1).

(b) With a few exceptions, disinfection inspectors have mostly been inefficient in this taluk. Disinfection duty is the grave of many a plague inspector's reputation. My experience has shown me that no disinfection inspector can be trusted to disinfect correctly and thoroughly and that sanitary inspectors have not had sufficient training to carry out disinfection operations correctly. Disinfection is not a rule of thumb, but presents innumerable difficulties in actual practice, which require a scientifically trained and intelligent man to meet. I would strongly recommend the deputation of an additional Medical Officer of some standing, as Special Plague Officer or, at least, of a reliable senior grade hospital assistant to be in charge of disinfection parties.

GROUP B (1).

(a) *Suppressing Plague.*—When the circle inspector gets hold of a genuine imported case, he succeeds in effectively isolating it and prevents its becoming a focus of infection.

Even when plague is indigenous, if infection has not been sown broadcast (say) by rats, most circle inspectors are capable of managing an outbreak. In this district, measures of segregation are carried out very promptly.

I cannot agree at all that “sanitary inspectors have, as a class, exhibited qualities that amply prove the value of special and skilled labour in dealing with plague” (G.O., Nos. 198-199, dated 27th January 1904, p. 8). There is nothing skilled about their labour whatever. They learn up certain formulae and repeat them. I have seen certificated men and experienced inspectors commit the most ludicrous mistakes in sanitation. Correct treatment is rarely to be seen in rural areas.

(b) The artificial radii prescribed are of course not strictly adhered to; the division into groups and circles is made to suit size and importance of villages in the taluk.

(c) *Pony allowance*—is certainly necessary.

Extra allowance—during plague is given now to temporary assistant sanitary inspectors and disinfection inspectors. I would retain it for the latter, but not for the former. A disinfection inspector on actual plague duty has very much more arduous work than an observation or even a preventive inspector. A pony allowance might be given to assistant sanitary inspectors, instead of an extra plague allowance. This extra allowance is a temptation to all but disinfection inspectors.

Having given a pony allowance, I am not in favour of giving inspectors a fixed travelling allowance. They are ordinarily expected to do 12 miles a day on horseback.

As regards pay, considering the kind of men we get, e.g., the temporary sanitary inspectors, I think Rs. 40 is high. I would not reduce the salary of a certificated sanitary inspector, though perhaps Rs. 20 will do for an assistant sanitary inspector, but I would put the temporary sanitary inspector's salary at Rs. 35. Even if we get better trained men as temporary sanitary inspectors—and I would strongly urge the necessity of modifying the present system of training—I think Rs. 20 or 25, 35 and 45 very fair and reasonable rates for the three classes. I do not think these proposals will at all impair efficiency.

(c) Practical training by the District Medical and Sanitary Officer—not mere examination of parrot knowledge of a few chapters in hygiene—in a plague-infected area might do some good. This specially applies to disinfection inspectors.

(g) A few are very efficient. But, as a general rule, few of the men work conscientiously. They are no better than what is to be expected of men without status, wealth or much education, with a temporary appointment attended with much risk. I have had nearly 18 months' experience of plague inspectors and supervisors and have been forming a more and more unfavourable opinion of them generally.

(h) Quite the reverse, I am afraid. There is quite an unreasonable general prejudice in the public mind against plague officials, and this stands in the way of much good work.

(i) *Suggestions.*—It would be well, if more of the class of men “permeated with revenue sentiments” could be employed. A permanent appointment in a Revenue office, though it has some disadvantages, will make a plague official more responsible.

But there is such a dearth of clerical hands in Government offices—specially so, in this taluk and division—that this is perhaps impracticable.

M.R.R. C. RANGANÁDHA MUDALIYÁR AVARGAL.

I am now to deal with a more important question. When a compact town like Tiruppattúr is simply under observation, it is needless to retain the three circle inspectors. In fact, they serve as a postal medium between the divisional inspector and the circle peons, who are actual detectors of cases, and defaulters. The circle inspectors have been enjoying a holiday, since the town was declared free. The Special Plague Officer has also had occasion to notice their want of work and consequent laches and to warn them. In his absence, they are simply lords, with no one to control them. Their diary is stereotyped, with no instructive matter therein. It is not their fault, but the misfortune of the council, which has no voice, though it has to pay them from the taxes collected by scraps from a population already exhausted by repeated outbreaks of plague. I, for one, would, from direct and personal experience of plague observation duties of this town, urge that this idle staff be done away with and the duties be confined to the divisional inspector and the three circle peons. The keeping of a pony by the divisional inspector must be enforced. I know full well that the local circle peon is the real worker and not the novice of an assistant or temporary sanitary inspector of two weeks' training. Whether my view is correct or not, I would recommend, on the score of the impoverished condition of the Municipality, that the staff of circle inspectors, whose jurisdiction here extends over a few small streets requiring not more than 15 minutes' patrol, be abolished.

Passport-system.—Imperfect, ineffective, liable to and easy of abuse.

(1) No guarantee to the truth of the contents.

(2) False personation is in constant practice, but difficult of detection, especially among goshas, who are not seen by the passport-issuing officer or the local authority. Observation by a nurse or lady apothecary is no voucher for the identity of the party.

(3) There is considerable oppression and corruption at passport gates and in villages.

In fact, the passport-system has opened the main door for every kind of offence that could be committed by one entrusted with observation duty.

(4) It is a hardship, annoyance, undue restraint, worry, exposure, loss of trade and profession and waste of time for people of all ranks.

(5) The ignorant and illiterate are unintentional offenders under the Regulations.

(6) Females are exposed to various difficulties, in attending for observation at periods of indisposition, pregnancy, ordinary illness, mourning or religious ceremonies.

(7) The passport-system only serves the purpose of statistics, i.e., account of imported cases; the history of a case or an outbreak can be traced also. But these objects can be gained by other means, as in all other branches of administration, for instance, vital statistics, vaccination, crime account, accidents by animal-bites and the like. History is not far to seek.

Note.—To appreciate the above argument, one should, for the time being, entirely forget the very name “passport” and that the system was ever in operation and put one's self in the position of an ordinary health officer guarding the health of a town or village for the first time against an epidemic. The people, for their part, have learnt to avoid contagion, rather “contactism,” so much so that villagers forbid people from visiting an infected area or working for coolly there and do not admit others into house-holds, much less the emigrants from an infected town or village. The Hindus especially do this for all infectious diseases, such as small-pox and cholera. I, for one, would recommend the entire abolition of passports. A mere caution given by authorities, as in the case of cholera, and advice from influential ryots or citizens, who would themselves set an example, would serve all purposes. A general supervision by local authorities is all that is required. A register of plague attacks and deaths, as for cholera, would be enough for statistical purposes.

F. J. RICHARDS, Esq., I.C.S.

GROUP A (3).

(c) In almost every outbreak I have had to deal with, an imported case has infected the rats and the rats have infected the houses next door or next door but one. I despair of ever controlling rats. They seem to breed at a rate that compensates for their mortality, whatever it may be. Rat-catchers and rewards for tails are failures. Rats have no respect for caste or religion. But for rats, the Brahmans would be safe from infection which has attacked the Sudras, the Mubammadans would be safe from the Hindus. The outbreak at Vániyambádi in 1902 was interesting. Rat-infection was traced in two or three houses which adjoined each other. One hundred and eight houses in a block were at once disinfected, and the disease was stayed for some days. The rats, however, migrated south, and dead rats and plague cases were detected in the very house next to that at which disinfection had stopped. A further block was disinfected. There was again a lull. Then new cases and more rat corpses were discovered, once more next door to the last house disinfected. It was interesting to note that not a single case was traceable to either of these disinfected blocks after disinfection. The same sort of thing occurred in Daulatábád and Krishnagiri in 1903. Block-war evacuation and disinfection could not keep pace with the rats. In the latter case, an attempt was made to draw a cordon across the town and drive the rats out of one half, by putting tar and sulphuric acid to the holes they had made and thus saving the other half of the town. The attempt, however, failed and the whole town had, in the end, to be evacuated and disinfected. Rats undoubtedly migrate and carry infection with them. The intervention of a street is no safe-guard whatever. I have reason to believe they will travel considerable distances and infect all the hamlets round an infected town. My experience in villages is the same as that in towns. The incubation period of the plague bacillus in rats seems shorter than that in human beings, and rat corpses are generally reported, some days before there is any evidence that plague is indigenous. I can suggest nothing to check the spread of infection by rats. The only hope is to disinfect the dwellings where an imported case has occurred so promptly that there is no risk of the rats catching infection. But this is often impossible. One point I have noticed and that is that rat-spread infection generally spreads in one definite direction and does not radiate from a centre.

(d) The only other creature I regard with suspicion is the flea. In Hosúr taluk (which is of the same altitude as Bangalore), native hovels swarm with fleas and, even after disinfection, one's trousers get black with them, if one ventures into the disinfected houses. But it would require a scientist to pronounce authoritatively on the point whether fleas are capable of inoculating plague. The only remedy I can suggest is advance disinfection, which certainly has the effect of driving rats away and deprives the plague bacillus of the environment of filth it loves.

GROUP A (4).

(b) The popularity or otherwise of a hospital depends entirely on the individual qualities of the medical officer in charge. For this reason, the Jalarpét camp is an exception to my remarks above. Some people are actually sorry to leave it. The family tie and the preparation of food are two points of consummate importance in dealing with plague hospitals. There is much less reluctance to use them, if only patients and relatives can be assured that the patient's food will be prepared by his own relatives and that one of them will always be allowed to attend and nurse the patient.

GROUP B (1).

(b) Yes, by abolishing altogether the grade of supervisor and by modifying the rules, so as to increase the jurisdiction of observation and preventive circle inspectors, by limiting the jurisdiction of Special Plague Officers and by recruiting Special Plague Officers from the junior ranks of the Civil Service. The supervision of a Special Plague Officer should, in my opinion, be immediate and never by proxy. It would cost nothing whatever to Government to put junior Assistant Collectors in charge of plague operations, and they would in that capacity acquire a knowledge of the language and people, more thorough than they could possibly acquire otherwise. A junior civilian, attached for a month as Personal Assistant to an experienced Special Plague Officer, should be quite competent to undertake the duties of a Special Plague Officer. I do not under-rate the good qualities of uncovenanted Special Plague Officers. All I say is that junior civilians would be cheaper. The most essential feature of a good Special Plague Officer is ubiquity; each and every imported case should be personally looked to by him. Otherwise, circle inspectors and ambulance inspectors and medical officers are sure to go astray. To vest the responsibility of a Special Plague Officer in a Divisional Magistrate is dangerous economy. I have had to adjourn important magisterial cases (in the middle of my enquiry) at 3 p.m., in order to attend to plague measures 15 or 20, miles away and, on the outbreak of an epidemic, I have had to adjourn each and every case *sine die*. Parties concerned in cases, under these circumstances, have a just right to complain, and it can scarcely be called a satisfactory state of things for the administration of a division to be brought to a stand-still, because the divisional officer is called away on plague duty.

Supervisors and divisional inspectors too I have almost always found very unsatisfactory as a class. If the Special Plague Officer makes a point of personal supervision, the supervisors are superfluous. If the Special Plague Officer contents himself with office work, supervisors get too much power. For supervisors, I would substitute an assistant plague officer taken from the Revenue department, with the rank, pay and experience of a Deputy Tahsildar. Officers of this stamp are habituated to responsibility and the exercise of authority and are not likely to lose themselves. The tendency of a supervisor, promoted from the status of circle inspector or recruited from the Salt department, is to lose his head in an emergency and abuse his authority. I consider the system of paying plague subordinates highly, in consideration of the fact that their service is temporary, a failure. I fear, in many cases, the main idea of a freshly passed circle inspector is plunder. If each and every plague subordinate had a permanent footing and if his service were pensionable, he would have a strong motive for good conduct. Of course, if such a plan were adopted, it would necessarily be frankly recognised that the number of permanent appointments in the public service is too small for the work in hand. I do not claim that the Revenue department is immaculate, but the men of that department are certainly more reliable as a body for practical work than any other and they have an incentive to good work in the prospect of high promotion. If a rule were passed that no circle inspector should be employed who had no permanent footing in the revenue department, I think that the large allowances might be considerably curtailed. If the Special Plague Officer's jurisdiction is limited and the grade of supervisor abolished, the extent of circles, both observation and preventive, might safely be enlarged. Circle inspectors have really very little work, and nothing but direct supervision will keep them up to a sense of their responsibilities. A Special Plague Officer's jurisdiction should never exceed a taluk at any time, unless there are exceptional facilities of railway communication, and his hands should be free from other matters. A Personal Assistant is essential and a well-paid head clerk and storekeeper combined (on not less than Rs. 50) is almost indispensable. The clerical work of a plague officer has grown terribly in the past four years. With a Rs. 15 or Rs. 20 head clerk, he is sure to get involved in mazes of audit objections, and the worst feature of all is that supervision by diary tends to supplant supervision in person. Supervision by diary is a very poor substitute for personal supervision and encourages fudging. The diary should not contain more than a bare list of villages visited against each date (which can be personally verified by the Special Plague Officer by inspection of village registers) with a note of the number of plague cases and a reference to the special report, if any special report be made. The Special Plague Officer can judge for himself of the sanitary work of circle inspectors in village sanitation infinitely better than it is possible for him to estimate it from diaries.

(c) I have dealt with most of these points in the preceding paragraph. I would suggest that circle inspectors be graded on the same lines as revenue inspectors, with perhaps Rs. 5 per mensem extra in each grade. A pony or bicycle should be insisted on. Some men do better with a pony and others with a bicycle. Facility of road communication should be considered and the question whether a bicycle or a pony be maintained can be left to the Collector's discretion. The existing scale of pony allowance is, I think, adequate and not excessive; a smaller allowance could be made for a bicycle and an advance, given for purchase, recoverable monthly from the allowance. I do not approve of an extra allowance during plague. A man who will not do his duty without it is not worth his salt and the prospect of such an allowance tends to make inspectors get up false alarms, a procedure which affects the people harshly and makes measures very unpopular.

(e) The defect of the present system of training is that there is too much theory with too little practice. Moreover, the plague service is open to any one who likes to offer himself. There is no chance of selecting men with due consideration of fitness for the service or their antecedents. A B.A. in Sanskrit is not necessarily a good accountant and a B.A. in mathematics is not necessarily a good magistrate. I am not in favour of the present promiscuous training of any one who likes to apply. I would suggest the substitution of a stiff district examination in the Plague Regulations and the Plague Inspector's Manual, open to any men in permanent Government (or Local Fund) employment who volunteer for the test. A minimum of 80 per cent. of full marks should be insisted on for a pass. A week's hard drill in mixing lotions and disinfecting work under the supervision of the District Medical Officer should follow. The candidate should then be posted as an assistant, immediately under a Special Plague Officer of experience, in a locality where plague is prevalent.

ADDITIONAL QUESTIONS.

GROUP A (1).

(e) The examination of grain is of little use in itself, though I believe dead rats may be found in it. I am convinced that infection can be conveyed by means of bags of grain. I understand that desiccation by sun-light is efficient. The bags in which the grain is kept deserve consideration. They are frequently damp and dirty, and I would recommend that they should every one be boiled.

GROUP A (2).

(e) Inoculation has not been practised in my time.

GROUP B (3).

(a) Plague police are a necessary evil. It is not possible to get a good class of men. When, however, a village or town is evacuated, property is always in danger both in the town and in the fields among the huts. Generally, the police are placed at the absolute disposal of the Special Plague Officer. I have always found the Police department very willing to co-operate, and the arrangement has worked smoothly, particularly when good head constables are allotted to supervise.

(b) and (c) Street patrol and guarding the huts in which the evacuated villagers are put up should be their primary duties. I do not see how they can very well be dispensed with at passport-gates. It is surprising what faith the people have in the white tunic and red turban, whatever may be the faults of the wearers.

DR. W. J. LUBECK.

GROUP A (1).

In cases of plague, a solution of 1/500 is used for disinfecting the earthen floors of certain sheds. The solution is used freely and allowed to soak in.

Recrudescence, etc.—I cannot exactly say that particular houses or streets were so infected—but I heard that certain villages were attacked with indigenous plague, although disinfected and evacuated the year before.

GROUP A (4).

Attitude of the people as regards the Camps under Dr. Lubeck's charge.—Many natives cannot realise they are suffering from fever of any kind. Even a temperature of 104° F. is looked upon by them as merely "carriage heat" (literally, *Vundi Choodoo*—as they say). It is only when they are utterly prostrated that they think they are ill.

Suggestions.—Only the relations of plague cases need be detained for the full contact period of ten days. Those contacts, who have any disturbance of health, will, of course, be similarly treated.

Attitude of the people.—Their idea of plague is—the *lubonic type*. They cannot understand the other varieties and ascribe them to ordinary causes.

I have seen a few cases turned out into disused sheds, away from the inhabited quarters, in the villages of Kávérípet, Kódiyúr and Yádiyampatti.

GROUP B (2).

Passport-system.—I have no personal knowledge of this (*vide* Appendix VI-A), but I heard repeatedly that such is the case in many villages.

I have met with one case in Jalarpet, in which a healthy relative personated a sick passport-holder. The fraud was not discovered, until the patient died of plague. The responsible parties were duly prosecuted and convicted.

There were a few other cases also and, in each, there was a conviction and a fine.

(b) The following is a brief description of our re-booking system:—

Let A represent the passenger, who has a ticket for Jalarpet, but wishes to re-book to Kátpádi.

„ B represent the intimation clerk, who takes his address.

„ C represent the police constable on re-booking duty.

„ D represent the clerk on special re-booking duty.

B takes A's address at his final destination and hands him over to C for safe custody: after the examination of the train, C takes A (and any other passengers who may have been similarly re-booked) to the booking office. D, who has in the meantime received the intimation slip of A from B, gets A to buy a ticket to the destination marked on the slip. He then marks the number of the new ticket on the slip and hands A (and any others who are thus re-booked) to C, to be sure that he goes by the next train. The intimation slip is then sent on by post to the Collector or District Medical and Sanitary Officer of the district concerned (North Arcot, in this case). If any evasion occurs after this, it must be with the connivance of the police.

If re-booked passengers try to evade the Passport Regulations, by getting out at an intermediate station and walking the rest of the way, this evasion can be prevented by making Jalarpet a notified station (as far as the Passport Regulations are concerned), so that, in any case, they will be passported and our object gained.

CAPTAIN D. N. ANDERSON, I.M.S.

GROUP B (1).

(e) Yes. Men to be locally selected and trained by the District Medical and Sanitary Officer for at least one month. Instruction to be commenced shortly (say, six weeks or so) before the time plague usually appears.

R. C. C. CARR, Esq., I.C.S.

GROUP A (1).

(a) Sufficient attention is paid to this, and I would not recommend increased expenditure.

Disinfection is only useful, when it is done thoroughly and, under certain circumstances, this can be ensured, *e.g.*, in large towns and villages, where a regular disinfecting staff can be employed and controlled. Otherwise, disinfection is only partial. It may kill some germs.

I would, however, encourage disinfection by the people themselves. Bratties have not been tried here, but could be easily procured in villages for 'dropping' cases. In Bellary, we tried burning margosa leaves, and the moral effect was good.

I think each circle inspector must devote attention to disinfection, as soon as original cases are discovered. See also Regulation 69 of Plague Rules.

(b) By custom, the villagers disinfect their houses, when cholera or small-pox appears. They would do it for plague with a little encouragement, if simple remedies were used. They don't like "hospital medicine." Bratties seem an excellent suggestion.

In rural tracts, evacuation is the sovereign remedy, and, people go out of their own accord or with very little pressing, provided the weather is favourable. After evacuation, disinfection should be carried out. I would not enforce disinfection with perchloride in villages, unless it could be done under supervision. This does not apply to first cases—see above.

GROUP A (2).

Inoculation.—I don't believe in inoculation. The protection is temporary, the operation risky and the effects doubtful.

GROUP A (3).

Rats.—Rats are undoubtedly plague agents and, in very many cases, I have known of dead rats being found, even before the first reported plague case. I should always advise a rat-killing campaign. The remedy may be only partial, but it helps to stamp out the disease.

GROUP A (4).

Hospitals.—There are no hospitals in North Arcot, though patients have been treated in sheds. In Bellary, we had several plague hospitals, public and private. The Sirkar hospital is always unpopular. Our results in Bellary in treatment were most encouraging, nearly 50 per cent. of cases taken in time recovering. I tried to induce those who had recovered to speak words of wisdom to their friends and explain how they had been treated in hospital. The "*Civium ardor prava jubentium*" was too strong however, and the people thought they would be poisoned in hospital.

GROUP B (1).

Observation.—I think the result of all our expenditure under this head—and it accounts for nearly half the total cost—is very disappointing and I am sure the charges could be greatly curtailed without much danger. I am inclined to wipe away entirely the present net-work of inspection circles in rural areas. There would be some risk of course, but I think we must accept it.

The original scheme of observation and preventive circles is excellent in theory, but, when plague becomes fairly general, the staff has to be increased to such an extent that the local body paying for it is ruined. Communications, education and even sanitation in areas still free from disease are perforce starved. Everything is put on starvation diet, in order to leave enough for the circle inspector *et hoc genus omne*. The result is generally an empty exchequer and an unwieldy plague staff.

On the other hand, we cannot, at this stage, neglect precautions entirely. For towns and unions, I think careful inspection can and should be enforced and, for this, you must have a special plague staff. For rural areas, I would, at any rate, make my observation circles larger than at present and entrust the work to revenue officers. I will deal with this below.

The question of pay is difficult. I have no hesitation in condemning the present pay of circle inspectors. It is far too high, considering the class of men employed. In this district, most of the inspectors, who are local men, are clerks on Rs. 15. 17½, 20 and are now rolling in the riches provided by Rs. 70. Even the certificated man, who gets Rs. 75, has sprung from a low

class, and his training is indifferent. In fact, these outside men are worse than the local gumastah, who has at any rate a permanent link with his district and who can be held to his duty by fear of loss of pension.

The supervisor ought to be worth his present pay and I would not touch it. I found European and Eurasian Salt Assistant Inspectors made very good supervisors, but Sub-Magistrates of active habits do very well too and are of course more in touch with the people.

The assistant sanitary inspector (Rs. 25) in towns is often useless, but some man of his class is necessary and I cannot suggest any method of improving him. The disinfecting inspector has most responsible and very distasteful work. He should be paid accordingly. He gets Rs. 40 + 10: this is perhaps enough.

I think the District Medical and Sanitary Officer could train the local staff.

As regards (d), for the hot weather months, I would cut down extra establishments to the minimum. I think the Collector should have the power of closing circles and dispensing with the staff. He has now to get previous sanction through the Sanitary Commissioner. For rural areas, I would, as far as possible, employ local men who are already working there and who know the people. The inspecting staff never discovers cases, unless the village monigar helps them. The monigar is, in fact, the real reporting agency and, during jamabandi, I have endeavoured to drum into the ears of all the monigars in two taluks that their main duty in such cases is to report. Divisional Officers are doing the same elsewhere in the district. If the monigar will report at once, the *raison d'être* of a circle inspector vanishes. But it is generally admitted that all monigars will not report without some pressure. This can be applied by Tahsildars and revenue inspectors, and I would not interfere with this agency, though I would strengthen it. As soon as plague appears in a revenue inspector's firka, he should be relieved of most of his revenue duties and told to go from village to village in the infected area and do what the circle inspector now is supposed to do. Another revenue inspector would be appointed to assist in ordinary work.

Medical assistance should be sent to the village.

The objection is that the revenue inspector is not a trained sanitary inspector. This training—say a ten days' course with the District Medical and Sanitary Officer—could be made general for all revenue inspectors, just as the survey training now is. After all, it is very simple.

I would not bother the people more than could be helped. It is useless to issue passports, when an area is widely infected, at any place within that area. But this raises another question, viz., the passport question.

If this idea of utilizing the existing revenue establishments for plague inspection is not acceptable, I would leave the constitution of circles for observation and prevention in the Collector's hands, without fixing an arbitrary limit of 10 and 5 mile diameter, as at present. One or two extra men for a firka, to work under the Tahsildar of the taluk—with a supervisor to act as the Tahsildar's assistant, in cases where the outbreak is serious. But, when once plague is fairly scattered over a group of villages, I would leave them to the hospital assistants and not bother much about circle inspection. The towns in the neighbourhood can be guarded by the passport-system. The villages near by will guard themselves, as they do at present. To questions (p) and (q) above, I answer, yes. To question (r), no. To question (s), I have already answered, yes. I think we are wasting money to little or no purpose.

I do not know why we should not follow the lead of Bombay in this respect. For five years past, the Bombay Government has given up rural inspection by a big staff. Cases are reported for statistical purposes. Of course, many cases are not reported at all, but this cannot be helped. Our village agency is fair, except in zamindari areas, and the people should be encouraged to help themselves. Our costly interference with the daily life of the people encourages the idea, which is latent everywhere, that the paternal Government is to be looked to in all emergencies. Self-help should be fostered and the deadening influence of officialdom minimized.

GROUP B (2).

Passports.—This is a very big question and a report is being drawn up on a previous reference thereon. I think the passport-system has, taking it all round, proved very effective—but, of course, it is open to criticism. Blackmail is levied by the low-paid clerks and others who issue passports and, with a people who are predisposed to pay *mamools*, nothing better can be expected.

Passport-issuing at railway stations is essential and can be controlled; at road gates, frontier-stations and town gates, control is weak and the gates can be easily evaded. Again, the check over passports after issue affords many a loop-hole. The surprising thing is that so many passportees are properly examined.

I have no useful suggestions to offer. The passport-system is a necessary evil and we must endeavour to make it as easy for the people as possible. I think in villages passports might be handed to the village munsif at once and the village munsif would be responsible for the health of the passportees.

A. C. DUTT, Esq., I.C.S.

GROUP B (1).

(b) I do not think the number of men employed could be reduced, but would prefer to leave it to the Collector to distribute the men. Exact circles are not necessary, and the staff in *amindari* tracts, where the village officers are not paid by Government, should be double of what it is in *ryotwari* taluks.

(c) The circle inspector and the assistant sanitary inspector are, in my opinion, too highly paid. A young revenue inspector would take a sanitary inspector's appointment, if he got Rs. 55, including allowances, and the circle inspectors are not required to be any better men than a junior revenue inspector. A disinfection inspector could similarly have his pay cut down from Rs. 45 to Rs. 35.

A pony allowance is, I think, an advantage, as it enables us to insist on the inspector keeping a pony.

I am of opinion that an extra allowance during plague is productive of no good. It introduces an uncertainty in a man's pay and makes it to his interest to pretend to find plague cases, where there are none to be found.

(e) I do not think it advisable to have the men trained by the District Medical Officer. The training would probably be more efficient in Madras. I have no alterations to propose as to the length of the training undergone.

GROUP B (2).

(a) I would beg to suggest that a considerable improvement in the work of railway passport-issuing officers could be secured, if the permission of Railway Companies were obtained and the passports issued were regularly checked with the ticket-collector's books. To quote an instance, I may state that, on the 20th of June, the passport-issuing officer at Gudiyattam issued passports to 147 persons, while the railway books show that as many as 336 tickets were delivered at that station on that date from infected localities. We have, at present, no sufficient means of checking the work of our passport-issuing clerks. In Gudiyattam, on the date in question, 189 persons coming from infected localities must have gone without passports. This does not necessarily show that the passport-issuing clerk is to blame. At Kátpádi, at Tiruppattúr and at Vániyambádi, passports are issued to departing passengers, and it would not be necessary to issue fresh passports to persons who had passports already.

To be able to efficiently check the work of the passport-issuing clerk, it is necessary that one should require him to keep a book, showing the number of persons coming from plague-infected localities, who, for various reasons, were not supplied with passports.

MUHAMMAD HABIBULLA SAHIB.

GROUP A (1).

(g) There is generally a tendency on the part of the lower disinfecting staff to carry on the disinfection more according to the inclinations of the house-owner than according to instructions given. These men require a vigilant supervision and, so far as towns are concerned, such supervision is always at hand. As regards villages, I am not able to say anything.

GROUP B (1).

(a) Not certainly to the extent justifying the large expenditure incurred upon it every year.

(b) I do not think the observation staff can, in any manner, be regarded as unnecessarily large, but I consider it of doubtful utility. When any area is under observation and the full complement of staff employed therein, very little good has come out of it, in the matter of detecting or suppressing plague. An area, which has not had the benefit of such a staff and which has had equal dangers of infection, has in no manner suffered worse.

(c) I would condemn the grant of an extra allowance "on appearance of plague in any circle in his charge and up to one month after occurrence of last case," as it partakes more of the nature of a reward for the presence of plague. Its effect is not always free from suspicion.

(e) I would prefer the training of these men by the District Medical and Sanitary Officer. This will give an opportunity to the local men to be trained and be available for service in case of necessity. Their enlistment will considerably smoothen the working of plague measures, as local knowledge and influence are important factors in their successful working. A perfect stranger to an infected town has greater chances of rendering the plague measures unpopular.

(f) I consider that, besides the plague officer, who is invariably a European, it is also desirable to appoint respectable Eurasians and East Indians as plague supervisors. Work under such a system will be more efficient.

GROUP B (2).

(a) It seems to me that, of all measures for preventing the spread of plague, *passporting* is pre-eminently the most important. The defects in the present system may be largely laid at the doors of the passport-issuing officers, who are all ill-paid and uneducated men. Their pay and position must be improved and respectable persons appointed thereto.

M.R. R. VENKATAVARADACHARIAR AVARGAL.

GROUP B (1).

(i) The men selected for inspectors should belong to the permanent staff. Some of the amateurs who are now trained and appointed as plague inspectors do not feel the responsibilities attached to their offices and are incapable of discharging executive duties.

C. ATKINSON, Esq.

GROUP A (1).

(a) More care should be taken in selecting the coolies; known depredators and bad characters should, on no account, be enlisted. Before enlistment, the Station-House Officer concerned should be asked as to the character of the coolie to be employed. During the plague in Bellary, three known depredators were discovered among disinfecting gangs; two of these are in jail at present for stealing while disinfecting houses.

(c) More expenditure on supervision is necessary.

GROUP A (3).

(a) No. The rat-extinator, as used in Kolar, should be tried. Merchants should report when rats die in their grain godowns. Plague inspectors should inspect all grain stores regularly and report. Failure to report death of rats should be made punishable.

(d) Fleas. People should be made to understand this; there are many native medicines for destroying fleas, which might be used with advantage.

ADDITIONAL QUESTIONS.

GROUP A (3).

(d₍₁₎) I have seen hundreds of dead fleas on rats and cats which have died of plague. I should say this is a most important channel for the spread of the disease, both from rat to man and rat to rat.

C. J. M. BLAKE, Esq.

GROUP A (4).

(b) A pukka building would not be objected to, but caste prejudices should be strictly attended to. Sheds make veritable hot-beds of infection, unless each base has a separate temporary erection to be burnt down eventually.

GROUP B (1).

(b) The arrangements are all good, but salaries might be reduced all round, as capable hands would be procurable locally for even half the present rates.

GROUP B (2).

(a) and (b) There are defects, but the remedy is not apparent just now.

(c) Local men of status or pensioners should be employed as passport clerks.

ADDITIONAL QUESTIONS.

GROUP A (1).

(e) There is no doubt infection is carried through it, but chiefly by the gunnies. The grain should be exposed and the gunnies disinfected.

MR. G. O. D'SOUZA.

GROUP A (1).

(a) It is beyond doubt that disinfection by means of chemicals is a very effective process, but the question suggests itself when the manner of doing and the means available are productive of that efficiency. Disinfection is generally done by splashing the lotion on the walls with an earthenware vessel and having the floor saturated with the solution. The majority of village houses have mud and cowdung floors, which crack after a few days and furnish a hiding place, as it were, for the plague bacillus. Into these cracks the solution seldom penetrates. The bacilli lie dormant in the hot weather and fecundate or become virulent during the rainy season. If a plague microbe dies immediately it comes in contact with the solution, then the present mode of disinfection must be effective; if not, we must ascertain how long the microbe lives in the solution and the disinfection must be done accordingly. Some say that a plague microbe must be fifteen minutes in contact with the solution before it dies; if this is true, the mere splashing of the walls will not do, as the solution falls to the ground, after having merely wet the walls, and dries almost at once—especially in small native houses, the walls are smoked and the solution does not adhere to the walls satisfactorily. I have greater faith in sunlight-disinfection, by completely unroofing thatch roofs and making large openings in mud houses and letting the houses be thoroughly desiccated, by not being tenanted for six weeks. Besides, the sanitary staff have not that high sense of duty to do the work thoroughly and honestly. They become discouraged, when they have hundreds of houses to be disinfected and when they have to work from day to day. The roofs of houses in the Ceded districts are ever a nursery for rats; many of them die and get caught among the rushes and sticks and propagate the disease. Roofs are not disinfected. The staff require very close supervision, as it frequently happens that the inspectors black-mail the owners of houses and use plain water. The sanitary staff is recruited from a very low class, some of them being sweetmeat sellers and kerosine-oil vendors, and these generally do not scruple to resort to the lowest practices. If they are detected, they are prosecuted, but this does not interfere with their calling. The standard has fallen considerably from 1898, when the observation staff was first appointed in this district.

(d₍₁₎) *In rural tracts.*—Thatch roof to be completely removed and no disinfection by chemicals. Small compensation may be given for damage done, which can be met by the savings in labour, staff and chemicals. Mud houses, by opening of roofs partially and chemical disinfection.

GROUP A (2).

(c) If inoculation is really protective, which many doubt, the protection extends to the person of the inoculated only and not his neighbours, as his clothes may be infected and, if he were to go into a healthy village from an infected area, he may give the infection to others, while he himself is free, and we will have an indigenous case of a person who has never been in an infected area; so there is no knowing how the infection may be carried, and the Sanitary Commissioner will not have "indigenous", in a village where imported cases have not been reported before. No body ever thinks an inoculated person is capable of carrying infection, fortified as he is with a certificate of inoculation.

(d) As inoculation has been known to fail in many cases within my knowledge, it is well not to attempt to persuade people to have recourse to it by coercive measures. Let those who have faith in it get themselves inoculated.

GROUP B (1).

(b) Most certainly.

I would appoint the village reddis to be the plague inspectors of their respective villages. They should report direct to the Tahsildars. They should isolate and segregate and disinfect houses and clothing and see that contacts don't go into health camps. They should be trained for this purpose by the District Medical and Sanitary Officer and his assistant, who should go into camp at convenient centres in each taluk and convene the reddis and karnams and teach them the symptoms of plague which they do not already know and how to disinfect clothing and houses. This should be done practically by disinfecting a few houses—by turning a few thatched roofs and by disinfecting clothes, which may be had of a village dhobi. The people may also attend, if they so desire. Practical knowledge is what is wanted and not theory. It is of no use for a man to know the number of germs to a square inch. It makes him timid and he is not disposed, with this knowledge, to risk himself by going into evacuated houses. An ignorant ryot

will not be afraid to enter an infected house, while a plague inspector will think twice. Has a plague inspector ever brought his knowledge, acquired in a medical college, to the benefit of the plague-stricken? The reddis thus trained will be of more use than plague inspectors from Madras. They will be local men with more influence and more persuasive powers, knowing how to work on the feelings of their brother ryots by speaking to them personally in their own tongue, rather than southern people, whose advanced views are repellent to the primitive ryot.

(c) I would think Rs. 30 a decent pay for a plague inspector; his position is somewhat analogous to a last grade salt sub-inspector or revenue inspector or forester. They are generally clerks, and a passed candidate and a clerk never start life on more than Rs. 15. As the plague inspector is exposed to plague and to temptation, Rs. 30 would be a decent wage for him to live on comfortably. A clerk gets Rs. 30 after 5 to 7 years' service. If an unpassed man, he is either a union clerk, a passport writer or a bazaar man. One of my plague inspectors is a permanent union clerk on Rs. 10, but draws Rs. 70 on plague duty as plague inspector. Another man is a sanitary inspector on Rs. 17-8-0 in a union of the district. Now that he is on plague duty, he draws Rs. 70 for doing precisely the same work. After this, could any body urge that plague inspectors won't be available, if their pay and allowances are reduced? I would stop the travelling allowance of Rs. 15 now given them, as their travelling does not cost them a cent. They do not convey camp equipment from village to village and they do not expend a single pie of those Rs. 30 on travelling. They have each a pony, which is all they have. The pony allowance should be reduced to Rs. 10, as the ponies maintained by plague inspectors seldom cost them more than Rs. 5 for their upkeep, and the other Rs. 5 may be given for the outlay on the purchase. The plague supervisor draws Rs. 15 only as horse allowance and he is expected to maintain a large animal. Thus, Rs. 40 should be the pay and allowance of a plague inspector. Assistant inspectors should get a salary of Rs. 20 and should always be natives of the district or union clerks. In fact, it ought to be feasible to train the union clerks as assistant plague inspectors; their office work is seldom heavy, and most of the chairmen are influential men, who find no trouble in collecting the taxes. The post of union clerk and assistant plague inspector should be merged into one. The assistant plague inspector has little to do, when there is no plague. His pay should be Rs. 20 only. Both plague inspectors and assistant plague inspectors should be trained locally for their training period. It is an education which a man must pay for, if he wants to earn a livelihood by it. It is surprising how these men are paid training allowances without a question or murmur. A man comes here from Madras, he works for a few months and then finds out that the place is unsuited to his tastes or that he is being too closely watched. He resigns and the Sanitary Commissioner is telegraphed to to send another man. The travelling allowance of the resigned man is paid to his native place and the new man is also paid his travelling allowance for travelling up. Look at the unnecessary expenditure. He resigns and he should be made to go back himself. Even when the Collector gives him a month's notice, no travelling allowance need be given. It is a temporary appointment and they know that when they join. These rules of pay and allowances are peculiar to the Sanitary department!

ADDITIONAL QUESTIONS.

GROUP A (3).

(f) Yes, up to five houses' distance. That is, if dead rats are found to have fallen in a house, which had been afterwards evacuated, people are known to have been attacked five houses away, roughly 300 yards or so. Hence, when dead rats fall, a block of ten houses round the infected house should be evacuated.

COLONEL R. PEMBERTON, I.M.S.

GROUP A (1).

(a) Yes. I am of opinion that it is absolutely necessary to pay greater attention to disinfection; the majority of the houses in this district, even in the larger towns, consist of mud floors, and the roofs consist of mats and bamboos covered with mud; the houses are dark and ill-ventilated and the floors are, as a rule, covered with a thick layer of cowdung. It is impossible for the mercuric solution to penetrate the floors and to kill the bacillus, which thrives in the deeper layers. I consider that at least 6 inches of the floor should be removed, bratties or straw burnt on it and then the disinfectants well applied. The walls and roofs should also be thoroughly disinfected; in the latter will be found both the urine and excreta of rats, which are known to be rich in microbes and will always be a source of danger; the excreta falling from the roof will, in all probability, re-infect the house and, still further to minimise the risk of re-infection, light and air should be let into the building; after disinfection, all doors and windows should be kept open. It is also necessary to make openings in the roof; the mud could be easily replaced; bacilli, exposed to direct sunlight, are killed in an hour.

In the epidemics in Hong Kong, it was noticed that public latrines were sources of infection, and I consider it advisable that straw or bratties be burnt on the floors of all latrines once or twice a day, the floor then scraped and a disinfecting solution applied, sulphuric acid preferably; 1 in 1,000 would suffice.

(e) Admitting that plague is a soil-infection, it is useless to disinfect a house, without the removal of at least six inches of the mud floors; the floors contain a considerable amount of cow-dung and are, in all probability, saturated with organic matter derived from excretions of plague patients; thus, there is sufficient nourishment in the soil to maintain the vitality of the plague bacillus. I am of opinion that there is no *revivification*; the plague germs are in the floors of the house and, when the people return to their houses after several months, which generally happens at the commencement of the rains, the door, which is shut, is the only means of admitting fresh air and, with overcrowding, dampness of rooms and increased temperature, the bacillus re-infects the occupants of the house and probably, in addition to the above, the clothes are infected.

(f) Yes.

(f(1)) Yes.

(g) The staff employed to disinfect—in my opinion—are untrustworthy; in towns, there is a fairly good amount of supervision and there is very little scamping of the work; but, in villages, where the circle inspector is responsible for disinfection, I consider that it is neither done intelligently nor efficiently. When constant supervision is required in a town, you can hardly expect the same class of man in a village to do his work conscientiously.

GROUP A (2).

(a) The arrangements here in force are adequate and proper—there is always an ample supply of serum available; I am constantly trying to persuade people to be inoculated. Notice-boards were, for a long period, provided in two dispensaries, Bruce-petta and Cowl Bazaar, stating that the District and Assistant Surgeons would be present at the stations to inoculate those that are willing to be inoculated on certain days in the week, but I have not had a single application from a single person in the town, during the recent epidemic. The principal residents of the town have stated that they are unable to get any one to undergo the operation. In 1902, during the prevalence of plague in Bruce-petta, the late Chairman promised to assist in the matter; the outcome was that he compelled all the municipal employes and several of the mill hands (he being a director) to be inoculated. This was no doubt due to compulsion; none of the town people asked to be inoculated.

(b) The inducements are quite sufficient under the Plague Regulations.

(c) An inoculated person can only be considered to be harmless to his neighbours, provided the whole household are inoculated; otherwise, if there are plague cases in his house, he can be a means of spreading the disease, by infected clothing or rats going from his house to the neighbouring houses.

(d) It is, I consider, useless to persuade them; the general public do not believe in inoculation; the protection afforded lasts, according to authorities, only six months, and there is a certain amount of risk. The educated native knows quite well of the recent disaster in the Punjab. Plague has appeared in people after inoculation in this district and, under the circumstances, it is not likely the educated will persuade the uneducated to be inoculated.

GROUP A (3).

(d) I see no reason why bugs, fleas and mosquitoes should not be a means of transmitting the disease. Further, it is a known fact that, when a block is evacuated, all the rats run to the adjoining blocks, and these blocks get infected in turn. The only practical remedies are to destroy rats throughout the year and, when a house is disinfected, to have it thoroughly done, so that no insect can live in it.

GROUP A (4).

(b) I think they might be made more popular, by being constructed near the infected localities and the several castes having male and female attendants of their own castes; they might also be made popular, if the cottage system were in force and the several castes separated from each other; of course, this would be an expensive matter.

GROUP B (1).

(a) In rural areas, without the assistance of the reddy, it is impossible for a circle inspector to detect cases—as regards suppressing plague, I cannot say that they take a sufficient interest in their work. Everything is done in a most perfunctory manner. Recently, plague occurred in a village 14 miles from Bellary, several cases of plague deaths occurring every day; the inspector visited the village and disinfected a few houses. Instead of remaining in the village, the only one infected in the taluk, he left for the next village and made no report either to me or to the taluk authorities. The first intimation was received from the reddy of the village; if the inspector had acted with promptness, he could have suppressed the disease. What has now occurred? Several of the villagers have gone to non-infected villages and Bellary, and I anticipate fresh outbreaks in some of these villages.

(d) (I) If it is intended to maintain an observation staff during the hot months, I think it is absurd to keep the staff up to their full strength. I am of opinion that, immediately a group of villages are declared non-infected, the circle inspectors' services should be dispensed with at once. The dropping cases could easily be attended to by the village authorities, and a medical subordinate could always be sent from the nearest hospital to attend to all details as regards removing sick, disinfection and segregation. When plague has been severe in several villages and it is known that people have evacuated, the staff, I consider, should be kept up for about a month after the village has been re-occupied; but, if there are a few dropping cases, there is no necessity to maintain an expensive staff; the work, as stated above, could be just as well carried out by the village reddi. In Municipalities, it is unnecessary to maintain more than half the staff, and the services of all divisional inspectors could be dispensed with. There is ample supervision by officials in Municipalities. (II) As a trained nucleus for a preventive staff, there is no necessity to maintain it. All the men are supposed to be trained, before arrival in the district and, at present, there is no difficulty in obtaining men; so their retention is absolutely unnecessary.

(e) There is need of great improvement in the training of both the observation and preventive staffs at present. We get numbers of men, who have had 14 days' training by the Sanitary Commissioner and are sent to this district as trained sanitary inspectors. It is absurd to suppose that men can be trained in such a short period in all matters relating to plague and sanitation. I would suggest (if the present system is to continue) that classes be held in Bellary at certain times of the year for those desiring to qualify as plague inspectors. A course of two or three months would be sufficient. Only respectable men belonging to the district, with educational qualifications and good physique, should be permitted to attend the classes. They would have to attend lectures by the District or Assistant Surgeon and be taught practical work in the town in all matters relating to sanitation and disinfection. They would also be required to be trained in the preparation of the disinfecting solution and the method of disinfecting houses and all matters relating to all epidemic diseases likely to appear in the district. I consider that it would be a decided improvement on the present system of importing men from Madras.

GROUP B (2).

(a) The passport-system can be improved, by employing persons at toll-gates, who hold permanent appointments in the district, or, if these are not available, respectable pensioners drawing fairly good pensions and by giving them, in addition to their pension, good salaries. The present system of employing useless men on this duty, who have nothing to lose and everything to gain, is most objectionable.

I would also suggest that, during an epidemic in the district, every villager should be forced, whether he came from an infected or non-infected village, to obtain a pass from the reddi, which should give full particulars regarding his correct address and destination, and that every one without a pass should be turned away from any town or village he visits: the above will obviate false addresses being given at passport stations.

ADDITIONAL QUESTIONS.

GROUP B (3).

(c) The duties they are engaged on are—

- (1) to guard vacant houses;
- (2) to guard houses, to prevent patients and contacts being removed, until the house and its inmates are disinfected;
- (3) to assist in the removal of plague patients to hospital;
- (4) to assist in the detection of plague cases;
- (5) to patrol the town and prevent vacant houses being re-occupied, sick men being removed outside the town without permission and bodies being buried without a pass;
- (6) to guard plague hospitals;
- (7) to assist passport clerks, medical subordinates at toll-gates and railway inspectors: to let no one escape without a passport, if coming from an infected area.

ADDITIONAL NOTES.

All mud huts, before disinfection, had openings made in the walls or roof, according to the size of the room, to admit light and air, and then they were thoroughly disinfected. Perchloride of mercury was the principal agent used and, after every part of the building and every article in it was thoroughly saturated, the houses were swept and all rubbish collected in heaps and

burnt. In infected houses, four inches of the floor were dug up and burnt and fresh earth put in its place and again saturated with disinfectants.

Cost of disinfection in the Bellary Municipality, from November 1903 to June 1904.

	RS.
Cost of disinfecting staff, water carts, etc., for disinfecting houses	4,646
Cost of disinfectants	6,310
Total cost	10,956
Total number of houses disinfected in the town of Bellary	3,417
Average cost of each house disinfected	RS. A. P. 3-3-3.

M.R.Ry. C. S. SUBRAHMANYA AIYAR AVARGAL.

GROUP A (1).

(a) to (c) Disinfection can never be effective, so long as it is not wished for or courted by the people. The present method of forcibly disinfecting houses has not been of any use whatever. Holding as I do this opinion, which possibly may go against the current of plague official views, I can only state that the remedy does not lie in the directions indicated in questions (a), (b) and (c) of A (1).

(g) It is impossible to do disinfection work properly, in the teeth of popular opposition. The opposition is no doubt passive. The disinfecting staff is persuaded by various means to omit meddling with a great many articles of the house.

(h) Villagers do not like disinfection.

(k) Disinfection should not be forced. It should be declared to be optional with the people. A choice of various methods should be offered. The advantages of disinfection should be published in leaflets and distributed among the villagers.

GROUP B (1).

(b) A separate plague staff is a very objectionable matter. Towns threatened or infected with plague should have their normal sanitary staff strengthened (doubled or trebled) and special efforts made in the direction of general sanitary precautions. At present, the whole of the resources and energies of local authorities are consumed by "plague measures" and ordinary sanitary precautions and measures are given the go-by. Every plague-infected town or locality will be found to be in very great need of light and air, and it is a matter of common knowledge that the more filthy quarters of a town are more severely affected, and plague breaks out generally among a less cleanly population living in insanitary surroundings. Instead of Government compelling local bodies to spend their last pie on "plague measures" and also generously subsidizing these generally bankrupt local bodies, a complete change in its plague policy is absolutely necessary, if the spread of plague is to be combated with any degree of success. The temporary plague staff are absolutely useless, because they are temporary. They possess no local knowledge and have no abiding interests in the place. They do not hesitate to ill-treat or extort money from the people and they do not feel a sense of responsibility. They have nothing to look forward to and have no fear of the future. The permanent sanitary staff, strengthened as above stated, should do the plague work as well. If the plague has not yet spread to a larger number of places in the Presidency than it has done up to date, it is not due to the exertions of the plague staff but to the slow, steady and rather eccentric course which this disease takes.

(e) The training of the staff by the District Medical and Sanitary Officer for each district will certainly not be inferior to the ten days' training, which the temporary and certificated sanitary inspectors now receive.

GROUP B (2).

(a) Great changes should be made in the passport-system. I do not consider that the passport-system has in any way helped the prevention of the spread of the disease. I can also say with confidence that the passport-system has not helped in the detection of attacks at an early stage. Such passport holders as were discovered to be suffering from plague were discovered some time after the development of the disease and when it was no longer possible to conceal the attack. If any such cases have been detected, they are not merely due to the passport-system. I have heard many officials attaching very great importance to the passport-system and it looks as if it were one of the chief planks of the Government policy. But, if an individual had been asked to devise an arrangement whereby law-abiding people could be worried, brow-beaten, put to all sorts of inconvenience and left to the tender mercies of subordinate officials, he could not have done better than suggest one similar to this passport-system. In towns, where observation is done at the dispensaries, the hospital assistants are not always punctual in attendance and people

have to wait from half an hour to two hours before they are observed. In rural areas, where the observing officer is the reddi, who has absolutely no hours and who is far away from the ken of superior officers, the troubles of the villagers are too many. The passport-system may theoretically be correct. It may be a counsel of perfection, and considerable sums of money are spent, in the fond belief that it is doing good. The only places where it could be retained, with any shadow of usefulness, are at railway stations or at the entrance of large towns, where the in-coming people may be checked and observed. But, to establish a net-work of passport stations, in a district which is infected all over, seems to me to be quite senseless. If we maintain a very much larger staff on much better salaries than are given now, it is just possible to work the system a little less imperfectly. But I do not believe that the passport-system can be really of any use in the preventing of the spread of plague. It is impossible for superior officers to devote attention to these passports. It is generally done by clerks in offices and I believe in some offices heaps of passports have been left untouched and unchecked. A system which cannot be worked satisfactorily had better be abandoned. This is not one of those cases where half a loaf is better than none.

R. WAIT, Esq.

GROUP A (1).

(k) (I) Employ more efficient supervision. Do not allow any disinfection to be done except under such supervision.

GROUP A (4).

(b) I do not think they can ever be made popular. The employment of more competent medical subordinates in charge of them and the discovery of some really effective treatment will do something. At present, in a great many instances, the hospital assistants employed on this duty are inexperienced hands or are men sent for plague duty, because found unfit elsewhere.

GROUP B (1).

(b) The expenditure in rural areas could be very considerably reduced. Inspectors should be paid Rs. 25, not more, with a pony allowance of Rs. 7. An inspector does not need a travelling allowance, unless in charge of a large area. Very few inspectors are fit to be in charge of a large area. With this reduced pay, the number of inspectors might be slightly increased. I have yet to meet the plague inspector, who uses his travelling allowance for its legitimate purpose. As a rule, his peon or the village servants carry all that is necessary for him, on the occasions when he halts away from head-quarters. Revenue inspectors and police and salt subordinates are not allowed travelling allowances, though their charges are usually more extensive than that of a plague inspector.

(d) (I) An observation staff is useful during the hot months to deal with "dropping cases"; as already explained, I do not think they do much "detection."

(II) It is useful as a nucleus for actual plague work. They get to know the geography of their charges and the characteristics, etc., of the people. Superior officers are also afforded an opportunity of getting to know something of their subordinates.

(e) *Practical* training of all staffs is a great desideratum. Ten or fifteen days' theoretical training is of no use. I have found that all inspectors fresh from training, who have done no actual plague work, require to be trained and shown their work. This is especially the case as regards disinfection. I think that training under the District Medical and Sanitary Officer would be an improvement. The men would be more likely to have some individual attention paid to them. They should be trained for at least a month, in places where they can see practical work going on. They should then be required to pass a *practical* examination in all kinds of plague work. This would also be advisable in the case of hospital assistants newly posted for plague duty.

ADDITIONAL QUESTIONS.

GROUP B (1).

(t) (II) I am doubtful whether a reward should be given to native practitioners. It would need a much larger sum to induce them to speak, and they are liable criminally, if they don't, in any case.

(u) No. They are not being employed, as they are generally enemies of the hospital assistants, who interfere more and more with their practice. I do not think they would render the least assistance. Most of them, I think, by this time can diagnose plague perfectly, but they will not disclose it.

[THE LATE] M.R. RY. T. V. ANNASWÁMI MUDALIYÁR (RAO SAHIB).

GROUP A (1).

(a) Yes. I think the root of the evil should be reached. I believe in the phenomenal changes affecting the sub-soils and giving birth to plague germs. That rats are the first of the animal kind affected by plague points to there being some sense in this idea. Sunlight and other kinds of heat applied to the surface submerge plague temporarily. The recrudescence, when the soil regains its original moisture during the cold or rainy seasons, must be due to the fact that the latent plague germs in the sub-soil resuscitate. The disinfection, to be thorough, should be made somewhat on the following lines, viz., that the ground floor should be dug up, say a foot or two deep, soil removed and kerosine oil poured freely into the place, inundating the rat-holes.

(b) No; fifteen days' training makes a temporary sanitary inspector; three months' training a full-blown man. This remarkably short time probably brings out cheap editions of doctors. I am open to correction and would gladly leave the question to be dealt with by the indefatigable Plague Commissioner, but this much is certain, viz., that, if the local District Medical and Sanitary Officers were entrusted with the task of training men with a few initial lessons on sanitation, we should be able to secure the same kind of labour at almost half the cost. Exposure to danger cannot be an item in the bargain. We get ever so many menials to serve on the plague staff, and Government men, from Sub-Magistrates to police peons, have to render plague duty, whether they choose or not.

(c) What I have said under A (1) (a) should cost more, rather than less. In the interests of the people, it is advisable that the well thought out scheme of the Sanitary Commissioner should be adhered to and not departed from.

(d) and (d₁₁) The cheapest and most efficient of the superficial disinfectants is by burning bratties. Where a house can be made air-tight and is built of pukka materials, burning of bratties destroys not only the plague germs but every kind of animal capable of retaining plague germs. Sunlight and other chemical disinfectants cannot possibly produce the same results. Where houses are of kutchra materials, sufficiently isolated from other places of abode, and the buildings are not costly, the cheapest arrangement will be to burn them down.

GROUP A (2).

(b) No. Protection from plague infection should be the only inducement to be inoculated. Travellers, inoculated or not, should, I think, be subject to the same rules of observation, in towns other than their own. False personifications may land other towns in difficulties. I do not know if it has been established beyond doubt that plague serum introduced into the human body can be absolutely harmless, as regards others brought in contact with the inoculated men.

(c) It would be difficult to say. The safest course would be to segregate inoculated persons also in a special camp for the purpose for at least ten days.

GROUP A (3).

(a) By destruction of rats the spread of plague is no doubt checked, but the existence of plague in the sub-soil which they indicate remains unchecked.

GROUP B (1).

(c) The bicycle seems decidedly better than the pony. It is necessary that sharp locomotion from place to place should be provided for. Emergencies require that we should have extra men and not existing men with extra allowances. If the old trained hospital men are considered more useful in plague duty, they should be drafted into it and their places taken by other qualified men.

(f), (g) and (h) We cannot think of better men than Europeans for emergencies. Should the selection be made from men who have experience of native habits and customs, nothing could be more desirable than to secure the co-operation of Europeans. Military pensioners, who have lived long in the country, would make capital plague officers.

(k) Circle inspectors are as useful in plague cases, as police beat constables are in their village patrols.

(l) Attempts on the part of village officers to conceal cases will be frustrated by villagers having an independent officer to communicate with.

GROUP B (2).

(a), (b) and (c) There are four classes of passport-holders to be dealt with, viz. :—

- (1) Passengers completing their journey at junction stations.
- (2) Passengers making a temporary stay of a day or two at junction stations.
- (3) Passengers breaking their journey at junction stations for a few hours.
- (4) Passengers continuing their journey by connected lines.

Those coming under classes (1) and (2) should not be allowed to get out of the platform without a police escort to the addresses given. The addressees should be made to stand security for the regular attendance of the passport-holders at observation offices. The plague staff should nevertheless be very careful to spot false personifications.

In cases falling under class (3) above, the plague authorities should insist upon tickets being purchased for the next outgoing train and punch them at once.

Those continuing their journey (class 4 above) should be escorted by the police to the booking office of the connected lines and tickets purchased by them and punched at once.

General remarks.—(1) In spite of Government notifications to the contrary, there were several instances of the sale of tickets to forbidden stations, during the last Ekadási festival at Srirangam. Much inconvenience was felt in disposing of the passengers. Discretion had to be used very reluctantly. To turn passengers back, in the case of those who had no money to buy tickets, became a difficult job.

(2) Pilgrims had no definite addresses to give. They could only be kept outside the town, so long as they remained here, but there was nothing to prevent their being booked, when in a healthy condition, to other stations, where choultries were the only addresses they could be traced to. If, in addition to the usual authorised intimations being given, it could be arranged for free telegraphic messages to be sent, more timely and advantageous checks could be exercised over the movement of such pilgrims.

MAJOR T. FFRENCH.

GROUP A (1).

(d_(ii)) (I) In towns, where it is impossible to remove terrace roofs:—

(i) Have the infected houses emptied of all their *sámán*, things that can be easily carried being exposed to the hot rays of the sun on the flat roofs.

(ii) Have openings made (east and west, if possible) slanting downwards, at intervals, near the ceiling, so as to allow the rays of the sun to penetrate on the floor as much as possible.

(iii) Open all the doors and windows wide, to allow free circulation of air.

(iv) Sweep all the floors and have sweepings burnt.

(v) Deluge the floors with the solution and have it well scrubbed in with a rough "Bass" broom, with a long wooden handle.

(vi) Have the walls scrubbed to (say) three feet from the ground with a rough hand-brush made of cocoanut fibre (these were very well made for me, in Salem Jail, I think): these brushes fit on to the hand, like a horse brush, with a strap across the back of them. They should be dipped in the bucket of solution, before use.

(vii) All dirty rags should be burnt, cotton clothes soaked in the solution, silks and embroidery and woollen material opened out and exposed to the sun.

(viii) Blankets I consider a great source of infection and, if infected, they are apt to retain it more than any other article, owing to the fatty oil in them: they should, therefore, be burnt, if part worn and if they have been at all in contact with the floor.

(ix) The furniture should be treated in the same way as the walls.

(x) Grain, such as rice, ragi, cholam and gram, should be spread out in the hot sun and oil-seeds destroyed by fire.

(xi) Houses should not be allowed to be re-inhabited for a full month.

(II) In rural tracts:—

Where there are tiled and thatched houses, the only difference would be that—

(i) Tiles and thatch should be entirely removed and the latter burnt, if old or if dead rats are found in them.

(ii) All *sámán* removed to the fields to be disinfected, as already stated.

(c) No; I don't believe that plague germs, when once they come in contact with the solution, are only, as it were, temporarily paralysed and come to life again after a bit, as a fly does, when subjected to narcotic poisoning (provided, of course, the solution is properly made). My theory is that recrudescence of plague is generally due to perfunctory disinfection, that is to say that some germs might escape coming in contact with the solution, owing to being below the surface of the ground (even though not far below) and being subsequently brought to the surface again by frequent sweepings, after the house has been re-inhabited. *Ergo*, the necessity for seeing that the floor of the house is properly saturated.

(f) (1) Chinese wooden pumps were, I am afraid, a failure, as they were always getting out of order and, in fact, they were at last discarded.

(2) The substitution of cocoanut fibre brushes and the "Bass" brooms already described was found to be more effective and cheaper in the long run.

(3) Buckets should be either of wood or canvas, with a wooden bottom.

(4) For disinfectors, two suits of "dungree" coats, fastened with bone buttons or tape, and trousers (with a running string) reaching down to the heels.

Native shoes, long "pillow case shaped" coverings of "dungree" for the hands and arms and mufflers of the same material are, in my opinion, absolutely essential. These were of good quality, supplied, at my suggestion, from the Salem Jail first and then made up locally.

GROUP A (2).

(a) (II) More care, I think, should have been taken in sterilizing the needles.

I was very bad after the operation, and the medical officer himself, who had been inoculated, nearly got "tetanus" from the effects.

I should never advocate inoculation with "Haffkinine", while there is plague about, for I believe that, if one, by any chance, has the germ in one, inoculation with "Haffkinine" only makes one worse.

Now, "Yersine" is different and I believe in it. Plague broke out in my regiment in Mauritius, about three years ago, and we lost nine men in quick succession. The whole regiment was inoculated by the French doctors with "Yersine," and we had no more deaths.

(c) To the extent only that he may not carry the disease in him (although even this measure of success is not always certain), but it does not follow that he does not carry it in his clothes, especially if he has been a contact of a plague case.

GROUP A (3).

(a) No. I think not.

(b) Yes. More decidedly both.

(c) Yes:—more so *after* the commencement than *at*—

For the following reason:—When there is an outbreak of plague in a village, the villagers all turn out of their own accord or are made to. The consequence is that the rats that are affected, being disturbed by the moving of *sámán* and having nothing to eat, naturally go to the nearest uninfected village and infect it.

(d) No. Except crows and kites, from one village to another, and fleas, from one person to another in the same house.

It has often struck me that crows and kites are very often the cause of spreading plague, by carrying rats sometimes from one village to another and certainly from one house to another in the same village or town. I have seen this myself in Vániyambádi.

As regards fleas, "Butch" or "Vasambo" (the common sort, sold in the bazaar, well powdered and mixed with water), sprinkled all over a room, would kill them.

GROUP B (1).

(a) I think, on the whole, they were very successful, during the two years I was on plague duty and, I have no doubt, now also. But they want constant supervision and frequent surprise visits and, unless the plague officer has no other work but that to occupy him, it is bound to be a failure.

(b) Every inspector ought to visit each of his villages at least twice a week. It would be far better to give a man so many villages to look after, instead of a uniform circle of five miles in diameter; and the same with supervisors.

(c) This had better be answered by officers now on plague duty.

I would suggest that the training be not confined to Brahmins but to lower castes as well—as the former I found generally bursting with knowledge and ever ready to air it, but reluctant to go into houses occupied by the Pariah caste, when there were plague cases among them.

(f) Most of this information I found was obtained unaided by village officials.

GROUP B (2).

(a) I do not think that the present "passport-system" could be improved on, except that I think that Europeans belonging to the recognized professions and in Government service should not be laid under the same obligation as natives and Eurasians with regard to reporting themselves daily for medical inspection and should not be obliged even to apply for exemption, but might be made only to report their arrival in writing to the local authority: they could be trusted to send for medical help—should they feel at all unwell during the first ten days after their arrival from an infected area.

GROUP A (3).

(d_(i)) I am certain they do, in both cases (I) and (II), although I have no positive proof.

(f) Yes. I have known villages, shortly before they have become infected, being visited by an abnormal number of rats and, shortly after, neighbouring villages have become infected and the villagers of the latter have turned out, and this has very often been the signal for uninfected villages to evacuate; those, who have delayed doing so till too late (*i.e.*, till after the arrival of rats), have paid the penalty.

T. J. McCLOUGHIN, Esq.

GROUP B (1).

(i) I do not consider that there is a sufficient staff for the observation and detection of cases of plague amongst the travelling public. At a large station, such as Conjeevaram, during the recent festival, there were only two men to examine all passengers, each train bringing in from 400 to 500 passengers.

(m) Cases have come under my observation, in which plague inspectors have been rough in their manner towards passengers. In 1901, I reported a plague inspector at Tuticorin to the Collector of the district, but I was not advised of the result.

(n) I do not know of any European supervision on this line.

GROUP B (2).

(a) It appears to me that the public should not be put to the trouble and sometimes expense of presenting themselves at plague offices—Government should, in my opinion, send medical officials to examine persons, who have come from plague areas, at their residence; a person coming from a plague-infected area has committed no offence and I see no reason why he should be forced to attend at Government hospitals.

(b) It is not quite understood what the fraudulent re-booking referred to is; if a person has booked from a plague-infected area to any station, his first ticket identifies him and it should be possible to detect him at his first alighting station, which should prevent him re-booking.

(c) I am not aware that persons have given incorrect addresses.

DR. F. J. OLIVER.

GROUP A (1).

Disinfectants used.—The disinfectants used are those laid down in the Plague Regulations. I prefer, as I have shown elsewhere, steam or izal or cyllin.

The printed rule as to disinfection of clothes, for the guidance of the staff in the Medical department of this railway, is:—"Clothes should be soaked for one hour at least in 1 in 1,000 corrosive sublimate solution or 1 in 500 izal, then well washed in plain water and thereafter sun-dried". This is the procedure that would be applied, if a case occurred in any railway dwelling, with reference to the clothing, etc., of railway servants.

Treatment of Grain.—With reference to the infecting of grain with the excreta of infected rats, it should be remembered that, as Maassen has shown, in the dried excrement of rats, the plague bacillus can only live for one day and, in excrement kept moist, for only four days. But Hankin's experiments showed that on grain the bacillus can retain its vitality for 13 days! We have here an example of the exceedingly conflicting results of experiments and observations as to the natural history, etc., of the plague bacillus. Only a trained body of professional men can eventually, after going over the whole ground anew, lay down formulated knowledge regarding plague.

Recrudescence.—I do not think the bacillus of plague has any high degree of resistance. Indeed, there is every reason to believe it has only very feeble resistance in the parasitic or disease-producing stage of its existence. Such is the evidence of laboratory experiments.

Probably our efforts in soil and floor disinfection fail, because they are made so long after the bacillus has had a start, and the circumstances are somewhat like a stern chase—long and futile. Besides, absolutely nothing is known of other cycles in the life-history of the micro-organism.

A cow-dung floor, if dry, need not be as advantageous for the bacillus of plague as floors of other kinds.

Infectivity of patients.—I do not think sufficient is known to make a statement regarding the comparative non-infectiousness of bubonic plague, pure and simple. I think all that can be said on this question is that pure, unmixed, bubonic plague has not been found to be as highly infectious as the severer septicæmic and pneumonic forms. And, in talking of infection, we must always bear in mind the possibility of contacts and attendants themselves escaping (for a longer or shorter time), but communicating the disease to others who have not been themselves in contact with the case. The micro-organism has certainly repeatedly been found in the urine and probably will always be found, if properly conducted examinations of the excretion can be carried out. So also with reference to the faeces and secretions. These considerations should lead us to regard even bubonic plague as belonging to the category of dangerous infectious diseases.

Channels of Infection.—Here too no positive statement can be made. In the laboratory, merely placing a speck of infective matter on the shaven skin of animals has produced the disease, and

rubbing, without any force, the unshaven skin with infective material was found sufficient to inoculate animals experimented on. Infected matter (water, for example) can infect through the stomach or any of the mucous membranes—the eye, nose, throat, etc. Thus, dust would probably operate. In water, Burnet has shown the possibility of the plague bacillus living three months. I think we must regard skin wounds, etc., as only further facilitating the entry of the micro-organism into the body.

Sanitary conditions.—I do not think occupation or mode of life, so long as these do not expose one to actual risk of contagion, have anything to do with pre-disposing persons to the disease.

GROUP A (2).

Inoculation.—While I believe the Haffkine prophylactic does for a very brief period confer some degree of immunity in a person inoculated, I do not think popularisation of it (as at present manufactured) is worth pushing at great cost and trouble.

I do not think the case I mentioned of Mr. S. should be made public. The result may not be entirely due to inoculation; it may be the result of accident or of personal peculiarity. I do not think it would be right to raise objection to the principle of serum-therapy.

Inoculation of persons incubating for plague.—The opinion I expressed in this matter is that of Calmette. Bannerman does not agree with this. In this, as in other points, I have expressed what I am inclined to believe from my studies of the subject. My own practical working in plague is too inconsiderable for advancing opinion practically tested by myself.

GROUP A (3).

Rats.—There seems to be no reason to doubt that rats can spread plague.

Other animals.—The earliest experiments in connection with our modern knowledge of plague showed that most animals were susceptible—domestic animals especially.

GROUP B (2).

The Passport-System.—This system has failed in the great majority of cases to give "the authorities immediate intimation of the occurrence of plague"; one cannot but condemn it, after reviewing its working since 1897.

I do not think European first-class passengers should be exempted in regard to passports. It is among this class that we meet with the largest number of amateur doctors who do their diagnosis for themselves and who too often judge of the necessity or otherwise for segregation for their servants. It is believed that, in more than one instance (Bangalore and the Nizam's Dominions for instance), plague has been introduced into towns by the servants of Europeans.

Finally, I feel I must put on record my opinion that what is required for the control of plague, as of all preventible and communicable diseases, is a re-organisation and re-constitution on more common-sense lines of the Sanitary Administration of the Province. To go into this subject fully, on this occasion, is impossible. But the lines along which necessary improvements must be carried might be indicated.

A. Administration.—The source of advice to Government, on all matters of State Medicine, and the control of the entire medical and sanitary establishment and working should be in professional hands. The constitution of the details of this administration I need say nothing about. The establishment attached to this office should include a staff of medical inspectors, experts in special branches of medical knowledge.

B. Executive.—The districts are out of all proportion under-manned, very much more so than the other government departments of districts. The number of covenanted medical and sanitary officers should bear some proportion to the population. Medical and sanitary duties should be served by separate staffs, though working in association. And the upper subordinates (especially, sanitary inspectors) and menials should be very largely increased.

Each District Health Officer, who should be in the corresponding position to a County Medical Officer of Health in England, should have a proper laboratory attached to his office.

It is along these lines it seems to me that the lessons taught us by plague should lead us, if we are really in earnest to control not only plague but all other communicable diseases and to protect the health of the people for any reason whatever.

To accumulate a vast and tangled body of statistics, which are *ab initio* untrustworthy (for what we have is only as trustworthy as the original gatherers of the "events"—village accountants and vettians), and to endeavour to glean therefrom "truths", by which to shape the continually altering lines of policy and procedure, appears to me to be equally bad in theory, bad, as it has proved itself to be, in practice and bad for the future of the public health.

C. G. SPENCER, Esq., I.C.S.

GROUP A (1).

Unroofing.—I differ from Major French in this opinion (*vide* page 354). In houses which are badly infected and where there is a smell of dead rats, it will be well to take off all the tiles. In other cases, it is sufficient to remove tiles in broad strips, piling them as they are taken off on the portions left untouched. Then tiles get less broken than if they are put on the ground, and less compensation has to be given. Ventilation is half the battle and that can be ensured without ensuring that the sun's rays fall direct on every portion of the interior.

Disinfectants.—Disinfection should never be neglected, as I believe is done in outlying villages in Mysore. If the Mysore Government had persevered with disinfection, I believe that the Madras Presidency might this day be free from plague. Again and again, in the hot weather, we stamped plague out in Hosūr taluk (the only part of the Presidency, at one time, infected with indigenous plague) and again and again we got our border villages re-infected by the undisinfected villages in Mysore, as the country is open and people coming and going over the fields and paths could not be stopped.

Difficulties of chemical disinfection.—I think it is necessary to have a few Chinese pumps attached to every disinfection party, to lay the dirt on entering a house. Afterwards, scoops and brushes (made of aloes) may be used.

The loft generally contains the rubbish of centuries (as natives never throw anything away), which must all be taken outside in the sun and disinfected. When a deserted plague corpse is found in a house and has to be removed, I think sulphur should be burnt, as a preliminary to entry for disinfecting.

Recrudescence, etc.—Cases were common of persons, who had evacuated their houses, getting attacked in consequence of their going back to fetch some article out, even though there had been no cases of plague in that particular house previous to evacuation. Cases frequently occurred in the camps round infected villages, but always ceased after all villagers' cloths and stuff had been thoroughly disinfected.

Exposure of Grain.—The practice was to expose it for three days to the sun. At first, some grain was burnt, but this was a very unpopular measure and involved large compensation being given. Hides are sent in large numbers from infected areas to non-infected places at great distances such as Madras. Yet infection has not been set up. Government have steadily refused to hamper trade by prohibiting transport of grain and other articles, and I think the result has justified the decision.

Villagers often petitioned to be allowed to remove their tiles themselves, instead of its being done by sepoys or disinfectors, knowing they would themselves break less. They do not understand or care about ventilating their houses by building them with windows.

GROUP A (2).

Inoculation.—The syces and servants, who were inoculated before the epidemic broke out, certainly escaped in a marvellous way. It was mainly the Komatis and the miscellaneous classes who were attacked. I think sepoys and servants, etc., often owe their immunity to being better clad and wearing boots, and their escape is put down to the credit of inoculation.

(c) Only when his clothes and belongings have been disinfected.

GROUP A (3).

Rats: Their destruction.—Very little was disbursed in the shape of rewards for dead rats. Indian rat-catchers are not thorough. They only catch a few. Rat-traps were distributed in Hosūr and Matigiri, but little used.

Other Animals.—A dead donkey was found in an infected and unroofed house at Jibi. The death of two horses at Mattagondapalli, from what the stock inspector, Civil Veterinary Department, certified to be anthrax, was followed by an outbreak of plague in that village, the first case being that of a girl who had been playing near the dead animals.

GROUP A (4).

Plague Hospitals.—I have known relations of sick plague patients nurse the patient till his death, without a thought of the risk to themselves, but, as soon as he was dead, they would not go near the corpse and left it to the plague staff to bury. I suppose the danger to them was as great during the life as after the death of the patient.

GROUP B (1).

The Observation Staff.—In no case should a sanitary inspector be paid more than the lowest grade hospital assistants on plague duty. Otherwise, there is a fertile field for jealousy. Sanitary inspectors on disinfection duty should be paid more than those posted to circles.

(j) One case was discovered in which the village munsif concealed an outbreak of plague and threw the plague corpse into the river. In other villages, they hushed it up till it could be no longer concealed, thus causing the outbreak to be more spread than it would have been, if reported and dealt with at once.

(m) Complaints were received of extortion by the disinfecting staff rather than by the circle inspector. The complaint was that, if the villagers did not give the disinfecting coolies money or supplies, the latter threatened to break their tiles, when they took them off.

(o) Villagers understand little of the danger of infection by contact with outsiders and their clothes. In some cases, plague has been spread, by the clothes of persons who have died of plague being sold cheap in healthy villages. However careful the better class of villagers (agriculturists and others) are to keep out people from other villages, there is always in every village some one careless and mean enough to make a miserable profit at the risk of introducing infection. The class of petty traders who visit shandies, buying here and selling there, their whole capital not exceeding a rupee, are a great source of danger. Then too the native desire to always go and visit sick relations (however distant in degree) frequently ends in the healthy person returning with infection on him and infecting a hitherto uninfected village. Small articles of food, betel-nuts, clothes, etc., are exchanged and smuggled in, with an utter disregard for the health of the community. It is to bring home to such pests of society the responsibility for their action that I should propose a disinfection-cess, to be legalised by legislation, to be imposed on all house-holders in a village infected with indigenous plague, at a higher rate for these houses in which actual plague cases occur and a lower rate for others that have to be disinfected on account of their propinquity to infected houses. Out of this fund, I would maintain the disinfecting staff and pay for compensation for unroofing houses in all taluks infected by indigenous plague.

GROUP B (2).

The Passport-System.—The railway authorities have since looked into this [*vide* page 311] and promised to see that no more delays occur. The delay occurred in the guards taking on the intimations.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c) I think that Mr. Grimley's circular, if introduced only to remind everybody of the necessity for killing and burning rats found in imported grain, is good: if it is intended that grain should be detained in every case where it comes from an infected area, until the medical officer can come and disinfect, it will only be harmful and cause inconvenience and dislocation of trade.

M.R.RY. JAGANNAYAKULU NAYUDU GARU.

GROUP A (1).

(d) There seems to be no absolute value in desiccation by burning bratties, for it cannot kill the germs that may be sticking to the lofty portions of the building. The air in the building may be raised in temperature by burning bratties with the help of coir and other combustibles and this may kill the bacilli within two feet from the ground. The remaining parts of the buildings should, however, be treated with chemicals. Desiccation by burning bratties cannot be done in bungalows and good buildings without spoiling the furniture and walls, etc. This does very well in rural parts, where the houses are generally built of mud and jungle-wood. Desiccation by sun-light can advantageously be availed of, when the sun is powerful. Desiccation by the use of chemical disinfectants seems to have effect, if the lotion prepared and used is of the required strength; it is not freely enough used generally.

GROUP B (1).

(h) As plague has become a common disease, it is easier to get hands on smaller pay. The pay that is given to a circle inspector is Rs. 75, which includes an allowance of Rs. 30. I think it may be curtailed to Rs. 50 (35 + 15). The pay that is allowed to an assistant sanitary inspector is Rs. 25 and it needs no alteration.

(c) Proper pay for the observation staff may be fixed as follows:—

	Pay.
	Rs.
Plague supervisors for rural areas	75 (Rs. 60 + 15 allowance)
Circle inspectors	50 (Rs. 35 + 15 ..)
One pice to each, at Rs. 7 per mensem.	

A consolidated allowance seems quite sufficient. Any other allowance seems superfluous.

GROUP B (2).

(a) Improvement is necessary. Generally, intimations (triplicate copies) are received a day or two and sometimes even later after the arrival of the passport-holder. The passport-holder leaves the first place and goes to another, before the intimation is received. In this way, the passport-holder is undetected, if he wants to evade observation.

In several cases, persons wishing to evade passport rules give false addresses, and sometimes the passport-issuing officer cannot prosecute them for want of evidence and must generally let them go, though he is doubtful of the genuineness of the addresses given. It would be better, if the passport-holder, who is suspected of having given a wrong address, be asked to furnish a surety. This procedure, though it may cause some inconvenience and hardship at the outset, will, in the end, make the people give correct addresses. The rule should only of course be worked in really deserving cases.

Until a village is declared as plague infected and notified accordingly by the Collector, passports are not being issued to persons who leave the village. Permission may be granted to the taluk official, when he first finds the village infected, to order the village officers to issue passports to persons leaving the village, without waiting for the orders of the higher authorities. It is generally found that, when a case is detected, villagers take the earliest opportunity to flee to other villages, to evade observation, and in this way infection is spread from place to place, if steps are not taken to observe such persons.

M.R.Ry. M. V. NARÁYANASWÁMI PILLAI AVARGAL.

GROUP A (1).

(a) The work of disinfection requires to be very carefully supervised. The temporary sanitary inspectors, who have to do this work in all rural parts, are, I think, as a class not to be relied upon to do it thoroughly and well. They are temporary men and, with the cessation of plague, they are deprived of their means of livelihood. It is therefore not to their interest that plague should disappear altogether. In Pamidi, where there was plague in 1902, there was a lot of complaint that this work was not done properly. Again, in Kalyandrug, this year, myself and the District Medical and Sanitary Officer inspected some houses disinfected by the temporary sanitary inspector. It was found that the work was done very imperfectly. There has been plague this year in some places and this was not due to importation. This is probably due to imperfect disinfection. Plague appeared in several places in this district in 1898 and several very stringent measures were taken to stamp it out. The measures taken were effective and the disease was stamped out altogether. It did not re-appear, except by importation. This has not been the case of late. It seems to be probable that this is due to inferior agency employed in disinfection work. My opinion is that too much attention cannot be paid to this matter, which is the sole means of eradicating the disease. Temporary men, as a rule, do the work unsatisfactorily.

There is another reason why disinfection, as it is carried out, is not thorough. I refer to disinfection of towns and villages, after they have evacuated. The Plague Regulations, as they stand, do not, I think, permit of the authorities breaking open locks put on evacuated houses, whose owners are not to be found or are not willing to open them.

There were several such cases, which occurred in Uravakonda, and there was considerable delay in disinfecting the houses. I submit that disinfection, to be effective, ought to be done not only thoroughly but also quickly. It is no use disinfecting houses in a town, leaving some here and there untouched. On this account, all the houses in Uravakonda had to be disinfected a second time. Disinfection of houses is made as they get infected, when there are only isolated cases of plague in a town or village, but, when plague takes firm root and wholesale disinfection of houses has to be made, it ought not, I consider, to be commenced, until the village has been completely evacuated and, even then, not until all the houses are available for disinfection. For this purpose, it is necessary that officers, not below the rank of a Sub-Magistrate, should be given the power to break open locks in the presence of panchayets, after a week's notice by beat of tom-tom; make lists of property and secure them. Ordinarily, the property left behind is small and of little value.

GROUP A (3).

(a) to (d) Attempts made hitherto to induce the killing of rats by the offer of rewards before infection have failed. The rewards must of necessity be small and the difficulty of catching them disproportionately large. I should think that, when wholesale disinfection of a town takes place, it would be well to catch rats and bandicoots in traps and destroy them in each house before disinfection. It is my belief that rats are not killed out at disinfection. They escape from houses at disinfection and return after it. They may also migrate into health camps. In a village in Uravakonda division (Janardhanapalle), house rats were found dead in the health camp. This ought to be prevented and I consider that as many rats and bandicoots in an infected place as possible ought to be destroyed. In Anantapur, three cats, three squirrels and a monkey were found dead. It is presumed that their death was due to plague. They do not spread infection as much as rats, and no special measures are necessary to destroy them.

GROUP B (3).

Plague Police.—Of control over them there is little or nothing. There are no special orders as to who should supervise their work and nobody does it, I think. It cannot be denied

that people ask for a police guard, when they leave a village or town, but they repent it afterwards. There is no doubt, however, that, if there are no policemen employed in evacuated villages, more thefts will be committed. What I mean to say is that, if they did their work properly and did not themselves commit offences, they would be a great help to the people. In such a case, more than half the reluctance of wealthy men to leave their homes could be got over. To make them do their work properly, I would put them exclusively in charge of the Revenue Department—officers of the ranks of Deputy Tahsildar and upwards.

E. P. WALSH, Esq., I.C.S.

GROUP A (1).

(d) Burning bratties has the merit of being easy and popular, with no suspicion attaching to it. It is the only method I know of, by which anything can be done towards disinfecting a straw roof or rough mud wall properly. Its value as a germicide is I think small.

(e) I have had no experience in this district of recrudescence of plague from revivification of plague germs. In Hindupur town, the recrudescence was clearly traced to Santebidanúr, which was infected from Choulúru, which in its turn was re-infected from Mysore. In Salem, I saw one or two villages re-infected without apparent cause. It was suspected in some cases that stores of grain were buried underground and that these gave rise to the fresh outbreak. I never saw the theory confirmed by the discovery of such stores in the villages. I think the plague germ can be dormant and revive in a village. I should say it is not a question of time but of temperature. I cannot say whether germs could revive in the second or third cold weather. There is no doubt the hot weather nipped the plague in Dharmávaram, which broke out just before its commencement. The town was not evacuated and I expected to see plague burst out as soon as the weather cooled. As Anantapur and other towns and villages in the district are now infected, it will be probably impossible to decide, if there is recrudescence at Dharmávaram, to what it is due.

(k) (III) The only plan is to work from the educated to the uneducated. Hence, the village officers and schoolmasters are the first to teach. It may be impracticable, but I do not see why a leaf should not be taken from the missionaries' book in this matter. I should suggest that some large brightly coloured posters, picturing graphically the spread of disease by rats, infected clothes, etc., the effect of disinfectant perchloride of mercury, etc., and the benefits of evacuation might be printed and taken round by plague and Government officials on their tours. They should explain them to the villagers and, if they seem intelligent, hang up a copy in the *chavadi* or in the school-house. As most of the people are illiterate, a few words in the vernacular, briefly indicating what the picture is, would be quite sufficient. In large places, I don't see why Magic Lantern lectures might not be given. I believe a special officer employed simply in popularizing plague measures might pay, but the people would trust local officials more.

GROUP B (1).

(g) I have noticed that disinfecting coolies work for much less here than in Salem, where they had in some places to be paid 8 annas a day. It has to be remarked that they had unroofing work to do there, which was exceedingly dangerous, on account of the cuts received by the tiles. Hence, the mortality was very high. On the whole, I think they work as well as can be expected.

GROUP B (2).

(a) I have noticed a serious drawback in the passport-system, but I can suggest no remedy. On the first indigenous infection, the inhabitants rush from the village. The Taluk and Divisional Officers are often there on the first day and order the issue of passports, but strictly this order is illegal and persons not taking passports cannot be convicted until the village is officially declared infected. This takes as a rule two days at least, by which time the place is empty. Fortunately, in most villages, the people do not understand the law on the subject, but they may discover it at any time. Unless a proclamation ordered by the Taluk or Divisional Officer were taken as legal notice, this cannot be helped and there seem insuperable difficulties in altering the present system.

MAJOR F. J. CRAWFORD, I.M.S.

GROUP A (1).

(a) My views here can be summed up *en bloc* as follows: disinfection, as carried out by non-medical hands under the present system, is more or less a farce. I refer to "chemical" disinfection. Even in the hands of hospital assistants, it is too liable to be perfunctory and the

term "perchloride of mercury" to be regarded as a fetish, the presence of which in the neighbourhood of plague germs is sufficient to destroy them. To adequately apply this form of chemical disinfection to a house or ground, a thorough soaking must be carried out and this at a very large cost in material and supervision. No one under the rank of Assistant Surgeon could do it over a large area. One has only to see the arrangements in a hospital for this purpose, to understand the extraordinary minuteness of detail necessary to ensure the destruction of disease germs. Rule of thumb is fatal to the system. On the other hand, some rule of thumb is necessary in giving orders to subordinates in dealing with certain eventualities and the simpler the better. Evacuation, exposure, scraping and burning are, in my opinion, the measures most likely to be efficient in tackling plague. The floors of infected houses and the surrounding ground should be well scraped and the scrapings burnt or otherwise dealt with. This plan would obviate the large expenditure at present incurred. The supervision need be small. An order given in the morning to deal thus with a certain number of houses could be carried out in a few hours and an evening visit would insure that the work was done, while, with chemical disinfection, the presence of skilled supervision the whole time is essential for each individual habitation. The opinion is almost a certain one that plague germs require frequent revivification with living bodies for their existence and that they cannot for any length of time exist without this. If chemical disinfection were successful, cases would not occur, as they did, in which plague broke out when people returned to recently disinfected houses.

Skilled training involves the gradual imbibing of principles, in such a way as to insure certain results from their application. It cannot be done in a few months.

The disinfection of clothes by the steam disinfector is of the first importance, as this is practically the only way of dealing with such articles, as well as bedding and clothing of all kinds. The moist heat is most effectual and the articles are returned to the owners, while they wait, in a perfectly dry condition ready for use. For this purpose, however, the proper machine is necessary, as a vacuum has to be produced, before the moist heat is applied. I have seen these working at home too and they are in universal use in dealing with infectious diseases in large towns. All contacts and suspicious cases should be treated so.

GROUP A (3).

(d) Other animals exercise some influence in the same way, but our information on this point is too meagre to allow any forming of opinion in the matter. More attention should be paid to the destruction of dogs in Municipalities.

GROUP A (4).

(a) They were fairly popular after the first scare. We made them popular by encouraging the visits of visitors, especially clergymen of all denominations. By taking an interest in the cases individually in hospital and in the visits of their friends, the medical staff acquired their confidence. This is, in my opinion, long and away the best plan to adopt for the purpose. Nothing encourages the people more than this. It is a vast mistake to build plague hospitals far from the scene of operations; people imagine that the mere going there means all sorts of mysterious treatment, which the authorities are anxious to hide from the light of day. A properly constituted plague hospital is about as safe a place to be in as possible, and the chief residents of the town should be induced to recognise this, both European and Native. There is no comparison, for instance, between the infection possible from a small-pox hospital near a town and that from a plague one. We know that the infection in the latter is not carried any distance. Special arrangements would of course be made for the treatment of pneumonic cases. The gosha plague hospital in Ootacamund was conducted in the very middle of the town.

(c) I have always found Native gentlemen willing to co-operate in providing accommodation for their compatriots, especially Muhammadans. Everything depends on the way they are approached in the matter.

GROUP B (1).

(a) Very little. The house-to-house inspection, which is the essence of detection, was not effectively done at all. I don't think this is much blame to the ordinary plague inspector. I feel sure, from my experience, that this duty will only be looked upon by householders as even tolerable, when done by medical men, who they know have their good at heart. It is so obvious that, when an inspector goes to a house, he goes for the purpose of finding plague cases, while, with a medical man, there is, at all events, the apparent intent of finding and treating cases of ordinary illness as well. This has frequently been proved in Ootacamund. This important duty should, much more often, be in the hands of hospital assistants. Not only are cases of illness found in houses in this way, but valuable information is obtained of illness near by. The prejudice against medical men carrying out house-to-house inspection is in most cases small, but instances are many where loud complaints have been made against plague inspectors performing it. The medical man too is accustomed to deal with sick people and can smooth the prejudice against plague hospitals in many ways not necessary to detail. But hospital assistants should be more liberally dealt with on this duty. In nearly all cases, they draw less pay than inspectors, when similarly engaged, and this increased our difficulty in putting them on the work. They felt it was a punishment. On my rounds, I have actually

found dead bodies in enclosures, which the inspectors should have informed us of. I had an isolated building in my hospital compound set apart for doubtful cases, and this could have been more extensively utilised, if I had been assured that a medical man had seen the cases, before they were removed from their houses. I need not point out the great difficulties in early diagnosis in this disease, particularly the non-bubonic forms of it.

(b) My views are sufficiently detailed above. In Municipalities, the staff would consist of hospital assistants and gangs of labourers, while, in rural areas, there would be travelling hospital assistants within each village, a certain number of labourers recruited locally under the headman, to be called on when necessary. With my simple form of dealing with infected houses, disinfection would be deprived of its terrors. A revenue official should also be available in rural areas, to help in obtaining labourers and in exercising the necessary influence over the headmen. A small addition to his pay, when so employed, would satisfy him, especially as he would have no actual plague work to do or run any risk. He would not be required in all cases of course. If the hospital assistant were liberally dealt with, he could cover a lot of ground in the day and, as I said, his presence would be only necessary to give the order and to return after some hours to see that it had been carried out. This system would result in a great saving in the end, with, I consider, added efficiency.

The District Surgeon should be, *ex-officio*, a member of the District Board. No District Surgeon has been a member of the Nilgiris Board for upwards of two years. It has, therefore, been impossible for him to back up his recommendations and suggestions. In Municipalities, the maintenance of registers of bazaar residents is of the first importance. They should be kept up by the municipal sanitary inspectors, and all new arrivals carefully noted for observation. From my experience, I do not consider there would be difficulty in making them a valuable means of checking the entry into the town of people from infected localities. If cases of disease occurred among unreported new arrivals, the blame for remissness in originally reporting them could be fixed on the defaulting inspector, and punishment would follow in appropriate instances. I don't think that sufficient attention has been given to this means of gaining early information of plague cases. The usual supervision would, of course, be exercised over the registers and they could be checked by any other sources of information available.

(c) If men are recruited, as at present, without prospects of regular work or pension, I doubt if the pay of plague inspectors could be lessened to any extent. A pony allowance is necessary in the rural areas, not in Municipalities. The regular staff of sanitary inspectors should of course do their work during plague times, as in ordinary times. It is to some extent their fault, if new arrivals are not taken note of and observed and the entry of the disease into the town thus prevented, as far as lies in their power.

GROUP B (2).

(a) This is the most difficult part of the whole problem of plague administration, the trick of giving false names and addresses being so prevalent. It is such a simple plan to give a false name and address, when travelling, that the large majority of passport holders escape scrutiny altogether, in places where no railway exists. I feel sure the time must come, when each town must be contented with protecting itself, that is, where a town is threatened, the local authorities must passport everyone coming into it and make its own arrangements for observing them afterwards. This, with the maintenance of registers of residents and new arrivals, will be recognised as the only effectual means of early detection and it will also result in a notable reduction of the present enormous establishments. It would obviate too the present huge correspondence regarding passports and the movements of holders. How can holders be traced, if they give false names? The machinery to do so would be ruinous and, in the end, ineffectual. Persons found in the town, who could not give an account of themselves, either as residents or as passportees, could then easily be noted, in conjunction with the sanitary inspectors, and their registers. This takes into consideration the possibility of new-comers evading the passport issuing offices, which is relatively a simple matter, as we found in the Nilgiris. The people, in fact, who are easiest to trace, are those also from whom the least danger is to be expected. Under the present system, I don't believe any appreciable proportion of cases of plague are ever detected at all, while we have all the expense and trouble of maintaining a costly establishment in every district. The police could not be trusted to investigate cases of false addresses for obvious reasons. It is so easy, for instance, in a district like the Nilgiris, to evade the passport rules or for personation to take place at the checking offices. This scheme would require elaboration, if adopted.

ADDITIONAL QUESTIONS.

GROUP A (2).

(c) Chiefly in the Municipality, though, in one instance at Neduvattam, where the proprietor of an estate took a strong interest in the matter, I obtained, with some persuasion, a number of the employes to undergo the operation. The total number inoculated was 256, and no ill-results followed of any consequence.

GROUP B (1).

(i(i)) For some months now in Ooty death certificates have been insisted on in every case. A special form was drawn up by the Chairman and myself, and all medical men in the town submit these in as complete a way as possible. They are regularly checked by us, when deaths are reported. Copy is attached. I do not attach much importance to the plague staff (except the medical portion of it) examining dead bodies. During life, the difficulties of diagnosis are serious enough: after death, it is almost impossible to diagnose plague, without bacteriological examination.

We have experienced no difficulty in obtaining these certificates in every case.

(i(ii)). I think the Municipality should have more power of entering houses under ordinary circumstances, apart from the plague regulations. These latter give sufficient authority, when plague is actually declared.

OOTACAMUND MUNICIPALITY.

Death Certificate.

1. Name.
2. Age and sex.
3. Residence (door number).
4. Cause of death.
5. Date and hour of death.
6. How long ill.
7. Was the case attended during life by the under-signed?
8. If so, for what period?
9. Was the case attended by another medical man?
10. Did deceased arrive from an infected area?
11. Are other persons in the house ill? State the cause.
12. Any other recent deaths in the house? State the cause.
13. Any other information available.
14. Remarks.

Signature

CAPTAIN P. C. GABBETT, I.M.S.

GROUP A (1).

(d) Evacuation, exposure to air and sunlight—a thorough cleaning and destruction of rubbish, soaking of everything likely to be infected in perchloride of mercury, when this can be done without injury. In some cases, such as grain, we can only confiscate the grain (or other article) and expose it daily to sun and air for a fortnight (taking care that it is stored in a rat-free godown) and then return to owner. I am sure that a thorough spring cleaning with soap and water and having a house open to sun and air and evacuation for a fortnight would, without using any disinfectant, render safe any house, where dead rats had not been found. By a "spring cleaning", I mean a thorough turn-out, according to the ideas of an English housewife. If dead rats are found, holes must be dug up, roofs removed, etc.

(e) Not at all. Never. If it lives, it lives on in the bodies of animals—human or other.

GROUP A (2).

(d) Looking to the inevitable prejudices against inoculation, I think that the measure of immunity conferred is not sufficient compensation for the greatly increased hatred of plague measures, which would follow. Any hope of the co-operation of the people would be lost. Even the almost certain protection of vaccination is not sufficient, in the eyes of a civilised community, for its unanimous adoption—and that after many years' experience of an operation which is milder than plague inoculation and probably more free from risk.

GROUP A (3).

(c) Plague spreads along lines of human communication. How? By clothing, food or, possibly, by rats carried in grain or other stores. We know that this latter is the method by which plague travels across the sea. Why not by land?

Bacteriological experience is against prolonged infection in any medium—such as clothing or food. Further, plague is not a very contagious disease from one human being to another—look at the numbers of cases in which the relatives, nurses, patients escape. Look also at the number of cases imported into Madras, and yet no epidemic has followed—Why? Because no rats have been infected. How do rats get infected and how do rats infect human beings? Either by fool or else by the medium of fleas. This should be worked out by the Government

bacteriological laboratories. The practical conclusion is to destroy rats before plague arrives. The only practical way is by giving them an epidemic disease harmless to other animals. Possibly Dr. Roux's serum may effect this. Here again, the laboratories should set to work. No other means can ever be wholly successful. Why is evacuation effectual? Because rats are left behind and the bacteria soon die out in infected clothes, fleas, etc. One other point probably also contains the key to the plague problem. Why do Europeans so rarely suffer? Is it because they are less flea-infested or that they are shod or that they do not eat with infected hands? Why does plague increase in the cold weather? Do rats come into the houses more? They certainly do in the rains. Why does plague leave one quarter and go to another, in successive widening circles? Because all the rats in an attacked quarter either die or emigrate to another quarter—I have noticed this. Rats prefer to live in an inhabited house: hence the value of evacuation. Why do epidemics usually start in dry food shops or grain stores? Because, there, rats are most numerous and an infected rat is most easily introduced in grain. I believe "no rat infection, no epidemic"—*vide* later note.

(i) Reports from China go to show that almost any domestic animal may suffer from plague. There is a great deal to be said for conveyance of infection by fleas or bugs—but the question cannot be said to be settled—further experiments are required.

GROUP B (1).

(a) I know of no case, where the observation staff have discovered the first case of sickness from plague in a previously uninfected population and where the discovery of such a case has prevented an epidemic. In the large majority of cases, one or two deaths have occurred before discovery.

Looking to the difficulties of diagnosis, this is perhaps inevitable. But they have certainly over and over again brought to notice the existence of an epidemic in its early stages and prompt measures have undoubtedly limited the spread. I consider that a perfect system of death registration and examination by a medical man would give just as good a warning of the first case of plague as the possible though most unlikely detection of the same case a day or two before death by a circle inspector. In the district, a circle inspector can generally only inspect a village weekly. What chance is there of his lighting on a case, while sickening for plague? If he detects it, will he always diagnose it? If it is suspected to be plague, it may easily be concealed from him. If it is an ambulant case, he will probably never see it.

If we could be absolutely certain that no case could die, without being reported and examined, we should, in 999 cases out of 1,000, know just as early. But, in districts at least, we cannot ensure these conditions: therefore circle inspectors are necessary.

I also know of no case, where the death of rats was discovered by a circle inspector, unless the people themselves reported it to him. How could he find it out, if it was concealed? Usually, the village munsif or other official is first aware of it and reports it. In time of an actual plague epidemic, an observation staff is of course necessary to detect fresh cases of plague, to observe contacts, etc.

In smaller Municipalities, I believe the registration of deaths could be rendered sufficiently perfect by legislation to do away with any observation staff, except such as is necessary to work the passport-system and of course one or more medical men to examine cases. The help of the people themselves, centralised in a vigilance committee, may, I am sure, be enlisted by judicious appeals, and thus any widespread intentional concealment rendered impossible.

In the districts, I rely very largely upon the death reports in each village, which are submitted weekly by the circle inspectors and collected by them from the reports of the village munsif. It is the circle inspector's duty to investigate every death within 24 hours of its occurrence, if possible, and the village munsif is responsible that deaths are reported at once and the body not buried before the circle inspector has been given time to inspect it. In doubtful cases, a hospital assistant is sent to investigate.

In conclusion, I think circle inspectors absolutely necessary in a district, but not to the same extent in a well ordered Municipality. House-to-house inspection, in the face of concealment, is useless: with the aid of the people, it is unnecessary.

(e) Practice is the best training, but a foundation of theoretical knowledge is necessary and this is best taught in a "class" as at present. Time necessary would vary with the individual. Too much theory is unnecessary and confusing. Training should be practical and could be conducted best in a district where plague was prevalent, in order to gain practice as well as theory.

ADDITIONAL QUESTIONS.

GROUP A (3).

I know nothing by experience—experiments elsewhere seem to show its possibility—theoretically, it would afford a satisfactory explanation of many difficulties. There is known to be danger in handling sick or recently dead rats and little in handling cold rats.

(f) Rats are probably always imported by human agency into a non-infected town. They will then infect the rest of a rat community in the same town.

In every case I have known, death of rats has accompanied and often preceded human infection.

In one case, recently, an isolated village reported an indigenous case. No rat had been found dead in the village, but, on digging up rat-holes, several dead rats were found.

GROUP B (1).

(i_{ii}) Yes: that of a hospital assistant in Municipalities, of a circle inspector in the district, whenever it is possible for him to examine the dead body, or, if he has seen the case, while sick. In any case, the circle inspector enquires as to duration and nature of illness.

(i_{iii}) No burial should be permitted in Municipalities, without examination by a medical man. This may be done by controlling the cemeteries properly. At present, special sanction of Government has to be applied for and it is not given, unless a female medical practitioner is available. Except in cases where there is a large gosha community, a trained nurse may be allowed to replace a female medical practitioner, as the number of deaths among gosha women will be too few to make the employment of a female medical practitioner worth the expense.

(t) (I). No.

(II). Yes, perhaps it is worth trying.

(u) Yes: action is desirable. They should be instructed.

ADDITIONAL NOTES.

I am of opinion that plague does not recrudescence, but is re-imported. The re-importation may be effected either by human beings, by rats concealed in stores or by food-supplies or by clothing. There is, therefore, every reason to closely enforce the passport-system. If recrudescence does occur, disinfection is absolutely useless as a method of prevention, since the infective agent must exist in the excreta of recovered patients—either human beings or rats—just as typhoid bacilli may be found, many weeks afterwards, in the urine of a recovered patient.

The most effective measure that can be taken is the total destruction of rats and mice. The manufacture and method of using the virus of Dr. Roux (Paris) should be inquired into.

Staff.—Without the aid of the people, all staffs are useless. Vigilance committees, printed circulars defining and explaining the *rationale* and limits of necessary measures, private hospitals and camps are all most valuable means towards this end. No house should be entered, without the presence of a vigilance committee member. In addition to these measures, there is one method and one method only which can be relied upon to give early warning of the arrival of plague, namely compulsory certification of deaths by medical practitioners. No burial should be possible, at least in a Municipality, until the body has been inspected by a medical practitioner. On the approach of plague, at least two additional medical practitioners must be entertained, one male and, if possible, one female (or a reliable nurse), solely for the purpose of visiting all cases of illness or death. No corpse should be buried, without a certificate of inspection. There is no reason why a system of inspection of all cases of illness should not be employed. Most natives employ the services of some native practitioner of repute, whether Hakim, Vaidiyan or midwife; all such should be compelled to submit a list of their patients for inspection.

With regard to house-to-house inspection, it is useless, in the face of intentional concealment; with the co-operation of the people, it is needless; it may lead to friction and abuse.

To sum up, our object should be a perfect system of death registration, effected with the aid of trained medical diagnosis, and the substitution of the aid of the people themselves for the somewhat clumsy and expensive machine of circle inspection by non-medical men.

In actual time of plague, an increased staff, to carry out disinfection, evacuation, etc., is, of course, necessary.

Evacuation is preferable to disinfection, though both are necessary.

Disinfection by fire should be avoided, even in the case of worthless articles, as it is apt to create fear that other more valuable property may be treated in the same way—hence, concealment.

The steam-disinfecter is useful in severe epidemics, but is unnecessary in small outbreaks.

Registration of arrivals in hotels, eating houses and chuttrams is an useful addition to the passport-system. Personal and home cleanliness, together with the free use of insecticide powder, are important theoretically, but practically impossible.

I consider the problem of plague epidemics would be solved by the introduction of a practical method of destroying all rats and mice.

My remarks apply chiefly to Municipalities. In the district, the problem is more difficult and perhaps the system of circle inspectors is unavoidable. The only other possible solution is that the revenue authorities should be compelled to send in lists of deaths weekly. A careful scrutiny of these lists should give early warning of the arrival of plague. A district hospital assistant to examine suspicious deaths and an ambulance staff should therefore always be in readiness. The most important point is that every inhabitant of an infected village should be passported, before any other measure is taken and the inevitable exodus commences. All cases of neglect or black mail at passport stations should be most severely dealt with.

APPENDIX VI-C.

ANSWERS COMMUNICATED BY WITNESSES WHO WERE NOT PERSONALLY EXAMINED.

A. C. GALE, Esq.

* * * * *

I have been making enquiries of the native staff and, with the experience already undergone of plague administration in this and other districts, am able to give you a few incidents, which I can vouch for and which show that there is room for improvement in the method (or want of method) in which the Plague Regulations are carried out, when entrusted to native officials.

1. When Gooty Railway village was ordered to be evacuated, the people were simply directed to leave their houses. No specified plot of ground was allotted for the erection of a temporary camp. The natural consequence was that the people put up their temporary sheds or huts, wherever they pleased. After they had settled down (or were settling down), Government officials ordered many of the huts to be again removed, when they were considered to be too near public roads or in any other way objectionable. Had ground been allotted for the villagers to settle on prior to the evacuation, many of them would have been saved the expense of having to build their huts twice over.

2. The inhabitants of the village left their belongings, furniture, etc., behind in their houses, whether by order or not I am not certain, taking only bare necessities into the temporary huts. Insufficient arrangements were made by the Government authorities to safe-guard property in the village during the period of evacuation, with the result that many houses were broken open and robbed. Building materials were even removed from houses. Specific cases can be quoted.

3. The period during which infected villages must remain evacuated is one month after disinfection. In the case of Gooty Railway village, a period of about two months was allowed to elapse, although the great inconvenience felt was alleged to have been represented to the Collector, Tahsildar, etc. The delay was stated to be due to want of disinfectants and of the necessary supervision.

4. The cost of disinfection and cleaning the houses was borne by the inhabitants, though I have always understood it has hitherto been borne by Government.

CAPTAIN ABDUL AZIZ KHAN SAHIB, SIRDAR BAHADUR.

It is the will of God that every creature in the Universe should die by some disease or other, and the diseases increase in number in this world, side by side with the increase of population and, as such, I think it is next to useless to resist His will.

The maintenance of elaborate plague establishments to prevent the epidemic is simply a waste of public money, which can be utilised for some other useful purposes, such as sanitation, public works, etc. It can be more easily imagined than described what these so-called *plague sanitary inspectors* with 14 days' (i.e., 28 hours') training can do to prevent plague, while eminent doctors fail. Plague has recently become a professional disease, which is amply paying undeserving men. The local bodies, which are called upon to spend much of their funds on plague every year, have become so poor as to give up even the most important sanitary works, and the result is that fresh epidemics are, as it were, invited into the town by the neglect of sanitation.

G. W. GILES, Esq.

GROUP A (1).

(k) (III) When huts are vacated and the inhabitants sent to a segregation camp, the articles left in the huts should be recorded and signed for by the police, so that, when the owners return, they will not find them missing.

GROUP B (2).

(b) I do not see that any improvement is possible in the arrangements to prevent fraudulent re-booking.

When a district is notified as free from plague, I think telegraphic advice should be sent to the local Railway officer, with authority to remove plague restrictions, as much delay now takes place, owing to the number of officers through whom the information has to pass, and during this time passengers refrain from travelling, owing to the inconvenience of the plague regulations.

H. H. F. M. TYLER, Esq., I.C.S.

GROUP A (1).

(a) Disinfection, coupled with evacuation for at least a month, is, in my experience, the most effective measure to stamp out plague.

(c) Expenditure on disinfection should not be less than at present. It might with advantage be more.

(e) Where people re-occupy an area, after evacuation for a less period than one month, there are frequently fresh outbreaks. The germs seem to lie dormant and come into activity on re-occupation.

(g) This depends entirely on the character of the supervision. If left to themselves, the disinfecting staff cannot be trusted to do the work properly.

(h) Yes. In some cases, they willingly co-operate, and I have known instances of the villagers adopting disinfective measures, before such steps were considered necessary by the authorities.

(j) and (k) If villagers could be got to carry out disinfection themselves under proper supervision, it would prevent a considerable amount of opposition and also would be cheaper.

GROUP A (4).

(a) and (b) If by plague hospitals are meant the segregation-sheds in which contacts and patients are kept, they are the reverse of popular. I don't see how they can be made more popular, while people are taken to them *willy nilly*.

GROUP B (1).

(a) This varies greatly, according to the character of the people and the efficiency of the plague inspectors. In some parts, detection has been very good.

(b) I don't think it is necessary to pay the plague inspectors so highly. Many are clerks on Rs. 15, 20 and 25; the same class of men could, I think, be attracted by a smaller sum than Rs. 70 per mensem, which circle inspectors now get. I think higher efficiency, etc., is to be looked for from local men, who have a knowledge of the district and who are working under the eyes of the officials upon whom their ultimate promotion depends. Pony allowance is, as a rule, necessary. Circle inspectors have to be constantly on the move and traverse considerable distances.

(d) In this district, there are plenty of trained men, who can form the nucleus of a preventive staff in the event of an outbreak. A large staff in the hot season is not necessary.

I think more use might be made of village officers and the circle inspectors used for supervising their work and given larger circles. The objection to this is that it throws more work on the monigars; still, the village staff is the chief source to which circle inspectors must apply for information. It would be cheaper to have a few assistant monigars and lessen the number of circle inspectors.

(m) The plague staff certainly do in some cases abuse their position and tyrannize over the villagers.

(o) and (p) Villagers frequently refuse admission to people from infected areas.

DR. KRISHNASWÁMI AIYAR.

Plague is essentially a soil-disease. The walls and roofs, if they could not harbour rats, other rodents and vermin that live on the soil, are found uninfected during epidemics.

The cooly lines in Kolar Gold Fields, which consist of huts with tatty walls and zinc sheet roofing, are found plague-proof, if the floors are renewed and the rats driven out or killed on the first appearance of plague in such lines. Thatched huts with low mud walls become equally safe, if they are removed to new sites. Such a hut, even if a case of plague had occurred therein in its original site, is quite safe in its new situation. Houses, that could effectually exclude soil-vermin and rodents, are singularly free from plague, no matter what class of people live therein, provided they are careful not to import the infection themselves.

Ordinarily, a rat-proof house is plague-proof. Walls and roofs of houses get infected ordinarily through the agency of rats and squirrels.

The bacilli, after their importation to a house otherwise than through the body of an individual, take time to attack man. Meanwhile, the more susceptible rodents fall victims to the poison. The residents themselves seem to be acquiring a certain amount of immunity. The old and the young take in the infection first and die before developing buboes.

A certain amount of concentration of the virus seems necessary, before the adult is attacked. It is generally in adults that the first evident cases of plague with buboes show themselves. By this time, the epidemic has taken a strong hold and spread imperceptibly to all the adjoining houses. Such being the ordinary course of infection in most localities and seeing how difficult it is to detect plague before the virus has taken a strong footing, the plague measures, to be successful, must be first popular; secondly, they should be thorough and, where neither of these is possible, as in rural tracts, the Government might content themselves with advice and help. To secure popularity, the people should be taken into confidence. They must be made to undertake or at least participate in all the remedial and preventive measures, under the supervision and guidance of Government officials. As it is possible to disinfect even rags, nothing should be burnt without the consent of the owner.

Speaking ideally, every kind of disinfection seems imperfect, except the ridiculous one of the Tamil proverb of *setting fire to a house for fear of rats*.

In practice, it is not possible to dig out every rat-hole on the floor, walls and roof of houses and to open out every drain, cess-pool and privy-pit and disinfect them.

Desiccation by bratties has a very limited application as a disinfectant. In most houses, fires to the requisite degree of heat could not be kindled. It is not applicable to verandahs, drains and other partly open spaces. It has been found that such spaces do harbour the virus, in spite of sunlight desiccation. Sunlight desiccation is too problematic a measure to be depended upon. It is time that tells and not sunlight and fresh air. Opening out of roofs and making holes in the walls are not objected to by people, but seem unnecessary. In towns, where evacuation is not practicable, greater attention should be paid to disinfection.

Disinfection should be made, on the assumption that, for each indigenous case, the infected area is probably large, and disinfection of such a large area should be completed in a day. Otherwise, there is every chance of a disinfected house getting infected over again.

A system of combined chemical and bratty-fire disinfection is necessary. Bedding, gunny-bags and other articles unfit for chemical disinfection should be treated by bratty-fire and the house itself by chemicals. One room in a house or row of houses might be found suitable for bratty-fire disinfection, and all articles requiring to be so treated should be transferred to it in lots.

In villages, the poison has been found to disappear permanently, after the houses have been once evacuated for a month and more. A large number of villages have thus remained safe for four and five years, even without disinfection.

It is also a fact that an epidemic was warded off from a village by wholesale chemical disinfection, on the occurrence of the first indigenous case. As all villages could not receive such close attention and as evacuation is an effective remedial measure, all villages might be left alone after complete evacuation.

In many cases, the usefulness of this remedy is marred by villagers frequenting their houses to tether their cattle at night and sleeping there to watch their stores of grain. This is how infection is brought to their huts outside the village. Recrudescence of plague, due to revivification of plague germs, seems probable. Such recrudescence starts in such localities as were the last to be infected in previous epidemics. There have been three instances of such recrudescence.

Katganahalli.—On the 31st of March 1903, there died a potter woman of abortion at the village. There was plague at the time in the neighbouring village of Ukkarahalli. The hospital assistant, Bowringpet, declared the death as natural, from the history of the case furnished by the patel. Two days later, *i.e.*, on the second day of April 1903, three of her relations, including her husband and son, left the village for Panchamahalli, a village near Budikote, and the two latter died, on the 3rd of April, of plague.

These persons must therefore have been ill at the time of their departure, and the patel too should have known of it. The patel of Panchamahalli reported these two deaths and segregated these arrivals outside the village. The assistant plague inspector of Bowringpet did not connect these plague cases from Katganahalli with the woman that died on 31st of March. As there was plague at the time in several villages of Bowringpet taluk, it was presumed that these persons might have taken the infection from some other locality than Katganahalli. It was not known at the time that the persons left Katganahalli only the previous day. The infected house in Katganahalli was therefore not disinfected.

Between 1st April and 16th of August, there were two deaths in the village, which I have reason to believe were due to natural causes. The accompanying list gives the details of deaths since 31st March. The first infected house was opened in July 1903 and re-occupied by some of patel's relatives.

Coincident with the opening and re-occupation of the infected house, one Venkatamma, aged 50 years, died of suspicious fever on the 16th August 1903. She was not living in the house. She might have frequented the house. Her husband was taken ill subsequently, and his was one of the two cases reported on the 25th of August 1903.

Second case.—Madamangala is another village in point. The epidemic of 1902-1903 died out by the end of March in the vicinity of this village. In the latter part of June 1903, there were four deaths in Madamangala. These were ascribed to natural causes.

Madamangala is a fairly large village, with a population of 676. The first recognised case of plague was on the 11th of July, though there were a few suspicious deaths prior to that date. Some, at least, of the deaths in June and the beginning of July must have been due to plague. People of the village had been changing their residence under the pretext that these deaths had taken place on inauspicious days. No history of fresh importation could be traced. There was no plague in Kolar Gold Fields at the time.

Third case.—Doddavalagamadi is another instance of recrudescence. On the 12th of December 1903, a woman aged 30 years died, after three days' fever. I made personal investigation of the case and came to the conclusion that she might have died of enteric fever or pelvic troubles. On the 26th of December, dead rats were found in four houses. The houses were evacuated and disinfected and the inmates were kept under observation. Plague was at this time prevalent, within two miles of this locality. The place remained free till the beginning of this month. Plague then started in one of the houses where rats died in December 1903. There have been other cases since then and the place has been evacuated. No history of any fresh importation is forthcoming. There was an interval of six months between the death of rats and the recrudescence in July 1904. The people of Valagiamadi have, however, been frequenting infected areas in the Gold Fields.

Inoculation.—Infectious diseases die out in one of two ways,—first, by every man getting immune to it by taking in the disease or by requiring a specific inoculation.

Inoculation should be more largely in the hands of the best and most trusted local practitioners.

Inoculation, to be popular, should be more graduated, so as not to produce a violent reaction. I learn that this is feasible, though not under Haffkinism. Inoculation is certainly protective and people should be encouraged to get inoculated. It should be done, a month previous to infection arriving at the spot.

The possible risks involved in the process of inoculation are small and should be guarded against by the inoculating medical staff.

Medical officers, who perform inoculation, should receive special remuneration, according to quantity of work done.

Inoculation being so very important, the Government should attempt to perfect it.

Rat-Exterminator.—It appears to be an ideal preventive, but, in practice, it is difficult of accomplishment.

There is no doubt that rats, squirrels and other rodents in general are the predominant factors in spreading plague, after the commencement of an outbreak. That they might also take the infection to adjoining villages seems very probable. That plague can spread, otherwise than through the agency of men or rats, seems also probable.

More attention should be paid to rat-destruction in towns and cities. Advice and inducements are of no avail in such big places. Rat destruction should form part of the Government preventive measures.

Rats, moreover, are such acute beings that they will not touch the baits, once they know their nature. Baits will have to be varied. It is certainly advisable to keep them out of inhabited localities, if it is not possible to exterminate them.

That other house-hold animals and pets do participate in the spread of the infection, as suggested by Dr. Simpson's experiences in Hong Kong, is not borne out by my five years' experience in Bangalore and Kolar Gold Fields.

I have no opinion to offer on insects, such as fleas, etc., influencing the spread of plague.

Plague Hospitals.—Plague hospitals are unpopular, because of the stringent measures of segregation adopted therein. Even ordinary medical institutions are unpopular to some extent, because friends and relations are kept out of them, except at stated hours. This creates a sort of mistrust.

If the relations and friends of patients were allowed free access at all convenient hours, all medical institutions are bound to become popular and, more so, the plague hospitals.

It is a matter of common knowledge that doctors and attendants at plague hospitals are comparatively free. They are exempted from all segregation. This is rightly so. It is not that these persons have special means of avoiding infection, but that infection is not likely to be taken in under the circumstances.

I would, therefore, extend to friends and relatives of the sick all the privileges that medical officers and attendants enjoy in plague hospital—at least, to such of them as are in the contact camp. An infected house is certainly more dangerous than a well-managed plague hospital for any person to visit.

Plague hospitals, to be popular, must not be far removed from an inhabited locality. In Kolar Gold Fields, the dead house of the plague hospital is within 100 yards of the Ooregam cooly lines and yet there has never been any complaint of infection having spread therefrom to the cooly lines.

I do not believe that infection spreads by casual contact in infected localities. New arrivals might be and are liable to take the infection by casual contact. It is on this belief that I advocate the employment of residents to disinfect their houses and to visit the plague hospital freely.

I know that, if such things are prohibited by the officers, they will go on all the same, and corruption of the menial staff will be the result.

Observation System.—This may be left entirely in the hands of village officials in rural parts. These might be encouraged to do their work more efficiently by some inducements. A special staff is unnecessary. If the village officials want to burk cases, they can do so, in spite of the plague staff.

An observation staff is no doubt necessary for towns and cities. I would recommend duly qualified hospital assistants for the post of supervisor. These will be able to diagnose diseases and certify as to causes of deaths. The present system of keeping two sets of officials—super-visors to detect suspicious sickness and medical men to diagnose them—seems superfluous. The detection of the first cases is extremely difficult, even for medical men, unless they are provided with bacteriological appliances and are allowed to hold post-mortem examinations.

ADDITIONAL QUESTIONS.

GROUP A (2).

(e) Eleven thousand six hundred and nineteen persons were inoculated during 1898-99. With the exception of an abscess in a single case, no other bad effects have been brought to the notice of the inoculators. Of the 37 attacks amongst the once inoculated, seven were found to have developed plague before they got over the inoculation fever. All these seven died within ten days of inoculation. One was inoculated six months prior to the attack and he died. Of the remaining 29, 14 recovered. No inoculations have been performed since July 1899.

GROUP B (1).

(i₁₁) All the bodies are examined and certified by the medical officers. Where there are evident signs of plague, the plague inspectors allow burials on their own responsibility. This practice obtains only within the Sanitary Board area of 25 square miles.

(t) and (u) Not desirable. It is not desirable to enlist the co-operation of native doctors.

GROUP B (3).

They are employed as escorts to patients and contacts to camp. The plague police are watchmen in the plague camp. They also do the duties of circle inspectors. The literate among them are made passport clerks at railway stations. They are entirely under the control of the plague officer. The Civil Surgeon is himself the plague and medical officer for Kolar Gold Fields Sanitary Board area.

List of plague cases, natural cases and deaths at Katganahalli from 21st March 1903 to 16th August 1903.

No.	Names.	Age.	Sex.	Caste.	Date of attack.	Date of death.	Natural or plague.	Remarks.
1	Pillakka ...	25	Female...	Kumbar ...	...	31st Mar. 1903.	Natural.	Abortion probably due to plague.
2	Maniswami ...	40	Male ...	Do. ...	3rd Apl. 1903.	3rd Apl. 1903.	Plague...	Died of plague at Pan-chamahalli.
3	Do. ...	45	Do. ...	Do. ...	3rd Apl. 1903.	...	Do. ...	This was a brother of Pillakka who recovered.
4	Battappah ...	2	Do. ...	Do. ...	3rd Apl. 1903.	10th Apl. 1903.	Do.	
5	Muniyamma ...	38	Female...	Vakkaligu ...	...	5th May 1903.	Natural.	15 of her relations are alive and healthy up to date.
6	Munivenkatappa.	60	Male ...	Dasari ...	...	19th June 1903.	Do.	An old rheumatic person: his children are alive.
7	Venkatamma ...	50	Female...	Vakkaligu ...	...	16th Aug. 1903.	Do.	Her husband is down with plague. Probably plague.

F. A. PAWLEY, Esq.

I have no experience or suggestions to offer, except under the head of:—

(1) "Observation" for suppressing plague. At Bangalore Cantonment, no preventive measures are taken. All educated people appear to report cases occurring in their compounds to the Municipal Health Officer and he sends men round to disinfect the houses.

(2) The great objection to this free and easy arrangement is that, whenever a bad outbreak of plague occurs in any large towns near Bangalore, all the well-to-do leave and come to Bangalore and bring the plague with them.

GROUP B (2).

(a) I consider that, in many places, the number of clerks employed for issuing passports is insufficient and that the public are unnecessarily detained on this account.

(b) I have reason to believe more people alight at roadside stations and proceed by road past a plague examination station than fraudulently re-book.

(c) Not until free education is introduced into India.

M.R.Ry. R. N. DHANAPÁLA MUDALIYÁR AVARGAL.

GROUP A (1).

(a) Increased attention is necessary and there must be reliable, close, superior supervision. At present, the work, in some places, is left in charge of unreliable men. Even in the case of superior officers who are appointed to supervise disinfection, only those who have faith in disinfection will do any justice to their duty.

(b) The arrangements are not adequate. Most of the men who are sent out have no practical training. After we take the trouble and undergo the expense of training them, they resign and go away. I have known one certificated sanitary inspector, who used stagnant waste water from a pool (or drain) near a water-tap in Adóni for making up the disinfecting lotion, without paying attention at least to use more perchloride of mercury.

(c) The present expenditure is just what is necessary; with reliable and close superior supervision, work will be done more efficiently and thus expenditure will be less in the long run.

(d) By burning bratties, it is not possible to raise the temperature and produce heat sufficient to kill plague germs and also there is the danger of the houses of the type usual in the Ceded Districts taking fire. Therefore, this process has no value. I have had no opportunity of seeing what effect sunlight (by itself) has on plague germs, but sun-heat has great power and is the only agency used for desiccating roofs of houses, as the chemicals cannot reach anything, except the surface of the interior. In all cases where the object to be disinfected can be seen, the chemical disinfectants now in use are very effective.

(d₍₁₁₎) (I) in towns—

Burning of rags and rubbish.

Boiling soiled clothes in water.

Exposing valuable cloths to the sun's heat.

Washing the houses with perchloride of mercury lotion.

Cleaning drains and cess-pools.

(e) (1) Assuming there was proper disinfection, I do not at all believe in the revivification of plague germs, and there could be no recrudescence, unless infection is imported by persons, clothing, articles of food, commerce and such other means.

(2) No.

(3) The interval within which revivification can take place will depend on the locality where the germ may have been left and the season of the year. If the germ is left in a closed and filthy place, under circumstances favourable to it, such as cold season or damp surroundings, it may revive within four or five days. If it should be left under less favourable circumstances, it will lie dormant, until circumstances change. In this case, my observation is that germs live for several months. I believe there can be a recrudescence after a year.

(f) The disinfectants now supplied are of good quality and are suitable for the purpose. There were no complaints in Adóni, and the disinfection in 1902 kept out plague in 1903. I have no experience of any apparatus.

(f₍₁₁₎) Disinfectants are generally supplied without any delay.

(g) As far as the coolies, maistries and inspectors are concerned, there is no conscientiousness or intelligence, but, when there is proper superior supervision, the work is done efficiently in towns.

(h) Yes, to some extent. And this is only in villages near towns.

(i) I am not aware of any systematic effort made in this direction. However, some officials have now and then explained to the people of Adóni the objects and effects of disinfection.

(j) My own experience is that, without official help, proper disinfection will not be possible.

(k) The employment of conscientious, willing and tactful superior officers is the best means.

GROUP A (2).

(a) Arrangements are adequate and proper, in regard to the performance of the operation, so far as I have seen, but, in regard to persuading people to be inoculated, they are not. If the medical subordinates who perform the operation in mufassal stations have faith in inoculation, several people will be induced to get themselves inoculated.

(b) Yes.

(c) An inoculated person cannot be considered harmless to his neighbours. He may have infection on his person and clothing, and his being inoculated will only protect him, but he may transmit the infection to his neighbours by contact.

(d) We should not persuade people to be inoculated more than we do now, until we are in a position to guarantee a longer period of protection.

GROUP A (3).

(a) No.

(b) Yes. But past experience has shown that even rewards do not induce people to kill rats, for they think that the rats they kill are taken by the plague authorities as plague rats. It is found difficult to get this impression out of ignorant minds.

(c) Yes. They do exercise an important influence in spreading plague, at the commencement and in the early stages of an outbreak.

(d) Cats, mosquitoes, fleas.

GROUP A (4).

(a) Very unpopular.

(b) The ability and popularity of the medical officer in charge of plague hospitals, the discipline he exercises over the ward attendants, etc., in the hospitals, the attention paid to the patients, the results shown in the shape of curing plague cases—are all matters which will go to make plague hospitals popular.

(c) In Adóni, people availed themselves of this privilege to a very small extent, to avoid the Government or Municipal plague hospitals, to which they have a great aversion. But they do not maintain any discipline in these private hospitals. They have very poor accommodation. They are not at all equipped as hospitals. They have no furniture—not even rope-cots—and have no arrangements for maintaining sanitation.

GROUP B (1).

(a) On account of the opposition of the people to all plague measures and their almost united efforts to conceal all information about plague, the observation staff has not been successful in detecting anything like a good percentage of living cases of plague.

(b) No. As we are not able to get a desirable sort of man with the present pay, we will only get a still inferior sort of men, if the pay is reduced. So, instead of reducing the pay to curtail expenditure, we must try to get better men. Even though the observation staff does not detect all the living cases of plague, it does not fail to detect all deaths from plague and other causes, which are examined by the medical officers. If the observation staff is dispensed with, the existence of plague in a place will not be detected, until it has taken a firm hold. By the time a preventive staff is appointed and gets into working order, all the mischief would have been done. In special cases, where a town is compact and the inspector has not to go round much, the staff may be reduced, but it will not be safe to do so in towns which are not compact and where houses are scattered. So, observation circles must be fixed according to the requirements of each town.

The distribution in towns is satisfactory, but I have no experience of rural areas.

(c) Provided good men are available, it is safer to continue the present pay to the circle inspectors (assistant temporary sanitary inspectors) and divisional inspectors in the Municipalities. No plague allowance need be given. Pony allowance for a divisional inspector—if one is appointed—is a necessity, but the present rate is high. I have not known any inspector spend more than Rs. 5 to Rs. 8 for hiring a pony. So, if Rs. 10 is given as pony allowance, it will be quite ample. In Municipalities, it is better to appoint a good European—not Eurasian—plague officer and make all circle inspectors work directly under him and do

away with divisional inspectors, who are only middle-men with no work. This was tried in Adóni and was found to work well. Mounted orderlies for divisional inspectors are not at all necessary. A peon, on Rs. 7 per mensem, will be sufficient. If more efficiency is required, two peons may be appointed, instead of having a mounted orderly (on a pay of Rs. 10, plus Rs. 15 pony allowance). It is necessary to have a divisional inspector exclusively for disinfection work; he must be paid a pony allowance; he must be a man who can ride or cycle.

An extra allowance during plague is not at all a good thing to any plague officer.

(d) An observation staff during hot months is no doubt useful in detecting "dropping cases," but it does not justify the expenditure. But, as a trained nucleus for a preventive staff, in the event of plague breaking out, the observation staff is certainly useful, provided it is guaranteed to the Municipalities that the hot-weather staff will not be permitted to resign until the next hot weather. I have known the whole of the hot-weather observation staff resign just before the commencement of the cold season, when there was the fear of plague breaking out. There was nothing to prevent the men resigning and, the moment they appear before the Sanitary Commissioner, they secure other appointments. Thus, all the expense incurred by the Municipality, in maintaining these men during the hot weather, has been in vain and, when they go back to Madras after resigning their appointments, they travel at the expense of the Municipality. This is an additional waste of money, as far as the Municipality is concerned.

(e) It will be an improvement to give the observation and preventive staff a practical training, if possible, in a plague infected place.

I do not think there will be any improvement in getting the staff trained by the District Medical and Sanitary Officer, for it will not be possible to get the required number of men for a district within itself.

The period of training must be according to the previous educational qualification of the man. For a man who has passed the Matriculation examination, a month's practical training will do.

(f) European supervision, in the towns of Adóni and Bellary, has been sufficient and satisfactory. In the rural areas, the work has been more in the hands of supervisors of all classes and kinds, who (with rare exceptions) neither had control over their staff nor exercised any good influence over the people. When there are young European civilian officers, the work is done thoroughly and conscientiously.

(g) There is nothing like conscientiousness or efficiency among the temporary assistant sanitary inspectors. It is difficult to get them to work without close supervision.

(h) The plague staff generally do not exercise a favourable influence on public opinion. This is not necessarily and always due to the staff. Even when better men and superior officers are appointed for plague duty, people dislike them. This is due to the ignorance of the people.

(i) Close supervision by an honest and hard-working officer will improve the efficiency of the staff.

(j) to (s).—I have no personal knowledge of work in rural tracts.

GROUP B (2).

(a) Yes. But I am unable to suggest any means.

(b) (1) None but passengers with tickets ought to be allowed on railway platforms.

(2) Each and every intending passenger, except respectable gosha ladies, must appear personally before the booking clerk for tickets, and the present practice of buying tickets through railway porters and other servants and policemen on duty must not be allowed. In the case of gosha ladies who do not like to appear before the booking clerk, they must be asked to produce a certificate from the medical officer or from some recognized Government servant, but from no one else.

(3) Tickets must be sold only at the counter intended for the purpose.

(4) Passengers getting down from a train, who are not known to the ticket collector, must, as far as possible, be detained on the platform and must not be given access to the ticket counter.

(5) Tickets must not be sold after the arrival of a train, except to known passengers.

I have also heard of persons practising another kind of fraud, by sending their men, either in advance or behind, to an uninfected Railway station, to buy tickets, to cover the journey of a man, who follows by a subsequent train.

(c). I have not got any valuable practical suggestions to offer.

ADDITIONAL QUESTIONS.

GROUP A (1).

(e) Examination and desiccation of imported grain is very useful, and it is possible to prevent infection, if it is properly done.

GROUP A (2).

(e) In the epidemic of 1902, about three-fourths of the town of Adóni was vacant. Out of these, about 3,000 people got themselves inoculated. [As I am on leave in Madras, I am not able to get the exact number.] The population of the town is 30,100.

GROUP A (3).

(d₍₁₎) I believe that fleas can carry infection from rat to rat and from rat to man. My experience has not furnished me with any facts to quote.

(f) I have not come across any instances.

GROUP B (1).

(i (i)) Yes; it is strictly observed in Adóni. The certificate of the civil apothecary or the lady apothecary is accepted.

(i (ii)) The law gives sufficient discretion generally. But, as regards segregation of contacts, it is safer to insist on their compulsory segregation, either in the municipal camp or a private camp—if there is a proper one—until plague has broken out in an epidemic form in a town and got out of control. Keeping them under surveillance in their houses is very undesirable and only tends to spread the disease.

(t) It is desirable to try the system of giving rewards to private persons and native medical practitioners.

Rupee one for every case of plague would suffice. It will be neither too high nor too low. Rewards must only be given, if the cases are reported before they are detected by the plague staff.

(u) They have been asked to help the staff by giving information about plague cases. But not even a single information has been received from them.

Action in this direction is desirable, but I do not at all believe that they will be of any help. It is desirable that native doctors should understand the diagnosis of plague.

GROUP B (3).

(a) (1) There is proper control. (2) They do their work most unsatisfactorily. They do more harm than good. (3) A system of recruits or volunteers must be started; if this is not possible, arrangements must be made to put the permanent men on plague duty, getting sepoy for town police duty; if even this is not possible, it must be arranged to have at least half the number of men on plague duty from the permanent staff of the police.

When temporary men are engaged, as many as possible must be got from the Military, Police and Salt Department, or peons.

(b) So far as my knowledge of Adóni goes, it is not possible to reduce the number.

- (c) (1) Guarding evacuated parts of town.
- (2) Guarding passport stations helping passport officers.
- (3) Guarding houses and things taken out from them for disinfection.
- (4) Guarding plague camps.
- (5) Guarding segregation camps.
- (6) Guarding health camps.

II. T. REILLY, Esq., I.C.S.

Plague Staff, etc.—All inspectors, assistant plague inspectors and disinfecting inspectors should be men in permanent service, duly trained, fit to take responsibility and men who can be properly dropped on for neglect of duty. The present class of plague inspectors are, in almost all cases, only fit for temporary jobs as Rs. 15 clerks, to fill the vacancies which would be caused by the deputation of permanent clerks on plague duty. More supervisors than are usually employed in Bellary are required in the plague season, at least one to six circles. They should be chosen with much more care than at present. Salt department "failures" are not necessarily any good, merely because they are Europeans. An intelligent and active Stationary Sub-Magistrate or some one qualified to act as such would do quite well, provided that he had received the necessary training, which, in most cases, could be given by the District Medical and Sanitary Officer better than by the Sanitary Commissioner.

Great improvement is necessary in all classes of the disinfecting staff. The inspectors now employed are quite untrustworthy, when left to themselves. The best of the plague inspectors now available are required for the work, especially those with a thorough knowledge of all disinfection means from a scientific point of view.

Supervisors are also required, specially for disinfection, if it is done on a large scale. The question of coolies is very important. The conservancy agent only supplies trained scoundrels, and the District Medical and Sanitary Officer's "reserve" usually consists of men who are not to be found when wanted. I would suggest that a list of the men employed in the past, who have worked well, be kept in the Taluk office.

Disinfectants.—Proper apparatus for preparing the perchloride solution should be provided and, where possible, should be made under the supervision of hospital assistants, as an ordinary plague inspector does not understand the importance of accurate measurement.

The enforcement of the first part of regulation 90, which Government declared contrary to its settled policy just before the revision of the regulations, would be very useful, in the case of large villages, when the inhabitants themselves are in favour of it.

Another regulation, giving the Collector general powers to do or order any measure he thinks advisable for the public safety, is required.

Some attempt should be made to educate the people in the theory of plague preventive measures, so as to get more co-operation with the authorities. Revenue inspectors and the more intelligent plague officers might be told off for the purpose and also any public-spirited member of the District Board.

The opening and closing of plague camps and passport stations should be entirely in the hands of District Officers, who alone know all the circumstances of the case: the same argument applies to preventive circles.

P. S. P. RICE, Esq., I.C.S.

I have found it difficult to send answers to the questions on the plague categorically and I therefore send my ideas for what they are worth. I was Collector of Bellary for nine months and of South Canara for ten. In Bellary, the plague raged over Bellary, Alúr and Adóni taluks, but there was not much in Bellary town. We had 8,000 cases. In Mangalore, we kept the disease down and I think we only had some 300 cases, from July to February.

GROUP A (1).

(a) to (d) I imagine no one but an expert would care to give an opinion on the relative value of sunlight and chemicals, as disinfectants. I have only used three kinds of disinfectants, the sun, perchloride and fire. In my opinion, evacuation and disinfection are the only remedies: whether chemical disinfection is good or not, can only be judged by results and, whenever I have used it intelligently, I have had good results. The whole of Adóni was so disinfected, and we drove the disease, not only from the town, but also from the taluk, with apparently good effect. We chased it from street to street, in Mangalore, with good results everywhere, but it was always accompanied by the sovereign remedy of evacuation. Where the plague staff was intelligent and well supervised, the work was good, otherwise not. Mr. Reilly did Adóni and did it right well. Mr. Blake did Adóni taluk, but Hadagalli, which was left to the Tahsildar, lingered on and, as for the first village in Harpanahalli (Halavagal), it took months. The staff may be well trained, but it is necessary to see that they are really up to the mark. I got fair results in Mangalore, but I was always in the town myself, and Mr. Stuart, for a time, and afterwards a Deputy Collector (to say nothing of the Vice-Chairman of the Municipal Council) were looking after the staff closely. Fire should not be forgotten. It is an absolute remedy for brass vessels, and all petty houses should be burnt down ruthlessly.

(d) I do not know what is meant by a combination of disinfective measures and I don't know why it should differ in towns and villages. We always used perchloride, coupled with exposure to light and air, when possible, and evacuation. Plague does not often, or should not, attack well-to-do houses. If it does, it is generally imported from a hut and can be stamped out or left to die by a temporary exile.

(e) As for revivification, no one but an expert can say. I really don't think any *a posteriori* conclusions I may have formed would be of any use.

(f) The disinfectants are well enough, if the medical authorities test them enough.

(f₁₁) A quarter anna piece is all that is needed.

(g) and (h) In short, what we want is good and conscientious disinfectors and good supervisors. I am afraid all disinfectors are not conscientious and many are very stupid. The people learn in time to understand disinfection and, in Mangalore, I accomplished a small revolution in this respect.

(i) When I went there, there was immense opposition to evacuation and disinfection, but, when I left, the people went out of their own accord and clamoured to have their houses disinfected first. I mention this, merely to show that they *can* be taught to acquiesce. That anybody should *like* it, can hardly be expected.

(j) I doubt if they can ever be trusted to do much disinfection themselves. There is always a tendency to leave out a fatal box or room, and they do not know what the chemical does. They would always require a great deal of supervision. The worst of perchloride is that

it does not penetrate everywhere. A gas is what we want. If we are going to supply coolies, they ought generally to be such as are acceptable to the people. I denounce the Madras-made hired coolies—off-scourings of North Arcot and other bazaars. They are expensive, *very*; they are most unacceptable and they are often untrustworthy. Nothing, I consider, could have been calculated to make disinfection more unpopular than the use of these men. Apart from the fact that we are more independent than the ordinary ryot, we should not like to trust our valued possessions, our *Sevres* china and our Italian glass to a herd of *Sansculottes* from the east end of London. If they are not that, the people think them so.

GROUP A (2).

Frankly, I do not care much about inoculation. I know this is heresy, but I will be a martyr to my creed. What do you protect? The individual—and him, only for a short period. There is nothing radical about it. I honestly pursued this inoculation policy in Bellary and got a good many treated. But, after all, what is 5,000 or 10,000 or even 100,000 in the population of a district? I cannot persuade myself that this is ever going to be a real line of defence against the advance of plague.

GROUP A (3).

As to rats, I think there can be no question that they do carry plague. But the matter recalls the legend of Thor and the sea. It is quite unlikely that the best-laid plans will do much to keep down rats. No form either of inducement or advice will ever do the work of the Pied Piper. I issued a circular in Mangalore, exhorting people to enter on a crusade against rats and, especially, to examine their houses periodically for dead rats, but I do not think it had any serious effect. To my mind, it is the dead rats that are almost more important, because more practicable, than the living ones. Time and again, a house has been "disinfected", that, on a recrudescence or other ominous sign, has been found to harbour one or more dead rats. Inducements are well enough, but can you, in the first place, succeed in making any impression on the countless rats and can you, in the second place, really afford to pay for such an impression?

GROUP A (4).

(a) Plague hospitals have undoubtedly been most unpopular, wherever I have seen them. The people, seeing the mortality in the hospital, think it is certain death to be there, and this belief makes the death certain. A horrible idea got abroad that the doctor wanted to poison them and to get rid of the patient at once. They even forced the hospital assistants (so I was told) to drink their own medicines. Now, I have been any number of times to plague hospitals, but I have not often had to complain of the hospital assistant. In point of fact, the hospital assistant often had nothing to do, for the patient would not accept English treatment.

(b) The worst feature of these hospitals is their temporary character. The people complain of neglect, but chiefly of draughts. The natives of cold climates want our ventilation and our punkas. The native of India, clad in a single cotton cloth and coming from his house, where air is carefully excluded, naturally cries out against the tatty walls and the spaces between wall and roof, that occur in many of these hospitals. When plague is recognized to be indigenous, it may perhaps be well to build plague hospitals, just as, in England, we have fever hospitals and lying-in hospitals. I managed to get the loan of a tiled house in Mangalore and, though there was some grumbling at going, the people were generally satisfied, when they got there. One method, then, of making the hospitals more popular is to build them better.

(c) I have seen very few caste hospitals. The Muhammadans have something of the sort in Bellary, but I rather think it was a health camp. I preached an *evangel* of caste health camps and caste hospitals in Mangalore, but, though I got promises and though subscriptions were raised and though the subject was a stir, very little had actually been done, when I left. Personally, I think a well-built hospital with caste wards is most desirable, as being less expensive, and the efforts of the Committees should be directed to caste health camps; but you will not get either in villages. The chief difficulty, in the towns, is that, as charity is generally confined within the caste, the richer castes, who can afford to build, do not require; the poorer castes, who need the hospitals, cannot afford to build them.

GROUP B (1).

(a) I have now reached the principal difficulty.

It does not lie in my mouth to say that the observation and preventive staffs have been useless, though I have always felt that the return did not justify the expenditure.

(c) I think it was in October or November 1902, that I discussed the position or status of the sanitary inspector in a letter to Government. That letter explains my views. The order was to the following effect:— "His Excellency the Governor in Council is not prepared to make any radical change in the case of sanitary inspectors, pending consideration of some

"scheme for reorganizing the staff. Mr. Rice must do the best he can with the material at his disposal, "getting rid of those that are incompetent." That letter and order may be useful, as throwing some light on the question of pay and efficiency.

I cannot see the object of the extended observation staff. For the most part, the so-called enquiries of these men consisted in asking the reddi, who was thus saved the trouble of writing a report. I have been accused of a tendency to follow, instead of preceding, the plague. It is easy to make these assertions, but what are the facts? When plague burst out over Adóni taluk, the circles were formed and were under observation. The number of villages where it appeared outside the observed zone was quite small, (certainly not twenty) and, out of these, the reddi gave information in all but one or two. If this proves anything (I do not say there were not other factors to be considered), it shows that, in spite of observation, plague spread and that the want of observation practically never did any harm. Here is a case in point.

The regulation assistant inspector—that is to say, a person of no standing or education, who has not been able to pass with credit a paper on the 15 days' training—was in charge of Hospet. The plague was at Kamalapur and the Union authorities were on the alert—in fact, the town was thoroughly frightened. The Tahsildar was told casually by some one, in a village 20 miles away, that so and so (naming the man) had plague in such a house of such a street. This was verified and it was the beginning of sorrows. If it is argued that this shows bad work, "quite so", say I, "that is the kind of work you get." The whole season in Mangalore, the circle inspectors went trotting round, drawing pay and really doing practically nothing.

But it is perfectly fair to ask that some sufficient substitute be found, that we should construct, as well as destroy. I do not say that observation is entirely useless, but I do not think it is of any use after a time. When a zone is thoroughly infected, it is utterly absurd to send a man solemnly round, to say that A or B or C has been added to the list. These things very soon become known in an area once thoroughly roused and the black sheep of a reddi is hardly more frequent than the same animal in the sanitary flock. I say therefore that there comes a period when the ambulance staff should completely supersede the observation agency, just as, in a battle, there may come a time when it is better to cease firing the big guns.

Can you then trust the reddi? To a certain extent you can and individual reddis you can; but some are lazy, some are incompetent and some are wilfully disobedient. Can you trust the sanitary inspector? Well, that is where I join issue. I say that, if you got the value of Rs. 70 from the man, the net pay of a Rs. 100 Deputy Tahsildar, who has neither horse allowance nor travelling allowance, it might be worth while, but, where we get private vakils, vakils' clerks on Rs. 10, failed dufterbunds not good enough for Rs. 7½ (all these I have known), how can you expect brains, tact and influence in the villages? My solution to the whole question is this:—When plague is raging, abolish your so-called preventive staff, but keep up a staff of really efficient men, not the halt, the blind and the maimed, to watch the area immediately threatened, a zone of (say) 10 miles; beyond that, I would make the recognised business of the revenue staff. Further, it is not necessarily a circle that should be protected. When plague breaks out in Bellary town, the dangerous points are, not the villages round about, but Hospet, Rayadrug, Adóni. It is quite true that villages near an affected town are likely to be affected first and I say you ought to observe them, as long as observation is of use, but, at the same time, you should have proper observation in the main centres. Your Rs. 25 man is useless, for the reasons which I have given already.

As for allowances, I do not remember exactly what officers get what plague allowances. One certificated sanitary inspector told me in writing that the terms "travelling allowance" and "pony allowance" were unfortunate misnomers, as it was evident that Government meant them merely to be an addition to the salary and that it was a pity they were not so called. A pony allowance is a good thing in a flat country, but what guarantee is there that these men can ride? I know they merely hire the pony, keep it on starvation allowance and pocket the rest. Out of Rs. 30 paid in horse allowance and travelling allowance, I don't believe the inspectors spend Rs. 15. Finally, I have done my utmost to get the month's notice abolished. It is almost impossible to say, a month ahead, whether plague will or will not have stopped, and the money is apt to be simply thrown away. It is all in favour of the inspector. If he wants leave urgently, a substitute is found; if not, he stays on for his month and draws his pay. The Sanitary Commissioner thinks he must have preparation-time to look about him. He is on the books of the office. He packs up his box, returns the pony with thanks to the reddi, who lent it to him, and goes home within the week. Does a Collector get a month's notice to sell his furniture, his tents, his horses, his carriage and all the *etceteras* that are so hard to dispose of? I am afraid, I have not answered nearly all the questions categorically, but, incidentally, I have, I think, indicated my opinion on most of the questions. For instance, I have more or less answered (s) and, in answering (s), I have incidentally spoken of the degree of confidence that can be placed in villagers, when left to themselves.

GROUP B (2).

Lastly, the passport-system. In my report on South Canara, I said you could never hope for more than a distant approximation to perfection and, though exception was taken to this phrase, I believe it to be true and I believe it to be the opinion of every officer I have worked with.

The main difficulty in the passport-system is the intimation question. I elaborated a scheme in Bellary, but I don't know if it came to anything; over and over again (in fact, in the vast majority of cases) the intimations do not reach the local authorities, till after the time when millions of microbes are running riot in the villages! "Faulty arrangements", say the critics. But, where are you going to get your carrying agency and, without intimations, what is the good of the passport-system? Has not the reddi to trust to his personal enquiries? It is very expensive; it entails hundreds of constables and tens of clerks. It is very irksome and leads to prosecutions, often because people don't understand the regulations. I think, myself, that the passport-system ought to be confined, at any rate, to large towns. I do not intend to enter into any sweeping condemnation of it: indeed, I should misrepresent myself, if I did. I have no doubt that more than one case was detected at passport stations in Mangalore, and other passport-holders were found to have plague in several of the villages. Whether these last were found out *owing to* the passport-system is another matter. Canara is a most difficult district, especially in the rains, for any perfect working of intimations. It seems to me that what should be aimed at is rather the control of railways and large towns. I would passport men coming *into* a free town, rather than those going out of an infected one. Or, if this involved too much money, I would restrict the passports to places where intimations can be sent at once. If Bellary were badly infected, I would make people take out passports for Rayadrug, for Adóni and for Hospet, but not for rural villages. In these, I would put the responsibility on the reddi, who can now plead that he did not receive intimation. There are plenty of objections to this scheme, I know, but what I mean is that people going into badly infected towns would not want passports and only those places where a man can lose himself in a crowd need be guarded. This is the principle underlying the whole. Of course, you will say, this is more and not less expensive. You guard many places instead of one. That depends—you must either guard the infected or the non-infected place. If Bellary is infected, you may have to guard Adóni and Hospet and Rayadrug, but, if Bellary, Hospet and Rayadrug were all badly infected, you would guard only Adóni. If such a scheme be unworkable, then I would abandon the passport-system and trust to increased vigilance on the part of the preventive staff in the towns. These are rather crude ideas, I fear, and I have not time to elaborate them. They are capable of a lot of discussion. I have only to add that station-house officers are quite useless as passport men. They know nothing of the work; they are frequently away from the station; the Inspectors know nothing and care nothing; the District Superintendent of Police looks upon this work in a protesting attitude. The plague staff cannot control the station-house officers. They can only hand him up to the District Superintendent of Police, who hears a garbled account and generally sides with his own men.

ADDITIONAL QUESTIONS.

GROUP A (1).

- (c_(i)) This is a scientific matter, of which I have no knowledge.
(e) It is of very little use, because it cannot be universal, and it hampers trade a great deal.

GROUP A (2).

- (e) I have not got a district.

GROUP A (3).

I have no knowledge.

GROUP B (3).

(a) The police are controlled in the ordinary way. In South Canara, they were fairly efficient, but, in Bellary, they were a terrible rabble. I suggested some improvements, in my printed fore-cast circular, issued in Bellary district.

(b) If you keep on the passport-system, they cannot be reduced. You must guard the exits to towns, if you are going to do the thing properly. If you evacuate a village, you must have a police guard, even if he is only a talayari dressed up to look a policeman.

M. E. COUCHMAN, Esq., I.C.S.

GROUP B (1).

(i) to (s) Villages, in the East Coast sense, are not found in South Canara. The people in rural parts live in isolated houses along the sides of their own fields. Hence, there is no likelihood of plague obtaining any footing in the villages. Many sporadic cases have

occurred in the villages, but, for the reason given above, plague has never become indigenous in any rural tract. In my opinion, the whole system of circle inspectors and supervisors is therefore inapplicable to this district; the men themselves, being mainly East Coast men, are unable to make any independent enquiries and are apt to shirk their work and make nominal inspections. To visit all the houses in a village, situated as they are at a great distance from each other, is a task requiring many days, even for one small village. Presumably, the inspectors and supervisors, like other native subordinates, live at the expense of the patels. I, therefore, consider that all the rural inspecting staff is a pure waste of money and should be abolished and the villagers encouraged to keep strangers from infected parts at a distance. To some extent, they do this already. In districts where there are railways and where most people travel by rail, the passport-system may be efficient. There are no railways here. People can leave Mangalore by hundreds of foot-paths or walk out at any point over the open hills. It is, therefore, a very easy matter for any one, who wishes to do so, to evade taking out a passport, and no doubt hundreds of persons pass in and out of the town without passports every day. Many persons give false names and addresses, and there is no possible means of preventing this. A patel of a village near Mangalore told me some time ago that he was receiving passports for observation by dozens daily, all of which were false. There were no persons of the names given residing in the village. Persons use the passport-system also as a means of annoying their enemies. They write down the name of anyone who is obnoxious to them, in place of their own names, and the patel then harasses him, by insisting on his reporting himself before him for ten days. In this district, the system has all along been a useless and mischievous farce and ruinous to the Municipality, and I cannot imagine any mode of working it which would improve matters in any way.

THE REV. FATHER MÜLLER.

Disinfection.—In my opinion, the best disinfectants are pure water, both cold and hot, fresh air and the rays of the sun. We keep perchloride of mercury on the premises (which we prepare ourselves and which can therefore be relied on) for those who may like to use it and to disinfect carts and articles in which plague patients have been brought, to conform to Government regulations, but the staff hardly ever uses any disinfectant. We also mix the excrement with perchloride of mercury, though I think slaked lime would do as well.

As for disinfection of houses in towns, I have only to repeat what I said in my speech at the opening of our plague hospital here. The real danger of plague is in the low, damp, badly ventilated, sun-excluding, dirty huts. The germ, whether bacillus or miasma or malaria, is there. Consequently, those who live in such houses should leave them, at least during the rainy season. If this cannot be done, then open all your drains and thus draw off the dirty, corrupted water of any pool around your house; cut down all undergrowth and strip your trees of all superfluous branches and foliage, so that the sun may come in. Clean your house; dry it, when damp, by burning in it every day for a few hours a pan of charcoal, which is one of the best disinfectants. Open frequently, during the day, the doors and windows, so as to let in fresh air and sunlight. Do not sleep on the floor, during the wet season, but on a cot a little above the ground; stay inside a low, damp hut as little as possible.

In case plague breaks out in a house, I should advise the people to evacuate it at once, get the roof taken off, let in the sun for a few days, have the house whitewashed and then, after ten days or so, go in again. I think this is better than destroying furniture and cloths by sprinkling them with perchloride of mercury. In no case, would I recommend the total destruction of the premises by fire, as was done in several cases.

As to the infected places in town, an infected house should be evacuated at once and even a whole street or compound, if it is suspected that plague is in hiding in all of them. The persons that lived in an infected house, therefore the contacts, should all get a passport, be forbidden to leave the town, be put in an observation or health camp and show themselves for 10 days to a medical officer, who should be obliged to do his duty by examining them well. The places infected should be surrounded by a cordon of police, and no one should be allowed to enter these houses or localities, until they have been thoroughly disinfected and drained and the houses whitewashed.

Contagion by contact.—From the little experience I have in plague matters here and from what I read in the report of the Plague Commission, I am perfectly convinced that plague, at least bubonic plague, is hardly ever communicated by contact. Our hospital was opened in October 1902; since then, we have had 51 patients under our care. But, though I, myself, my assistants, the infirmarians, nurses and menial staff mixed freely with the plague-stricken, touched them, washed them, opened their buboes, in short, treated them, in every way, like ordinary patients in the hospital, none of us got ever attacked. I purposely said, *bubonic* plague, for it is quite different in the case of pneumonic plague; contact with the latter may easily prove fatal; we lost two of our servants in this way.

Inoculation.—I have no faith in inoculation. First, no one can tell how long it will protect a person. In the beginning, the advocates of inoculation stated that the protection would last for a year, then for six months and now they are not sure even of three months. They say

that the mortality among those not inoculated has been greater than among the inoculated. But, this is no proof. Whom does the plague usually attack and carry away? The weak, the starving, those whose system has been run down by disease or vice and those who live in an unhealthy locality. These people are too much afraid to get inoculated. It is those who are in good health and in good circumstances and living in healthy localities that get inoculated. Many of them do not get plague, but the same holds good with those of the same standing who do not get inoculated.

2. I am against inoculation, because we can never be absolutely sure of the serum being innocuous and we may easily have a recurrence of the Punjab disaster.

3. I have many patients in plague district, viz., Bombay, Poona, Belgaum, Bellary, Bangalore, whom I treat by letter. A good many write to me that, ever since the inoculation, their system is completely upset, they are no longer the same, and then follows a list of ailments that came in the train of inoculation.

I am, therefore, opposed to compulsory inoculation.

Rats.—I do not consider rats as the propagators of the plague. The dying of rats, their migration, I consider only as a danger-signal. If they die or migrate, they seem to tell us "there is plague here, get out as quick as you can." But I do not think they carry the plague from one place to another. I have heard of rats migrating in large numbers from one village where there was plague to another, and not a single plague case occurred in the village to which they had migrated.

Plague Hospitals.—are very popular, if they are properly conducted. When we first opened ours, it was rather hard to persuade patients to come to Kankanadi. But, when they found out by experience what kindness and attention they met with from the staff, both superiors and menials, all changed. As soon as any of our Christians were attacked with plague, they insisted on being brought at once to the hospital, nay, several of them, as soon as they felt the first symptoms of the disease, came walking over to the hospital, saying "I have plague and I have come at once, so as not to die outside the hospital."

This same eagerness was shown by the Hindus, at least by those of the lower castes. In the beginning, we admitted a good many of them in special sheds erected for them, but we could not continue, as our staff was too small. Several of the Hindus admitted died; once, a whole set of six of the same house. (These were cases of pneumonic plague, for, of bubonic plague, we saved over one half.) When, after that, the same caste people came again to ask for admission for other patients, I said to them "What is the use? All have died, you know, up to this." "Never mind, if they die," they answered, "they will at least be well taken care of, as long as they are alive." However, patients, up to a short time ago, when changes for the better were introduced, showed the greatest repugnance to go to the Government plague hospital at Urwa.

Passports.—I think the passport-system in Mangalore, since the outbreak of plague, has been a perfect nuisance, the cause of much evil and productive of little or no good. Of course, I wish my remarks on this subject to apply to Mangalore and not to other towns of India, where conditions may be quite different.

1. The circumference of Mangalore is about 12 miles. There are some 10 or 12 roads, by which travellers may pass out of town and, at these places, there is a passport station. Though the police are stationed here and there, the distances are so great and the by-ways are so many that many persons will pass out without a passport. This, for the day, but, at 9 p.m., the police along the by-ways go home. What is there to prevent persons from going in and out, between the hours of 9 p.m. and 6 or 7 a.m.?

2. The passport clerks are uneducated persons, generally a little above the common cooly, inasmuch as they know how to read and write. They have no medical knowledge. They simply write down the name of the person and the place he intends to go to and give him a passport. No one cares whether or not he comes from a plague-infected house or whether he has plague or not. The person, thus armed with a passport, goes to his village, and there the same farce is enacted over again, every day, if he is a poor man, or, once or twice in ten days, if he is well to do and influential, and all is over. What protection is this against plague?

The same results and, perhaps, even better results could be obtained by letting people go freely to the town and come back to the villages without a passport, but ordering the village officials to have a sharp eye on their villages and obliging them to report, themselves, any suspicious case of sickness that might occur in the village. But, as the village officials are generally not well educated, it has happened again and again to my knowledge that a case of common fever, sudden death from apoplexy, etc., was reported as a plague case. The plague inspectors should visit these villages and see whether the case is a true plague case or not. To this end, the plague inspector should be well up in plague matters himself. He should have a horse to move about quickly from place to place and have only some few villages under his control, which he should be bound to visit, once a week, in turn, one or several villages a day, according to size and distances. This arrangement would save the enormous amount now spent on the police and plague passport clerks in town, save the poor people from the exactions of unscrupulous underlings and put an end to the disruption of trade which the passport-system brings along with it.

The plague, moreover, has never been general in Mangalore, but has been confined to a few localities, known for their insanitary conditions. The elevated parts of the town, where there is no crowding, no low, badly ventilated houses, no stinking pools, have been extraordinarily free from the scourge and, whenever an exceptional case occurred in them, it could always be traced to one of the inmates having gone to the houses of the infected area.

M.R.Ry. V. T. KRISHNAMÁCHÁRIAR AVARGAL.

GROUP A (1).

(a) As disinfection coupled with evacuation is the only successful remedial measure, increased attention is necessary.

(b) No. Disinfection inspectors are not taught to disinfect infected houses. Their training is more or less theoretical. It is necessary that, in addition to the theory of the origin and spread of plague, the inspectors should have a practical course in the disinfection of plague infected houses.

The coolies are most of them untrained. They are recruited from the labouring classes. The best way is to get trained coolies from Madras. The Local Fund coolies have been brought from Madras and are trained men.

(c) More might with advantage be spent on disinfection in Mangalore, especially during the hot months, when a systematic disinfection of infected places might be undertaken. A staff of four inspectors and fifty coolies will suffice.

(d) 1. *Disinfection by burning bratties*.—I tried this in some go-downs in Bunder and also in some houses. It was not tried on a large scale. Plague did not re-appear in the houses desiccated. The greatest advantage is that it does not necessitate the removal of things. But it is not suited to this district, (a) as, in all cases, the people objected to the smoke and complained that it discoloured everything, (b) as most houses in Mangalore are tiled and thatched and heat can escape very easily. The success of the desiccation depends upon the maintenance of about 80° of heat in all the rooms for some hours. It is less costly than the disinfection by perchloride lotion.

2. *Desiccation by sunlight*.—In all disinfected houses, I always insist upon the tiles being removed. Wooden planks, etc., below the tiles are also removed in many places. It has, however, been tried only in conjunction with (3) and has been a success.

3. *Disinfection by chemical disinfectants*.—This has been very successful in Mangalore, especially if carried on in large blocks thoroughly evacuated. It has been a signal success in localities like Dongerkerry, Kudeoli, Golicatta, which were highly infected, but have now been healthy for a long time. In all these cases, (2) was combined with disinfection by chemical disinfectants.

The only possible objections to this system are (1) that it spoils the floor of the house, (2) that the lotion may not reach all the parts of the house. (1) Applies only to mud flooring. In the case of floors of mud mixed with cow-dung, the floors have to be dug about 4 inches and flooded with lotion. My experience, however, is that the mud coating can be renewed soon, without much expenditure. There is no danger of the lotion not reaching the ceiling, etc., if the disinfection is thoroughly done.

I think that, on the whole, disinfection by chemicals is the best suited to Mangalore.

(d(i)) I would suggest a combination of (2) and (3), for both towns and rural areas in South Canara.

(e) There was only one interval in this district, when there was no plague—from 25th November 1902 to March 1903. The plague broke out in March 1903 virulently.

During this interval, there was one plague case in January. Further, there were three cases in rural areas in December. These cases could not have occurred, unless there had been infection in Mangalore in December. January had one plague case and, as the staff had been abolished in the Municipality alone, "dropping cases" were probably not discovered. February returned a clean sheet, but it is very probable that some plague cases were lost sight of and the deaths ascribed to other causes. Eleven cases set down as due to dysentery and 13 to "Respiratory diseases" (as against 4 of February 1902 and 7 of January 1903) show that this view is very probable.

It is, therefore, possible that the fresh outbreak was due entirely to recrudescence and not to re-importation from outside.

(f) Yes.

A pump is necessary for disinfection of houses with high roofs. A steam disinfectant would be a great convenience, but the cost is prohibitive.

(f(i)) Yes. They are got from Madras.

(g) I always superintend disinfection as closely as possible and, so far as I have seen, it is done conscientiously. A good deal depends on the inspector. There is only one inspector.

in Mangalore who is well trained and who does his work intelligently. This is due to the fact that he has received some training in the Medical College. The others have to be closely watched.

(h) In Mangalore, people appreciate disinfection. They have come to understand the advantages of disinfection.

(i) The plague staff is constantly advising the people to have their houses disinfected, as soon as rats die. The leaders of several communities instruct the people in this respect. But the popularity of disinfection, even among the most ignorant classes, is due to the success that has attended that measure in practice.

(j) As people become more and more accustomed to plague measures, they can be made more independent of official help.

(k) Disinfection can be made more efficient by improving the training of the staff, as suggested in (b). I do not think it can be made cheaper. The chemicals now used seem to be the best for the purpose, and no savings seem to be possible.

(c(i)) Considering that the smallest organisms will suffice for the bacillus to multiply on, one cannot without bacteriological examination give a decided answer, but I have observed that the plague bacillus seems to flourish for a long time in floors composed of mud, often smeared with cow-dung.

(e) This has been tried in several go-downs in Bunder. Sulphur-fumigation was often employed for the purpose, sulphur being burnt with pitch, etc. I cannot say that the desiccation was thorough, but the results were not discouraging. In highly infected go-downs, this was repeated many times.

GROUP A (2).

(a) There are no arrangements now in force for inoculation.

(b), (c) and (d) I have not made any observations on these points.

(e) About 1,300 people were inoculated during the first outbreak. Most of them were people in high ranks of life, who could be trusted to keep themselves out of infection—Government officers, merchants, etc. This large number is due to the fact that several firms had all their coolies inoculated. Very few in the infected localities—Golicatta and other places—were inoculated, and so it cannot be said whether inoculation was a success or failure. A circle inspector gave three cases of deaths amongst inoculated persons; one of them, however, died within the incubation period.

The statistics on this point are very incomplete.

GROUP A (3).

(a) Yes, in Mangalore.

(b) (I).—The destruction of rats has always been urged upon people living in infected areas. I now find that people readily camp out, as soon as rats die, and request disinfection.

(II).—I do not think inducements necessary. Rewards for killing rats are useless. Rewards were offered last year and very few rats were brought to the office. As people have come to understand the danger of rats dying, no inducements need be offered.

(c) Rats seem to spread plague from one locality to another.

As soon as a particular locality gets infected, rats leave it and migrate to healthy localities. Some of these rats have probably taken the infection already, and hence it happens that, very soon afterwards, rats begin to die in healthy localities adjoining infected areas.

I also observe that, as soon as a highly infected locality is evacuated and disinfected, rats begin to die in adjoining localities. In a few cases, there were actual cases of plague, a few days after the death of rats had been reported.

I observed this tendency especially in three cases—

• About the middle of February, Kudroli cross street was very highly infected. It was evacuated and disinfected and, in a few days, rats began to die in Alke garden very near.

Again, when Dongerkerry was evacuated and disinfected, Dongerkerry garden began to show rat-deaths. On the disinfection of "Twelve Shops" bazaar and part of Golicatta, Lakdi bazaar and Khandak garden began to be infected.

In all these cases, the presence of infection in the new localities became known by means of rat-deaths. In Alke, three days after rats began to die, there was an attack. The whole garden was at once evacuated and disinfected. In other cases too, plague attacks followed closely on rat-deaths.

One common feature in the movement of rats in the above cases is that they all migrated from a higher to a lower level and that the infection accordingly spread from these localities to those lower in level. I am not sure if, from this, a general rule can be deduced as regards movements of rats.

To prevent this spread, I followed this plan:—

As soon as a locality became infected, a big block, comprising all the infected houses, with an outer ring of healthy houses, especially those situated on a lower level, was evacuated.

Disinfection of the healthy houses was begun on both sides, and so the party worked on to the infected house, which was taken up last. Special attention was paid, in the course of disinfection, to the destruction of rats, and rat-holes were blocked up.

These isolated phenomena cannot, in themselves, form the basis for any general propositions, but they are submitted, as, taken in connection with phenomena observed in other districts, they may suggest some propositions of utility.

Rats seem to communicate infection to men direct. I am not referring to the large number of cases, in which the infection is due to the patient flinging a dead rat into a drain or into his neighbour's compound, but to a set of rather interesting facts that come under my observation. I observed some huts, in which infection was very pronounced. One of them in Kudroli was evacuated and disinfected. After some days, it was re-occupied and, in a few days, there was another attack. After re-disinfection, there was another. In all, the house was disinfected five times, and there were four attacks after each successive disinfection. Ultimately, it was thought advisable to pull down the roof and burn it. The roof was a thatched one. It consisted of two coatings—one of cadjan and, over it, one of "muligrass." When it was about to be burnt, I found more than 20 dead rats in various stages of decomposition between the two layers. There was no doubt whatever that these rats had died of plague and had infected the various people that died.

I found the same phenomenon in many other cases, but this may be taken as a typical one.

A very ingenious explanation was given to me by the hospital assistant diagnosing cases. He thought that a fit of shivering preceded plague in rats as in men and that they sought shelter between the two layers. The infection was attributed by him to plague germs constantly falling from the roof.

I drew Mr. Rice's attention to this fact, and he was inclined to believe the infection due to germs falling from the roof and to regard it as a case of rats directly infecting men.

(d) No. Other animals like rats may operate in the same way, but never to such an extent.

(d₁). Fleas carry infection from rat to rat. I have not seen fleas carrying infection from rats to men.

(f) I have not seen infection spread for any great distance by rats spontaneously. It may spread to a neighbouring garden without human agency, but not to long distances.

GROUP A (4).

(a) They are generally unpopular.

(b) No special steps are necessary. Constant advice to the people is necessary. If the hospital arrangements are good and the officer in charge is able and sympathetic and if there is a good nursing staff, hospitals will become more popular. The Kankanadi hospital owes its immense popularity to all this. Caste scruples must be respected in the municipal hospital, especially in matters of diet.

(c) The Catholics have a hospital of their own and the Protestants are about to build one.

GROUP B (1).

(a) In Mangalore Municipality—

The circle inspectors are successful in detecting plague cases, as (1) the wards are small, (2) the vigilance committees, where they exist, and educated people in all places help them and (3) people themselves have to a great extent learnt the necessity of taking early steps in plague cases.

From March 1903 to 20th January 1904, there have been, in all, 548 cases: of these, 349 were reported before death. Of these 349, 308 (or nearly 88 per cent.) were detected by the circle inspectors. Almost all the cases reported after death were reported by the circle inspectors.

(b) In Mangalore, plague is mainly confined to two wards—Golicatta and the Fort.

A separate inspector is necessary for Golicatta. Of the seven remaining wards, Kodialfail has over 10,000 people and may have one inspector. Of the other wards, each inspector may have two. On the whole, five circle inspectors are quite enough.

For disinfection, the strength is now sufficient.

Division inspectors are not necessary, if a special officer can always be spared to supervise plague work in the Municipality. If a full-time officer cannot be spared, division inspectors will be necessary to check the work of the circle inspectors.

According to the distribution I suggest, each circle inspector will have from 8,000 to 10,000 people in his ward: the extent will be almost the same. Golicatta is an exception. As it is peculiarly exposed to infection, it is necessary to have a separate inspector for it.

(c) I would suggest the following scale of pay:—

For Temporary Sanitary Inspectors—Rs. 25 to Rs. 30, rising by annual increments of Re. 1.

For Certificated Sanitary Inspectors—Rs. 40 to Rs. 50, rising by annual increments of Rs. 2.

Pony allowance is necessary, in the case of division inspectors in Municipalities. It is also necessary, in the case of supervisors in rural areas.

In the case of circle inspectors of rural areas, it is quite unnecessary. There are only about 4 or 5 villages in each preventive circle, which are accessible on horseback. The same is the case with observation circles. In South Canara, therefore, a pony allowance is unnecessary.

An extra allowance during plague is inadvisable, as it makes it the interest of the inspector to see that cases are declared to be plague, and for many other reasons.

According to this proposal, temporary assistant sanitary inspectors in rural areas will get Rs. 25, plus Rs. 15 (consolidated travelling allowance), while now they get Rs. 40, plus 15, plus 15, i.e., Rs. 70. If temporary assistant sanitary inspectors are engaged in Municipalities, their pay is only Rs. 25: there is no reason why they should get Rs. 40 in rural areas, especially as they are given a travelling allowance of Rs. 15.

(d) For Mangalore, two of the circle inspectors may be retained during the hot months. These, working with the permanent sanitary staff and the disinfection staff, will be useful for the purposes mentioned.

The disinfection staff must be increased during the hot months, so as to carry on systematic disinfection of infected blocks.

(e) The training given under the new scheme to certificated sanitary inspectors is very satisfactory.

The temporary assistant sanitary inspectors are, however, trained only for a short time (15 days).

It is desirable that their training period may be extended to two months. In addition to the general principles of hygiene and sanitation, they must be taught all matters concerning plague. A knowledge of the plague regulations may also be insisted upon.

It is also desirable to insist upon some preliminary educational qualification (matriculation, at least), in the case of candidates to these schools. If it is made a rule that, as vacancies occur in the permanent sanitary staff, the best men from among the temporary inspectors will be selected to fill them up, a good class of people will be attracted to these places.

In addition to the general training received in Madras, inspectors must be made to undergo a fortnight's training under the District Medical and Sanitary Officer in actual plague work. Training under the various District Medical Officers exclusively is not advisable, as it will lead to great diversity, and transfers from one district to another will be impossible.

For supervisors' places, I think Police Officers, Salt and Abkari Officers or Military Officers may be employed with great advantage. What is expected of supervisors is power of organization rather than mere technical knowledge and, in case such officers are available, they may be employed, after some training under the District Medical and Sanitary Officer.

(f) There is no European Supervisor in this district.

(g) In many cases, they work conscientiously.

(h) Public sentiment is becoming more and more favourable. They are not viewed with the same amount of distrust as formerly.

(i) Answered.

(j) Yes.

(k) Circle inspectors in rural areas are not popular with patels and cannot, with a few exceptions, be said to be a stimulus to them.

(l) No. In this district, the circle inspectors cannot do anything, without the help of the patels. "Could not check passports, as patel was absent," "Could not trace out the case, as patel was not in the village"—these are very common entries in the diaries of the inspectors.

From March last, there were 36 cases of plague in rural areas. Only 5 were reported before death. Twenty-three of these cases were reported in the first instance by patels and shanbhogues. Thirteen were reported by circle inspectors. Of these, only 4 were living cases. Nine were reported after death. In many of these cases, even the dead body was not examined, as the inspector came very late, the cases being declared plague from the history gathered from neighbours and on mere suspicion. There are at least two cases, in which the circle inspector, visiting the village three days after death, hearing about the death and collecting the history thereof, reported the cases to be plague.

(m) No.

(n) Nil.

(o) Villagers are said to be greatly afraid of plague cases and to understand the danger of infection.

(p) In some cases, neighbours complained against a particular man for admitting people from Mangalore in his house. If this attitude is encouraged and all Revenue officers in their tours emphasise this lesson, villagers can, in course of time, be trusted to keep out outsiders.

(q) Yes. No special staff is necessary. But, in all big villages, committees of the more prominent men may be formed and these may be instructed in such matters. Some time ago,

I organised such committees at Ullal and Panambúr and I understand that they are working well, especially in reporting arrivals from Mangalore. The permanent Revenue officers can do more in this respect than the plague supervisor and circle inspectors.

(r) This committee may have under it, or form itself into, a sort of a village patrol. It may be watched by officers, but it need not be officially worked.

At first, it cannot of course be expected to work systematically, but, when sufficiently educated, not only by the advice of officers, but also by the measures taken in respect of plague cases in their villages, it can be trusted to work efficiently.

(s) It is found, from the facts submitted, that the circle inspectors cannot detect cases without the aid of patels and that they do not stimulate the village officers to any great extent.

The function of circle inspectors, therefore, seems to be (1) to supervise the passport work done by patels; (2) to attend to general sanitation; (3) to take steps, when plague cases occur. Villages in South Canara are very difficult of access, and the houses are completely isolated.

Taking all this into consideration, it appears that the rural staff may be considerably reduced. One year ago, this staff was increased, as it was thought that circle inspectors would be useful in early detection of plague cases and in other respects do things which the inspectors in the Municipality do every day. The figures I have given above prove that detection of cases by circle inspectors is absolutely impossible.

It does not seem to be necessary to maintain such a large staff, simply to supervise the plague work of the patels. I would suggest:—

- (1) the retention of 2 out of the 3 plague supervisors;
- (2) the abolition of some of the existing circle inspectors.

In preventive circles, each circle inspector may have about 25 villages and, in observation circles, about 40. If the circles are arranged like this, only about half the number of inspectors will be necessary.

(i(i)) The plague staff insists upon seeing all dead bodies. If there is the slightest suspicion of its being plague, a medical opinion is got. In cases of suspicion in fresh localities, the Assistant Surgeon or the District Surgeon is requested to diagnose.

(i(iii)) There are no certificates of death in this district, nor do people like the system. They prefer to get cases examined before death or after death and before the removal of the corpse.

(t) (I) It is not desirable, in Mangalore, to offer rewards to private persons. It will open a door to all sorts of oppression and raise up a class of persons who will make Government measures unpopular. There is no difficulty here as regards getting information. Educating the people and well-chosen prosecutions always have a very salutary effect. These seem to be a better way than offering rewards.

(II) No inducement is necessary. These practitioners have always given me information about the cases they treat. Most of them are anxious to be known by officers as treating cases of plague and some of them wish to have certificates, if particular cases under their treatment are successful.

(u) Their co-operation is very easily secured. No action is desirable. They need not be instructed, as their diagnosis is not accepted. All cases are examined by the hospital assistant. Further, some of them are very good in their diagnosis and may be relied upon.

GROUP B (2).

(a) I do not think the passport-system will work well in this district:—

- (1) as there are numerous trunk-roads to be guarded;
- (2) as there are a large number of by-paths, leading from one place to another a long way off, and a patrol cannot be placed at every such point: small hills, which are numerous in many places, also afford facilities for evasions;
- (3) as the backwater on the west, south-east and north-east forms another great natural barrier to its success. It is impossible to guard all the points along the line, and a boat may leave from any point on the line and go to distant places without passports.

(b) Nil. This question does not apply to this district.

(c) The giving of false addresses in this district is not as frequent as it might be, and it does not seem possible to contrive a system of registering correct addresses.

For this purpose, the system of making village officers watch and report new arrivals in their villages will have to supplement the passport-system.

GROUP B (3).

(a) The work of constables on plague duty is checked by head constables and by the revenue inspector. Their work is also supervised by the plague officer, who, however, reports irregularities to the District Superintendent of Police.

Under close supervision, they do their work satisfactorily. I think they might work more efficiently, if the plague officer, who comes into closer contact with them than the Inspector or District Superintendent of Police, had some control over them, subject to the Collector's supervision.

(b) No.

(c) They are engaged in:—

- (1) securing the isolation of the sick and guarding infected houses;
- (2) where contacts are isolated, in guarding such houses;
- (3) watching evacuated houses and preventing their re-occupation without permission;
- (4) one constable for each disinfection party, to watch the coolies and search them, as soon as disinfection is over;

Passport patrols have been abolished.

A. J. LOBO, Esq.

GROUP A (1).

(a) In my opinion, sufficient attention is not paid to disinfection in this town. In the first place, the clothing and some of the other articles in an infected house are generally not allowed by the house-owners to be disinfected or even allowed to be exposed to the sun. To avoid disinfection of these things, what is very often done is that, before the arrival of the disinfecting party, these articles of apparel, etc., are stealthily removed from the house to some other quarters, thus carrying infection elsewhere. I would suggest that some precautions be taken to prevent this and to get all the articles in an infected house disinfected.

In the next place, disinfection, as at present carried on here, is mainly confined to the washing of the floors and walls of the infected house with chemical disinfectants. Due attention is not paid to the roofing of the houses, where at times there is much infection lurking. I know of instances, where, in removing the roofing, dead rats were found, which I have no doubt were stricken with plague. I suggest that, while disinfecting a house, the roof should be thoroughly over-hauled; in the case of thatched houses, the cadjans and thatching grass should be removed and burnt and, in the case of tiled houses, the tiles should be removed and allowed to be replaced, after the house has been exposed for a sufficient length of time to the rays of the sun. Of course, this may not always be possible, especially in the heavy monsoon of this place.

(b) I take it that this question refers to the staff employed on disinfection duty. Coolies employed for disinfection should, before entering on their duties, be made to undergo some sort of training at the hands of some experienced ambulance or disinfecting inspector, under the supervision of the District Medical and Sanitary Officer. They should not be employed, till the District Medical and Sanitary Officer certifies as to their competency.

(c) At present, there are 32 coolies employed in the Municipality on disinfection duty, exclusive of the six ambulance coolies, who also do disinfection work, when not employed for ambulance purposes. In my opinion, this number is far too big and entails unnecessary expenditure on the Municipality. During the time I was in charge of the plague operations, or the greater portion of last year, I was able to manage with a gang of 20 disinfecting coolies, divided into two sections of ten coolies each, exclusive of the four coolies employed on ambulance duty. Of course, when disinfection is being carried on on an wholesale scale, even three sections of 32 coolies (as at present) or more would not suffice for the requirements, but, in such an emergency, additional coolies would be easily procurable here at short notice. At present, there is not sufficient work for 38 coolies, and I would propose 24 coolies, as being quite sufficient for all disinfecting purposes. Out of these 24 coolies, 20 coolies to be divided into two sections of ten coolies each, which would be in charge of two certificated sanitary inspectors, and four for ambulance purposes.

(d) Desiccation, by burning bratties, etc., I consider to be of great value. At present, much of the repugnance on the part of the public to disinfection here is due to the floors of the houses, which are generally mud, being soaked with lotion, which makes the house unfit for occupation for some days. The method of heating the floor by burning bratties would not only remove this objection, but would also serve to destroy plague microbes and remove any infection not approached by the disinfecting lotion. As bratties are not easily or cheaply available here, I think cocoanut shells or even common straw would answer the purpose quite well enough. Desiccation by sunlight is, I consider, of the utmost importance in removing plague infection.

(d(i)).—The disinfection measures that I would recommend, as stated above, are—

- (1) washing the floors and walls with disinfecting lotion;
- (2) burning bratties or cocoanut shells, after so washing with lotion;
- (3) removing the roofing, so as to allow the free play of sunlight inside the infected house, the roof also being thoroughly disinfected with lotion.

(e) The recrudescence of plague, after an interval, is in my opinion mainly due to the revivification of plague germs. I do not believe that plague microbes, as a matter of fact, really all die, unless such extreme and careful measures are adopted.

(f) At present, wooden tubs and bamboo scoops are used here for disinfection purposes. The bamboo or wooden scoops serve well enough, but, in spite of all the force used by the coolies in splashing the lotion with these scoops, I do not think the lotion penetrates sufficiently to fully remove all the infection.

It would be well to have a gravitating pump to be had in Madras for sprinkling the lotion. I doubt, however, if the present straitened condition of the municipal funds here would permit of the purchase of such apparatus. At one time, at the suggestion of the Collector, Mr. Rice, I thought of utilizing the municipal fire-engine for splashing the lotion, but the idea was given up, as the lotion would corrode the metallic portions of the engine.

Scrubbing the walls with brushes is rendered difficult here by the unevenness and roughness of the mud-walls of the houses generally occupied by the lower classes, who are the greatest victims of plague.

(f₁) There being no easy communication at all times of the year between this place and Madras, it takes at least 10 or 15 days before the necessary disinfectants are got down.

(g) The disinfection work, so far as my experience goes, is being both conscientiously and intelligently done here, but I cannot say as much in regard to its efficiency. In my opinion, greater supervision is required on the part of the officer on plague duty or of the medical authorities in this matter.

GROUP A (2).

(a) During the first year, 1902-1903, people went in very eagerly for inoculation. More than 1,300 people got themselves inoculated that year. Last year, however, so far as I know, not a single person went in for inoculation. This, I think, is mainly due to the Punjab disaster, which created a great scare here and made people lose faith in inoculation. If only, however, a start was made again and some of the Government officials and some of the educated persons went in for inoculation, I am sure people at large would take to it and inoculation would again be made popular here.

Considering that, out of the 1,300 persons or more that were inoculated in 1902-1903, only one died, I think there is much immunity afforded by inoculation and I would suggest that every inducement be offered and a little pressure put to persuade all classes to go in for inoculation.

GROUP A (3).

(c) There is no doubt that rats exercise a great influence in spreading plague after the commencement of an outbreak. When a plague case has occurred in a house, in 90 cases out of 100 the history of the case would show that rats died in the house previously. Further, rats have been the main source of carrying infection from an infected to a non-infected locality. When plague breaks out in a new uninfected ward, it is preceded by rats dying in the ward. Rats so dying is a sure sign of the near approach of plague. Sufficient attention, therefore, cannot be paid to the matter of destroying rats. As a precautionary measure, I would suggest that it be made obligatory on a person to report every suspicious death of a rat in his house, as it is made obligatory, under the Plague Regulations, to report every suspicious case of fever. When coolies go for disinfection work, they should make it a duty to hunt after rats and kill as many as possible. Further, small rewards, say two or three pies a rat, would do much to induce the people to kill rats, wherever found. In 1902-1903, as many as 2,888 rats were so killed and brought to the municipal office for rewards. The reward, however, of six pies then offered is, I consider, too high.

GROUP A (4).

(a) I must say that plague hospitals have not been popular in this district. People believe that they are taken to hospitals only to die, and it often happens so, because the cases of recovery from plague are generally few and far between, and generally a plague case is not detected, until the disease has far advanced, and so, when the patient is removed to the hospital, in spite of the care taken, he generally succumbs within a day or two after removal. Another reason for this unpopularity is that each class of patients wish to have their own caste wards and to have their own caste people to attend on them at the hospitals, which is well nigh impossible. Considering, however, the many different castes prevailing in this town, it would be too much for the Municipality to build hospitals and secure ward attendants, to satisfy the caste prejudices of so many varied communities. The only possible alternative is for people to help themselves in this matter. The Brahmins, the Saraswats, the Konkanies and the Muhamadans are all possessed of sufficient means to provide their own respective caste hospitals, if they wish to have them. Several of these communities have already raised subscriptions for this object, but have done nothing more; a little official pressure is all that is required to have these hospitals actually raised. Without a little official pressure, people rarely move of themselves in such matters in this town.

GROUP B (1).

The observation staff, when I took over charge of plague duty last year, consisted of eight circle inspectors, who were put in charge of the eight wards the town was divided into. Two divisional inspectors were further employed, to supervise the work of these circle inspectors. The number of circle inspectors was reduced by me from eight to six, which number has continued up till now. In my opinion, six circle inspectors are quite sufficient and, further, no divisional inspectors are required and they may as well be dispensed with altogether. Circle inspectors know their work well enough, and the Municipal Chairman and the Special Plague Officer supervise their work and exercise the necessary check over them. Circle inspectors have, further, to submit their diaries daily. Under these circumstances, the divisional inspectors are, to my mind, a superfluity and may be done away with.

The observation staff, to my mind, is a necessity in this place. However much the various classes may be advised or educated in plague measures, they cannot be trusted to safe-guard themselves against the spread of plague. The people, if left to themselves, in spite of the penalty provided under the Plague Regulations, seldom give information of any case of suspicious fever or of a plague attack or death occurring in their houses. This is so, not only amongst the lower classes, but even amongst the higher classes in this town. It is only due to the exertions of the circle inspectors that plague cases have so far been detected in this town. Vigilance committees, if formed, would no doubt be of much service in checking the spread of plague, but it would not be possible to leave everything to them. I would suggest that an observation staff, consisting of six circle inspectors, be maintained and, further, that each community or caste formed its own vigilance committee, to strengthen and help the plague authorities in detecting plague cases.

The six circle inspectors may be appointed, one for each of the following ward or wards:—

No.	Name of Wards.	Population.
1	Golicatta	4,554
2	Fort	4,621
3	Court and Cantonment	9,609
4	Central and Market	8,694
5	Kodialbail	10,737
6	Jeppu	5,598

The Golicatta and Fort wards are the ones where plague generally exists. The Court and Cantonment wards are generally immune from plague and so may be well looked after by a single circle inspector. The pay of the peons attached to the circle inspectors may be reduced from Rs. 7 to Rs. 6, as there are plenty of persons offering to serve on that pay.

(c) As regards the pay of the observation staff, the present scale seems to be reasonable. In my opinion, however, the circle inspectors need not be given any extra plague allowance, which they draw at present. In this town, there are certain wards, which are nearly always free from plague, and it is at times due to the exertions of the circle inspector that some wards are rid of plague. It would be poor consolation to the circle inspector, to be deprived of this allowance, once he succeeded in getting plague out of his ward. Further, once a ward is free from plague, then it is that the circle inspector should exert himself all the more, to see that it does not get infected again. In view of all this, I would recommend the stoppage of any extra plague allowance. If necessary, their pay may be raised from Rs. 25 to Rs. 30.

(d) During the hot months, plague is generally on the decline and for days together at times there are no plague returns. It is during these hot months that the greatest amount of vigilance on the part of the observation staff is called for. When plague has disappeared for the time being, the circle inspectors should then:—

- (1) busy themselves in watching and improving the sanitation of the respective wards;
- (2) make searching enquiries as to the health of the residents in their wards;
- (3) trace out any rats dying;
- (4) induce people to disinfect their houses every now and then as a precautionary measure;
- (5) advise them to get their houses exposed to the sunlight, by removing the thatching, grass or tiles from the roofs;
- (6) deal effectively with any plague case that may unexpectedly occur in the ward, etc.

I would further suggest that, during the hot months, a general order should be given to the public to have all the houses in the infected wards desiccated, by exposing them to sunlight for at least one full day. It would not cause much inconvenience to do this.

(f) Till the people are sufficiently educated to fully appreciate plague measures, it is desirable to have an European officer on special plague duty. At times, there is much opposition and obstruction offered to disinfection, evacuation and other necessary plague measures and it requires a stern but at the same time tactful hand to cope with the situation and smooth matters. The presence of an European official is of very great use in such a situation and would be of

great service in times of any opposition or obstructiveness to the plague measures on the part of any section of the public. The plague staff also would work much better. A notable instance of this may be quoted, when Mr. G. D. Stuart was deputed as Special Plague Officer here; I noticed that the plague staff were very active and turned out much better work than it does at present. Besides, in successfully combating plague, much originality and independence of views is called for and this would be better met by the appointment of an able European officer.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c.) I know for a fact that plague cases have occurred in the very houses where there were plague attacks a year or so before, and this has happened in spite of the houses in question having been disinfected and evacuated after the former attack. This shows that plague bacilli are not easily destroyed and may lie dormant for months together in the floors of houses and then suddenly revive under favourable conditions.

(e) It is known that plague first invaded this town on account of infected rats being imported from Bombay in consignments of grain got down by merchants from there. The immunity from plague for the previous years was, in my opinion, due to the rule then made that all goods imported from Bombay should be desiccated on the sea-beach, before being allowed to be landed. This was a salutary rule, and I do not know why it was subsequently done away with. As, judging from the returns of late, there is a chance of plague subsiding altogether in this district, it would be as well to revive this rule and enforce it again.

GROUP B (1).

(i.) As a rule, the plague staff insist on seeing dead bodies, before removal for burial or cremation. In some instances, however, corpses were stealthily removed, without previous intimation to the plague inspectors. Since last year, however, on account of the dread of prosecutions, instances of this have become very rare. There were a number of prosecutions filed last year under section 47 of the Plague Regulations, which had a very good effect on the people of this place. Since these prosecutions, people very readily came forward to report plague cases and give the necessary information. A single prosecution ending in an exemplary punishment has ten times more effect on the people of this place than any amount of good advice. Of late, I remark, there is again a tendency on the part of the public to conceal plague cases due, to my mind, to there not having been any prosecutions of late. It would be well to again start a few prosecutions against some of the defaulters, and I doubt not matters will be set right again.

(ii.) As the regulations stand at present, I do not think sufficient powers have been vested in the Municipal Chairman, in the matter of ordering disinfection, evacuation, etc. The Chairman generally has a wide experience in plague matters and an intimate knowledge of the conditions of the place and of the people at large and may always be trusted to use a wise discretion in enforcing plague measures and in taking all the necessary steps to prevent plague or check its spread. In my opinion, therefore, it is advisable to invest the Chairman with the same powers as are given to the Collector under the Regulations. At present, the Chairman is only an Assistant Plague Officer and stands more or less in the position of a subordinate to the Collector, with very few powers as to ordering the disinfection of houses or evacuation (when necessary) or granting compensation for houses destroyed or burnt for plague purposes, etc.

(t) In this town, as I have already stated, prosecutions against defaulters have a very beneficial effect on the public at large and would be productive of better results than any system of rewards. Regulation 48 should, in my opinion, be strictly put in force, whenever possible.

(u) The co-operation of native doctors would no doubt be of much assistance to the authorities in this place in plague matters. In the treatment of plague, native treatment is more eagerly sought for and resorted to in this district than English medicines and has attained wide popularity. If these native doctors are taken into the confidence of the plague authorities and their assistance and co-operation requested, I have no doubt that they can do a great deal, by way of detecting plague cases and getting over any prejudices on the part of the public against plague measures.

GROUP B (3).

There are, at present, 50 temporary police constables with 2 head constables employed on plague duty in this town. These policemen are fresh recruits, without any status and without any previous experience and possessed of very faint notions of their responsibilities or duties. In spite of the supervision exercised over them, they are often very negligent in the discharge of their duties. I would suggest that policemen of the reserve should always be posted for plague duty in the place of these temporary police constables, many of whom, in my opinion, are no good whatsoever.

Further, the policemen on plague duty should, in my opinion, be under the direct control and orders of the Chairman or the Special Officer on plague duty. Although the policemen, before being posted for duty, are made to report themselves for the orders of the Chairman, still it is stated by the Superintendent of Police [vide Appendix VII] that the Chairman has no power to transfer them from one place to another or to punish them in any way or even to demand an explanation of their conduct, in case they are found or reported to have misbehaved themselves or neglected their duties or disobeyed orders. When persons like these policemen work directly under the Chairman or the Special Plague Officer, it is but proper that they should be responsible to these officers for any dereliction of duty on their part. When the officer on plague duty finds a policeman disobeying his orders or absenting himself from duty or misconducting himself in any way, it is but natural that he should demand an explanation about it from him and then report him for punishment to the Superintendent of Police.

Again, in the matter of transfers, constables on plague duty have necessarily to be shifted from one place to another, as the exigencies of plague may demand. Before making these transfers, it is not possible to wait and, in the meantime, write to the Superintendent of Police and get his orders. The plague administration cannot work smoothly, unless the Chairman and the Special Plague Officer be empowered to exercise direct control and make postings and transfers and demand explanations from the constables for any dereliction of duty. The ultimate punishment may be allowed to rest with the Superintendent of Police.

MUHAMMAD BAZLULLA SAHIB BAHADUR.

GROUP A (1).

(a) Yes; in order to ensure its thoroughness. Next to evacuation, which is by far the best remedy, disinfection is very useful, provided it is carried out intelligently and thoroughly. If not thorough, it may do more harm than good, by raising a false sense of security in the minds of the house-owners, who, but for this, might perhaps have elected to vacate the houses.

(b) Yes, in the case of certificated sanitary inspectors, the training of the other inspectors being more or less nominal. But it is advisable to supplement even the certificated course with a month's practical training in actual plague operations and disinfection of infected houses.

(c) It cannot be reduced, if disinfection is to be systematic and thorough.

(c₍₁₎) This is more or less a bacteriological question, which I do not feel qualified to answer satisfactorily.

(d) Disinfection by chemical disinfectants is certainly useful and decidedly the most effective. Next in value is desiccation by sunlight, but, unfortunately for South Canara, plague gains ground with the advent of the monsoon, when this method becomes out of the question. Desiccation by burning bratties has not been tried here or in Bellary—the other plague district of which I have experience. I understand that it was tried in Mysore, though with no marked degree of success. It may be given a trial in the rural areas of this district, but it seems to me to be more or less a primitive method, not likely to produce any very satisfactory results.

(d₍₁₎) A combination of chemical disinfection and desiccation by sunlight, in towns, and of all the three, in rural areas.

(e) Recrudescence of plague in towns is very probably due to the revivification of plague germs, although it cannot be said that this is always the sole cause. In my experience, it was never the cause of plague re-appearing in a village. The other parts of the question are matters for bacteriological research.

Examination and desiccation of imported grain is useful as a precautionary measure before an outbreak.

(f) Yes.

(f₍₁₎) Yes; but, when the ports are closed during the monsoon, some inconvenience is felt. This can, however, be obviated by obtaining a sufficiently large stock beforehand.

(g) I have grave doubts—both as regards towns and villages. Personal and unremitting supervision by an officer higher in status and responsibility than the ordinary disinfecting inspector is necessary. The disinfecting staff must consist of trained men, who understand the object of the process—not recruited from the local labouring classes, as has been done by the Mangalore Municipality for the sake of economy. The disinfecting inspector must be a certificated sanitary inspector, who has had sufficient training in the disinfection of houses, and must be an intelligent and conscientious man. Ullal was badly infected in 1902, and I personally supervised the disinfection work, which was carried on by a trained ambulance inspector, with the aid of a trained disinfecting staff from Madras. The result has fully justified the attention bestowed—Ullal, although so close to Mangalore, has remained free from infection during the last two outbreaks in Mangalore.

(h) In the Municipality, people have begun to appreciate disinfection and, in the villages, if they do not appreciate it, they, at any rate, are not averse to it, having learnt to regard it as a necessary evil, so to speak.

(i) The plague staff is expected to impress on their minds the utility of disinfection. Revenue officers take the opportunities afforded them by their tours to do the same.

(j) Yes, as people become more and more used to plague measures. A half-hearted acquiescence in this as well as other remedial measures—the result of extraneous influence and pressure—is quite different from an intelligent and self-generated sense of self-help in the matter.

(k) It cannot be made cheaper without material loss of efficiency. It can be made more popular only by educating the people to a sense of its utility. This can only be attained by a practical demonstration of its effects in individual cases, for which purpose it should be as thorough as it can possibly be and, to secure this end, personal supervision by responsible officers is necessary, as already stated.

GROUP A (2).

(a) The year before last, Lieutenant-Colonel Sanjana inoculated some persons, who voluntarily applied for it, and the same arrangements are in force at present, with this difference, that none have since come forward to get themselves inoculated. No improvements are called for at present.

(b) Yes, the same as are given at present.

(c) Personally, he may be considered to be more or less harmless to his neighbours, but he may carry infection in his clothing, etc.

(d) I think inoculation should not be made compulsory. So long as inoculation has not been demonstrated to be as harmless as vaccination and to confer on the subject that protection from plague infection which vaccination confers in the case of small-pox, people should be left to their own good sense and discretion in the matter.

(e) The District Medical and Sanitary Officer will be able to furnish the information.

GROUP A (3).

(a) Yes.

(b) People in the Municipality have already learnt to sufficiently understand the part played by rats in plague infection. No inducements by way of rewards for killing rats are therefore necessary. Rats are not always an unmixed evil, for they give timely warning to the observant and sensible house-holder to quit his house. Continued attention by way of advice is, however, necessary in the rural areas, and this is being given.

(c) Yes; but not more than men. As soon as a particular locality becomes infected, the rats migrate from it to adjacent localities and, some of them having already caught the infection, the latter localities also get infected. In fact, rat-deaths in localities otherwise healthy have been the first warning of the spread of infection in the case of several parts of the Mangalore Municipality.

(d) Yes; squirrels and cats, so far as my experience goes, but not to such an extent as rats.

(d₁) This is quite possible, but I have made no observations on the point.

(f) I know of numerous cases in which rats have directly infected men, but I have not seen infection travel to any great extent through the medium of rats without the intervention of human agency. (*Vide answer to (c) supra.*)

GROUP A (4).

(a) Decidedly unpopular, as they usually connect the idea of compulsory segregation and isolation in a sequestered locality with a half-hearted hospital assistant and with poor arrangements for diet, etc.

(b) They can be made more popular by making it distinctly known that none will be compelled to resort to them, but chiefly by a practical demonstration of the good results attained in the hospital. The medical officer in charge of the hospital must be a conscientious and sympathetic man and the nursing staff must likewise be good. Caste prejudices must be respected, as far as possible.

(c) Father Müller's hospital at Kankanadi is the only instance in this district. It was built by private contributions.

GROUP B (1).

(a) To no considerable extent.

(b) The observation staff may be entirely done away with and, in its place, the preventive staff may be strengthened, by narrowing the sphere of action of each preventive circle inspector. At present, these circle inspectors have a much larger area to patrol than they efficiently can. This is specially applicable to South Canara, where the houses in a village are scattered far apart and are not easily accessible, especially during the monsoon. The large expenditure at present incurred on the observation staff is so much money thrown away, which can be better

utilised in reinforcing the preventive staff, in making disinfection more thorough and effective, in evacuating highly infected blocks and in compensating poor house-owners for the damage caused by the demolition of houses or the burning of thatches.

(c) The existing rates of pay, in the case of circle inspectors of rural areas, are unnecessarily high. I think that the pay of a preventive circle inspector need not exceed that of a first-class revenue inspector, who usually has a much larger area to travel and equally heavy, if not heavier, work. A pony allowance of Rs. 15 or a bicycle allowance of Rs. 10 may be given in addition, considering that the nature of their duties requires greater promptitude. No fixed travelling allowance is necessary. I have already said that the observation staff has been found to be of little practical utility and may be dispensed with. A supervisor on the same pay as a Deputy Tahsildar, with no fixed travelling allowance but with a pony allowance of Rs. 15, would do to supervise the work of at least four preventive circle inspectors. The disinfecting inspector's work being more risky and arduous, the existing rate of pay may continue in his case. An extra allowance during plague is not desirable. More often than not, it makes it the interest of the plague inspector to report cases as plague which are not actually plague. This has been my experience in the Mangalore Municipality.

(d) The advantages are inconsiderable and are not commensurate with the expenditure. It has never been found difficult to organise a preventive staff at a short notice.

(e) The training given to circle inspectors under the new scheme is quite adequate, but the fifteen days' training of temporary and assistant sanitary inspectors cannot but be nominal. The period of training, in the case of the latter inspectors, should not be less than three months, of which the first two months may be devoted to hygiene and sanitation and the last month to an intelligent study of the Plague Regulations and Dr. King's books on plague. It would be a decided advantage, if, in addition to the above training, all plague inspectors were required to undergo a month's course of practical training in plague operations under the District Medical and Sanitary Officer, before they entered on their duties. An affected Municipality would be the best field for such training. The candidates would, besides, acquire local knowledge and experience, which would be invaluable to them, when they actually entered upon their duties in the district.

(f) There is no European supervisor employed in this district.

(g) Yes, if properly supervised and controlled.

(h) They are not looked upon with the same degree of distrust as formerly, and public opinion and sentiment is likely to become more and more favourable, as people better appreciate plague measures.

(i) No other suggestions than those offered above occur to me at present.

(i₁) All suspicious cases are examined by a medical subordinate or by the plague medical officer, either before or after death, and declared to be cases of plague or not, according as the appearances suggest. The people do not object to such examination, except in the case of *goshas* females, when the plague nurse takes the place of the medical man. I think in such cases the female hospital assistant in charge of the Women and Children's Hospital should be deputed for the examination, as the diagnosis of a nurse is open to question. This was being done in 1902 and 1903. Why it has been given up subsequently, I do not know.

(i₁₁) Yes; no change is necessary.

(j) No—apart from the fact that their ordinary duties are sufficiently onerous and exacting and sometimes necessitate their absence from the village, local influences and association and sometimes ignorance stand in the way of their detecting plague cases.

(k) I should think they are more than a mere stimulus. They are actual goads, sometimes exacting from village officers duties which they ought to perform themselves.

(l) Yes; by local personal enquiry. Circle inspectors must be made to understand that village patels are not their subordinates and that they are expected only to assist them in but not to relieve them of any portion of their duties in this regard.

(m) No.

(o) Villagers now understand sufficiently well the danger of such infection.

(p) Yes, if it is made known to them that they have a right to do so. But the fact that the houses in villages in this district are isolated and far apart renders it difficult even for the villagers to exercise that lynx-eyed supervision, which is necessary to keep out men and things coming from infected places.

(q) Yes; it would be well to notify that villagers have a right—the right of self-protection—to turn back men and things coming from infected places, but it is a question whether this will not involve a curtailment of private rights and liberties.

(r) Yes; in the more important villages (*e.g.*, Buntwal, Panemangalore, Ullal and Mulki), vigilance committees have been organised and some of them have been working fairly well. They are watched by officers, but not officially worked. Official intervention is undesirable, as it is likely to interfere with the growth of that sense of self-help and self-reliance, which is essential to the success of all such undertakings.

(s) *Vide answer to (B) (1) (b).*

(t) No; such a system would open the door to oppression and other malpractices and is, for various reasons, inexpedient.

(u) No; no action in this direction is necessary or desirable.

GROUP B (2).

(a), (b) and (c) I doubt whether the passport-system has justified its existence. It has not proved a signal success anywhere and, in South Canara, it has proved a failure, because it is altogether unsuited to the local peculiarities of the district. If any cases of plague have been detected in villages in time, it has not been on account of the passport-system, but in spite of it. At any rate, the expenditure it involves and the hardship and harassment it entails on the people are quite out of proportion to its advantages. The system is inherently defective, and I am humbly of opinion that no amount of improvement in its minutiae can render it thoroughly effective. I am in favour of its entire abolition in South Canara.

The modified passport-system recently introduced, under which patels are required to issue passports to persons visiting their villages from infected places, is bound to prove a total failure, for it aims at the same end and that without the machinery of passport stations and patrols—leaky and defective as it was.

GROUP B (3).

(a), (b) and (c).—The plague police were hitherto employed on patrol duty at the passport stations and at plague-infected houses, but, now that the passport stations have been abolished, their number has been greatly reduced. Their work was neither more nor less satisfactory than could be expected in the circumstances.

J. H. ROBERTSON, Esq., I.C.S.

GROUP A (1).

(a) I think disinfection has been very beneficial in this town, where it is carried out under the personal superintendence of the Chairman or of the Special Plague Officer (a Deputy Collector). I doubt if it could be given greater attention than it has received.

(b) Yes, except temporary sanitary inspectors.

(c) Much of the money spent in passporting people and on observation and preventive circles might, in my opinion, be better employed on disinfection and opening up congested localities.

(c₍₁₎) Judging from the way the *virus* can remain active in clothing, rags, etc., I consider the plague bacillus can flourish in the floor of a hut, without the support of a living organism, for several months.

(d) Burning bratties has not been tried in this district, except, to a limited extent, but, in Mysore, where it was a good deal used, the results were not very satisfactory. It would not be suitable for houses on this coast. Sunlight and perchloride of mercury are the disinfectants employed here; both are valuable, but the former cannot always be employed, on account of the monsoon and the situation of the houses, many of which are concealed in dense groves of cocoanuts.

(d₍₁₎) Sunlight and perchloride of mercury.

(e) It is difficult to answer this question with any exactness, but I certainly think that there is ground for holding that recrudescence is, in some cases, due to revivification of plague germs, if by revivification is meant the arousing to activity of dormant germs. There is a good deal of evidence to show that cloths, skins, etc., may preserve the *virus* for several months.

(f) Yes.

(f₍₁₎) Yes, except perhaps during the monsoon, when the port is closed.

(g) Yes.

(h) Yes; the people often come and ask for their houses to be disinfected.

(i) No special efforts.

(j) No.

(k) None.

GROUP A (2).

(a) and (d) The people in this district have not taken kindly to inoculation, and personally I am not in favour of it. There is no reliable evidence as to the extent of protection it affords or the time such protection lasts. The value of statistics, such as they

are, is considerably discounted by the fact that many of the persons inoculated are those who, by reason of their environment or physical condition, are least likely to contract the disease. Apart from the Punjab disaster, there are well-authenticated cases, where the operation has been followed by untoward results. On these grounds, I should not persuade anyone to be inoculated.

(b) No.

(c) In 1902-03, 1,374 persons were inoculated in this district. None have been inoculated since.

GROUP A (3).

(a) No. I think it is important to kill rats, as far as possible, in a town threatened with plague, before plague actually comes there, not to wait till its arrival.

(b) The people are beginning to understand the danger of rats; neither advice nor the granting of rewards is likely to have much effect.

(c) Certainly, both at and after the commencement of an outbreak.

(d) and (d₍₁₎) Fleas are believed to spread plague, both by infecting rats and also human beings. That they actually do so, is not as yet proved. I have not seen any case in which it could be definitely stated that the infection was due to their agency.

(f) Yes; one or two such cases have occurred in this town. The infection did not spread any great distance.

GROUP A (4).

(a) Generally unpopular.

(b) The difficulty to be contended against is that people prefer to be treated in their own houses and dislike being dragged to a place they know little about and which may be a long way off. This feeling is very natural, and I doubt if it can ever be completely got over. The only remedy I can suggest is to provide comfortable, well equipped buildings and place them in charge of a competent medical officer, whom the people know and have confidence in.

(c) Only one private hospital has been built in this town—by the Rev. Father Müller. It is a capital building and well attended. The Basel missionaries are constructing another.

GROUP B (1).

(a) In rural areas, only 15 out of 46 cases were detected by the preventive and observation staff combined. Of the 518 cases that occurred within municipal limits, the circle inspectors detected 308 out of 349 cases reported before death and the majority of those reported after death.

(b) I think expenditure under this head could be reduced very considerably, without loss of efficiency. In this district, there are, with one or two exceptions, no villages in the proper acceptance of the word. People usually live in houses isolated from each other by compounds of considerable size and, consequently, it is unlikely that plague will ever get a serious hold, except in places like Mangalore or Udipi. There are seven rural observation circles (in addition to three preventive) and all seven might with advantage be abolished, as they can hardly be said to have justified the expenditure they have caused.

(c) An extra plague allowance is not a good thing, as it encourages the reporting of bogus cases of plague.

The pay I would suggest for the observation and preventive staff is:—Circle inspectors, Rs. 25, plus Rs. 15 consolidated travelling allowance; supervisors, Rs. 45, plus Rs. 30 consolidated travelling allowance. The rates now given in rural areas are too high. A supervisor, for instance, gets Rs. 80, plus Rs. 30 travelling allowance, plus Rs. 15 pony allowance, while a divisional inspector, who holds a similar post in the Municipality, though within a more restricted area, gets Rs. 35 pay, plus Rs. 15 pony allowance, plus Rs. 8-12-0 plague allowance. The supervisor, even if he has any actual plague work, which in this district is not often the case, runs no greater risks and has no more responsibility than the divisional inspector, and there is no reason why he should be paid at so disproportionately high a rate.

A pony allowance is not required, except for municipal work, as, elsewhere, riding (save along the roads, where a bicycle is better and more often used) is for the most part impracticable.

(d) No.

(e) I think temporary sanitary inspectors should undergo at least one month's theoretical and two months' practical training. The practical training ought to be conducted by the District Medical and Sanitary Officer, in towns where plague exists.

(f) The only European supervision in this district is by the Collector and District Medical and Sanitary Officer.

(g) On the whole, yes, within the Municipality. In rural areas, it is not easy to have the same supervision, and I doubt if the inspectors really visit all the villages they say they do.

To give an instance: one inspector recently reported that he had checked four passports in a certain village. These passports were examined and showed no signs of having been checked and they did not relate to the village in question. About nine or ten of the staff have been dismissed, during the past year, for neglect of work or making false claims or statements.

(h) I doubt it. The public generally think them a nuisance, which unfortunately they are obliged to tolerate.

(i) See answer to (c).

(i_i) Dead bodies are usually examined, but, if not, no certificate is insisted upon.

(i_{iii}) The regulation is not in force in this district.

(j) Yes. Most of the cases in rural areas were reported by the village officers.

(k) Not to any great extent.

(l) Very little.

(m) One proved and one suspected case of taking bribes recently came to my notice.

(n) They very soon learn the danger.

(d) In most cases, yes, but not in the case of Moplas.

(q) Certainly. If they undertook to try and keep out infection, they should be rewarded by not being subjected to restrictive measures at the hands of the authorities or saddled with observation and other staffs.

(r) Yes; I would leave it entirely to the villagers themselves.

(s) Yes. Vide answer to question (B) (1) (b).

(t) No.

(u) Not obtained nor desirable.

GROUP B (2).

[In connection with the questions on the passport-system, please see paragraph 736 at page 404 of the Report of the Indian Plague Commission, with which view I fully agree.]

(a) I would suggest its abolition. It has been tried for a long time in Bombay and abandoned as useless. Even if it were possible to work it so as to prevent all leakage, the fact that infection is carried by rats prevents the system being any real safe-guard. That it cannot be worked without leakage and that it is very costly are additional reasons against its continuance. In this district, where there is no railway communication and where there is a long jungle frontier, it is the easiest thing in the world to evade the passport station, without anyone being a bit the wiser. It causes infinite annoyance and worry to persons subjected to it and is, in my opinion, the cause of greater discontent and resistance to the rules than any of the other measures in force.

GROUP B (3).

(b) Yes; if the passport-system be abolished, not more than half the present number would be necessary.

(c) They are engaged on guarding (i) passport stations; (ii) evacuated areas; (iii) frontier inspection stations; (iv) plague hospitals; (v) infected houses.

J. L. SALDHANA, Esq.

GROUP A (1).

(a) Yes. Disinfection should always be carried out under the observation and direction of a responsible officer, who does not belong to the regular disinfecting staff. When this work is left to the ordinary plague staff, it is done very imperfectly.

(b) No. Many men who have no adequate educational qualifications receive fifteen days' training and are then sent out on a high salary to superintend most important work. Their training is worse than useless, for they are not capable of doing the work they are appointed to do and, being placed in a position, the true importance of which they do not appreciate, they are apt to abuse it. The superintending or inspecting staff should consist of men of good education and thorough training.

The subordinate staff should also be thoroughly drilled, as work can only be done efficiently and quickly by men who understand their duties. In every Municipality, a number of the municipal servants should be formed into a plague corps and thoroughly drilled.

(c) So far as I can form an opinion, it is sufficient.

(d) This is a question for specialists. I understand that the relative value of the measures specified in the question is in the order in which they are given, desiccation by fire being of most value.

(d₍₁₁₎) In the poorest portions of towns, wherever possible, desiccation by fire should be resorted to. Where this is not possible, on account of the permanent nature of the structures, sunlight and disinfectants have to be used.

(f) The apparatus is mostly very crude and is not the most suitable; at the same time, apparatus that would be suitable would be very expensive. For disinfecting purposes, wooden spraying pumps would be much more effective than scoops and would also be much speedier.

(f₍₁₎) Yes.

(g) No. It is done in a very imperfect manner, with very little display of conscience and quite a wonderful display of lack of intelligence.

I am strongly of opinion that the spread of the disease is very largely due to the very inefficient way in which disinfection is carried out by those to whom it is entrusted. Wherever possible, this work should be directly superintended by a responsible revenue officer.

(h) For the most part, in villages only where plague has once appeared. Amongst the villagers generally, there is a most unreasonable prejudice against disinfection.

(i) So far as I am aware, no efforts are being made. It seems to me that it would be a good thing if the chief village officials were brought into certain centres in the district to undergo a short course of instruction in connection with plague measures; a few days would be sufficient. The knowledge acquired would become a source of enlightenment to the villagers and of safety to the community.

(j) Yes.

(k) (I) Better men, better trained. The men should have higher general educational qualifications; they should be thoroughly trained and be compelled to pass a searching examination. If it were possible, it would be well to select young men from Government departments, where their character and intelligence have been tested.

(III) That disinfection is so unpopular is purely due to lack of patience and want of tact on the part of the officers entrusted with the work. They are very conscious of their authority and so are apt to act in a most arbitrary manner. Property should not be destroyed, where it can be avoided. When it is destroyed or injured, the owners should be fully compensated, without loss of time.

GROUP A (2).

(b) If inoculation is of any value.

(c) An inoculated person may undoubtedly carry the disease, but, for the most part, just as it is conveyed from place to place by merchandise, against which no effective precautions can be taken. He is harmless, only in so far as he does not himself contract the disease.

GROUP A (3).

(a) No.

(b) Yes. Every effort should be made to ensure the destruction of vermin in an area threatened with plague or in any area already infected.

(II) Generous money rewards should be offered for the vermin destroyed.

(c) Certainly. Before and after. It appears to be frequently conveyed from place to place by rats and to be conserved by them.

The history of plague in Australia, I think, supports this.

(d) P^las and other vermin and domestic animals appear to be subject to the disease and to convey it from place to place.

GROUP A (4).

(a) Decidedly unpopular.

(b) For the most part, it is unreasonable prejudice, but this might be overcome to some extent by placing in charge of the hospitals medical officers and a staff who would command the confidence of the people, who understood them and sympathised with them.

The caste and other prejudices of the people should be taken sympathetically into consideration by the plague officials, who should be less anxious to exercise authority than to gain the co-operation of the people.

(c) So far as I am aware, they do not avail themselves of the privilege.

GROUP B (1).

(a) For the most part, the work of the observation staff has been fairly satisfactory. All cases of plague and of suspected plague in this area have been detected and necessary precautions taken.

But for the observation staff, the spread of plague would have been terrible; still, if a better class of men had been employed, the spread of the disease might have been much less throughout the district.

(b) No. The staff needs strengthening and improving.

With a small staff of badly trained sanitary inspectors, the work of visiting every house within a Municipality once in forty-eight hours cannot be done. Fever cases have to be detected and reported, deaths have to be noted and enquired into, burial-grounds, public and private chattrams visited, etc., and this cannot be satisfactorily done without a sufficient staff of intelligent, honest, well-trained men. The staff should always have the loyal support of native revenue officers. As things are, at least in some districts, Tahsildars and similar officers render no assistance whatever to the plague staff and criticise them severely.

(c) For the class of men now employed, the present pay, for the most part, is far too high; a more highly qualified class of men, on an even higher pay, would be a step in the direction of economy. In Municipalities, a pony allowance is not necessary.

No extra allowance should be given during plague.

Every man who is taken on to the plague staff should give ample security for the due performance of his duties. This would tend to honesty and thoroughness.

(d) (I) Yes.

(II) Yes.

(e) Yes. The present system, improved, would be better than a course of training by District Medical and Sanitary Officers. It is doubtful whether they have the time and, in some cases, the qualifications necessary for training men. Moreover, there would be no uniformity in the training.

The training should in any case not be for less than three months.

(f) I do not know, but it seems to me that, in every plague-infected district, according to the extent of the infection, there should be Europeans in charge, who could go round and thoroughly supervise the work. It should be part of the duty of these officers to thoroughly inspect the work in each centre and to seek, by personal instruction, to make the staff more efficient.

(g) No.

(h) No.

(i) A higher educational standard is essential. If inspectors could be selected from among intelligent men of good character employed in Government Offices and efficiently trained, there would be a great improvement.

(j) To a very limited extent.

(k) They might be of much service, but it seems to me that a better plan would be to have village officers trained.

(l) No. I do not think so.

(m) Yes. They have become notorious in this respect. The evil is probably exaggerated, but it certainly exists.

(n) No. It is quite insufficient.

(o) Speaking generally, they do not understand it in the least.

(p) In cases where there are a few educated and intelligent men in the village, this could be done or where the people have learnt by experience, but, in most cases, it would not be wise to trust to the villagers.

(q) Yes. Certainly.

(r) Yes. It would have to be worked officially, but, as I have said, much could be accomplished by training the village officers.

(s) I do not know.

GROUP B (2).

(a) The passport-system is very complete and efficient.

(b) So far as I know, all is being done that can be done, save that sometimes station-masters at intermediate stations are not careful enough in collecting tickets.

(c) Any improvement in this direction lies mostly with the passport-issuing clerks, who at times are extremely careless.

ADDITIONAL QUESTIONS.

GROUP B (1).

(i) No certificates are granted, in case of any deaths.

(t) It would be of little service and would be likely to encourage blackmail or extortion.

(u) No. No. It should be made compulsory on all native doctors to furnish information at once of all cases of plague coming under their notice.

M.R.Rx. D. ANANTAYYA AVARGAL.

GROUP A (1).

(a) Increased attention is necessary to disinfection, especially when the place is known to be an infected one.

(b) The arrangements for training the plague staff are sufficient, but the period of training is too short.

(c) The expenditure on disinfection by chemicals can be reduced, if waste and carelessness be avoided. If cheaper chemicals than those that are now used can be suggested, the expenditure can be greatly reduced.

(d) My experience is confined to desiccation by chemical disinfectants and sunlight. The former has proved valuable to some extent. Sunlight has not proved efficacious. I have not tried desiccation by burning bratties, etc., but, from what I have read in the papers of the trials made in other parts and from what I know of the bratties burnt in almost every house occupied by the natives, I think desiccation by burning bratties will be more efficacious than by chemicals. Bratty-fire burns the ground thoroughly and heats the walls and carries the heat-power to the loft or ceiling, if it be a tiled house. If it be a cadjan or thatched roof, it is better to pull down the roof and destroy the materials by fire, leaving the ground floor and the walls to be heated by the bratty-fire.

(d_(i)) Bratties being available in towns as well as in villages generally, I would recommend bratty-burning in towns as well as in rural tracts.

(e) Wherever sub-soil or under-ground or over-surface dampness or moisture exists, the plague germs propagate widely. With the heat of the sun or other destroyer applied to the surface, the germs on the surface are suppressed or destroyed, while they increase in the under-ground or sub-soil. When the monsoon or cold weather makes its appearance, the germs propagate and multiply, and recrudescence occurs. So far as Canara (or, rather, the West Coast) is concerned, as the houses in the villages are spread (or, rather, dotted) about the country, there is generally no recrudescence in the villages, but houses in villages in other parts of the Presidency are huddled up in one spot, as is the case in the towns on the West Coast, and the houses are damp and some parts of houses are used as bath-rooms and sunk pits exist in the houses; that keeps the ground floor moist and damp; there is cause for recrudescence every now and then. Generally, immediately after the cessation of the hot weather, such recrudescence occurs, the interval being for about three months of hot weather in the year, except in Canara or, rather, the West Coast districts, where the soil, being porous, does not retain much moisture or dampness and the country is exposed to the powerful sun for about five months, at least, in the year.

(f) Yes, they are, but sometimes, for want of the prescribed chemicals, others are substituted for the occasion, and I don't think that they are as efficacious as the prescribed chemicals.

(f_(ii)) Disinfectants are not readily available in Mangalore. They are generally ordered from Bombay or Madras.

(g) Except under close supervision of other than plague supervisors, the work of disinfecting is not carried out conscientiously, intelligently and efficiently, either in towns or villages.

(h) The villagers themselves are not getting to understand anything about disinfection by chemicals. If bratty-burning disinfection be introduced, they will understand the efficiency thereof.

(i) So far as I know or understand, nothing has been done to train them or advise them.

(j) It is expedient to endeavour to gradually make them more independent of official help in this matter, by suggesting some simple but effective disinfection, such as bratty-burning.

(k) I have already stated that bratty-burning could be introduced.

GROUP A (2).

(a) Inoculation was carried on, only in the Mangalore town, at the first appearance of plague in this town. It was fairly successful, though the number inoculated was not large enough. So far as I know, it was not done nor any attempts made to introduce it outside the Mangalore town. As it does not secure immunity for more than six months, there is not much demand for it, and I have no hope of any success in any further trial.

(b) I see none.

(d) So far as my experience goes, inoculation is not popular, and I do not think that any persuasion will be successful.

GROUP A (3).

(a) Attention was, at the beginning, paid to this means of combating plague, but not since, as the people did not much appreciate it.

(b) I do not think that any good will come out of further attention being paid as regards advice or inducements.

(c) I have no doubt that rats do exercise an important influence in spreading plague at or after the outbreak.

(d) I was reliably told that squirrels and monkeys spread plague and import it to human beings. I do not know of any other animals or insects operative in the same way. Except the people taking care to avoid contact with rats, I can suggest no remedy.

GROUP A (4).

(a) Plague hospitals are unpopular in this district.

(b) They may become popular in course of time, when it is proved that due attention is paid to the patients under treatment and to their comfort and recovery. This greatly depends on the medical officer in charge and his staff and on closer supervision by proper authorities and allowing a limited number of relations to visit the patient.

(c) Nothing of the kind has been done by the people, except the Kankanadi hospital of Father Müller, originally intended for Catholic Christians.

GROUP B (1).

(a) I do not think that the observation staff has succeeded in detecting and suppressing plague to any appreciable extent in South Canara. This is partly due to the compulsory provisions of the Plague Regulations not having been put into force, and this could not be done, when the plague suddenly made its appearance for the first time and the people were excited and panic-stricken.

(b) Plague, in this district, was confined chiefly to the Mangalore town. The cases outside the town were chiefly those that escaped from the town. I am not, therefore, in a position to give any particulars in this connection.

(d) An observation staff on a smaller scale will be useful during the hot months for both purposes.

(e) The present training, which the present employes are supposed to have been given, is little or nothing. The training of local men by the District Medical and Sanitary Officer would be a vast improvement over the present system. They should be trained for at least a month.

(g) I cannot say that the whole staff worked conscientiously and efficiently. There were individual cases, in which they did so.

(h) The work of the plague staff was not appreciated by the people, and the measures taken were not popular. So I am not in a position to say that the staff exercises a favourable influence on public opinion and sentiment.

(j) In this district, where there is no village in one spot, but the houses are scattered all over the country, the village officers cannot be depended on as a means of detecting plague cases, but, in East Coast villages, they can be depended on, if the village is not a very large one, say, containing not more than 200 houses.

(k) Circle inspectors are of no use to village officers, unless the inspector is a local man, knowing the language of the place, and is in a position to mix and move freely with the villagers.

(l) If the circle inspector be one of the above description, he will be in a position to obtain information, apart from village officers.

(m) I had no occasion to supervise the rural staff. Hence, I am not in a position to answer this question.

(n) The villagers profess to know the danger, but take no steps to avoid it.

(p) No.

(r) A village patrol on payment will be very useful in this district. It must be officially worked.

GROUP B (2).

(u) In my opinion, the passport-system is of no use, at least so far as this district is concerned.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c) In my opinion, desiccation of imported grain, by exposure to sunlight for forty-eight hours, will be of some use.

(f) In almost all cases in the town, the infection was spread by rats spontaneously.

GROUP B (1).

(t) I would not recommend the payment of any reward either to private persons or to native medical practitioners.

(u) No, but it is desirable to have their co-operation and assistance. Native doctors may be instructed in the diagnosis of plague.

MAJOR E. H. WRIGHT, I.M.S.

GROUP A (1).

(a) General supervision by a medical man, not lower in rank than a civil apothecary, is desirable.

(b) Yes, in the case of certificated sanitary inspectors.

(c) No.

(d) Desiccation by bratties has not been tried here, but, in the majority of infected houses, this method will not be practicable, as most of them are thatched. Sunlight is certainly very effective, but, the season for plague in this district coinciding with the south-west monsoon, it is not possible to give it an extended trial. Further, many of the houses are so situated (in very low thickly planted localities) that the sun never reaches them.

Of the chemical disinfectants in use, the acid solution of perchloride of mercury (1 in 500) is the most effective for mud houses.

(d_(i)) Sunlight and disinfection by perchloride. The former is very often impracticable.

(e) As far as can be made out from observations in the past, revivification of plague germs appears to be the cause of recrudescence. This is apparently the cause of recrudescence, in localities badly infected in the previous year. The revivification appears to depend upon conditions suitable for the development of the germs, viz., wet weather, alternating with rain, and a filthy insanitary condition of the localities, especially, overcrowding and want of light and ventilation.

(f) Yes.

(f_(i)) Yes, from the medical stores.

During the monsoon, some inconvenience is felt, owing to closure of the Port.

(g) Yes. The plague officer exercises supervision and directs the working of the disinfecting staff in the town and the supervisor in the villages.

(h) Yes; as disinfection has been very effective in rural areas, the villagers are gaining confidence in the measure.

(i) Nothing special.

(j) No. Supervision will, in any case, be necessary.

(k) Nil.

GROUP A (2).

(a) (I) No arrangements are in force for persuading people to be inoculated, and no people have voluntarily applied for inoculation. (II) Inoculation is generally performed by the District Surgeon or his Assistant Surgeon.

(b) Yes; those inducements allowed at present.

(c) I do not consider an inoculated person can be in any way *directly* harmful to his neighbours. He may, however, carry infection in his clothing or person from infected sources.

(d) I think this should be left entirely to the option of each one. In time, if inoculation proves to be more popular and the people gain confidence in the measure, they will themselves seek inoculation, similarly to vaccination.

GROUP A (3).

(a) Yes. As far as municipal funds permit.

(b) As mentioned before, supervision by a medical officer, not lower in rank than an apothecary, is desirable. (II) Inducements in the way of suitable hospitals, properly equipped and manned, and health camps and compensation, in the case of the poor, will popularise plague measures, as people will in time be themselves educated to appreciate the advantages of plague measures.

(c) Yes. Rats form an important link in the spread of infection and, in many cases, the handling of dead rats has been the direct source of infection.

(d) Fleas are, in my opinion, likely to convey infection and to this may be, to a great measure, attributed the high infectiveness of plague rats, as they are invariably seen covered with fleas, if examined just before or soon after death.

Flies may also be a source of danger, by conveying infection directly from the excretions or open sores of a patient to a healthy person with an open sore.

GROUP A (4).

(a) The municipal plague hospital at Uruva is unpopular, and people object to going there for treatment, on the ground that it is situated in a dreary locality, about two miles from town. The site is, further, very exposed, and the unpopularity is mainly due to the original hospital having been built without due regard to the severity of the monsoons and the poor quality of the buildings, which were mere cadjan sheds. The Kankanadi plague hospital, under the supervision of Father Müller, S. J., for Christians, is a pukka-built, well-ventilated building and very popular, and results are satisfactory.

(b) The location of the hospital nearer the town was suggested and sites were pointed out; the proposition was discussed at a public meeting held by the Collector. A mud and laterite tiled hospital is being constructed in the same Uruva maidan.

(c) The only private hospital is the one referred to above as the Kankanadi plague hospital, which was built by private contributions, chiefly among Christians.

GROUP B (1).

(a) Owing to the unpopularity of plague measures, there is a great deal of concealment, chiefly among Moplahs, who often do not admit the circle inspectors in their rounds, as they claim to be Gosha. Many cases are, therefore, brought to light only just before death or after.

(b) Expenditure under this head may be to a great extent reduced, by doing away with observation circles in the district; the village officers may themselves be asked to exercise vigilance in the matter of observation of new comers. Preventive circles may, however, be retained as a precautionary measure.

(c) Nil.

(d) During the hot months this year, plague did not die out and an observation staff was found useful in detecting dropping cases. The observation staff during the hot months may be reduced to some extent.

(e) The training of certificated sanitary inspectors is sufficient. With reference to the temporary sanitary inspectors, who are trained at the Sanitary Commissioner's office for ten or fifteen days, many of them are found to possess a very poor knowledge of things, and the training of the temporary staff may be carried out locally by the District Medical and Sanitary Officer. A month's training will suffice.

(f) The medical staff works under the supervision of the District Medical and Sanitary Officer and the Assistant Surgeon, who is also plague medical officer for the Municipality. The general measures are under the supervision of the Collector and the plague officer (a Deputy Collector).

(g) Yes, as far as I am aware.

(h) Owing to the unpopularity of plague measures in general, it is possible that they do not exercise a favourable influence on public opinion.

(i) A special medical officer will have sufficient time at his disposal to attend to the proper efficiency of the observation and preventive staffs.

(j) No. Not entirely, as they have many other things to attend to and may be absent from their villages.

(k) To no appreciable extent.

(l) Yes, but very rarely, as they invariably depend upon the village officers for information.

(m) No instances have come to my notice.

(n) No.

(o) Very little.

(p) Yes, under supervision.

(q) Yes.

(r) Until the villagers themselves are educated to appreciate the value of plague measures, official supervision will be necessary.

(s) Yes, by the abolition of observation circles.

GROUP B (2).

(a) No.

(b) No.

(c) No.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c_(i)) Yes. The plague bacillus is likely to survive and flourish in the floor, as the houses where plague generally occurs afford all the conditions necessary for the development of the bacillus, viz., warmth, moisture, filth and exclusion of sunlight. It may flourish for months.

(e) Examination and desiccation of grain is useful as a precautionary measure in uninfected localities.

GROUP A (2).

(e) Number inoculated in 1902—1377.

Do. 1903—Nil.

GROUP A (3).

(d_(ii)) Yes. This is quite possible, and my experience leads me to think so.

(f) Yes. Rats play an important part in spreading infection among their own species, and several cases were the result of handling dead rats.

GROUP B (1).

(i_(i)) Yes. All suspicious cases are examined by a medical subordinate or the plague medical officer. Certificates of qualified medical men are accepted.

(i_(ii)) Yes.

(t) The reward system is not desirable, as it will lead to black-mail.

(u) There are several native doctors, who practise in the town and profess to be specialists. In some cases, they do report cases of plague, but, in others, they try to mislead, by giving false information.

GROUP B (3).

(a) The Police work under the orders of the Superintendent. They do their work satisfactorily, considering that they are mostly recruits.

(b) Their number has already been reduced, since the abolition of passport stations.

(c) Patrol and accompany the divisional inspectors.

G. A. F. FRENCH, Esq.

GROUP A (1).

(h) The villagers do not understand much about disinfection. They dread the process being carried out in their houses by the plague staff, because of the damage done to their property.

(j) Every effort should be made to gradually make them more independent of official help. A simple disinfectant could very well be used by the villagers, under the superintendence of their monegar.

(k) The use of fire and the digging up and renewal of floors appear to me to be within the grasp of all.

GROUP B (1).

(a) Owing to the dread the populace has of the actions of the plague staff, they do their best to hide suspicious cases from the observation staff. For this reason, plague often gets a hold on a place, before the observation staff are aware of its existence.

(b) When plague exists, a reduction of expenditure would not be advisable.

(c) It is difficult to say. A good observation staff is a great blessing, while a bad one is a curse, as the latter are often suspected of taking bribes to hide real attacks and of reporting ordinary fever cases as plague, in order to levy black-mail.

(d) An observation staff is not generally useful in the hot weather.

(e) An efficiently trained staff would soon gain the confidence of the people, especially if they were taught to know the difference between real plague and ordinary fever.

(g) The European staff are always highly spoken of and have the confidence of the multitude, but there are not enough of them.

(h) The native has no confidence in native supervision, as a rule.

(j) Village officers cannot be depended upon to detect plague cases, although some of them are very successful in keeping out plague from their villages.

(m) Yes.

(n) No.

(o) They understand it so well that a good village headman, by his arbitrary rules with reference to ingress and egress from his village, often keeps plague away.

(p) Many of them do and, if encouraged, others would follow suit.

(q) Yes, I think so.

(r) The village monegars could work this system, and it is desirable that they should be encouraged to do so.

M.R.Ry. K. V. SRINIVASA AIYANGAR AVARGAL.

The people, so far as I am able to enquire, have no faith whatever in disinfection. Thorough disinfection is not possible, in a big town like this. It was not satisfactory, so far as this town is concerned, because, in a number of instances, the disinfecting staff was bribed by the people, to escape temporary discomforts and inconveniences. My impression is that disinfection, judging from the way in which it was carried out here, is more or less a farce and a waste of public money.

The only effective, cheap (with no material loss of efficiency) and popular method of disinfection known to the people of this country, by long usage and custom, is by whitewashing the houses thoroughly. To this may also be added the re-shifting of the tiles (after exposing the house to sunlight, say, for six hours) and burning of all rubbish. But I am of opinion that plague-infected houses may be disinfected with chemical materials (in addition to whitewashing and re-shifting of tiles) twice before re-occupation. In municipal towns, ward councillors may be requested to superintend the disinfection and certify that it was carried out satisfactorily. Care must also be taken to see that the religious sentiments and caste scruples of the people are respected, by employing their own men to disinfect their kitchens and places of worship, under the direct supervision of ward councillors.

In this connection, I may be permitted to observe that sufficient attention is not paid to the sanitation of this town, which is in an awfully bad state. Never was Coimbatore so insanitary as it is at present. Coimbatore is sorely in need of a strong, efficient, and level-minded Chairman at this crisis, and the people will not be sorry, if a paid Chairman is appointed temporarily, till the improvement of the town is effected. The town is congested and needs extension very urgently. A body like that of our present Municipal Council cannot safely be entrusted with that work, and a separate committee of official and non-official members should be appointed to carry out some effective town improvement scheme.

Whether inoculation is of use or no, I am unable to answer. It is more or less a question for the specialist. But, judging from the results, it does not seem to be of much use. Besides, scientists say that inoculation is effective only for six months at the utmost. I am strongly of opinion that it can never be popular. Some people are averse even to vaccination, in spite of its beneficial results.

At present, plague hospitals are not at all popular and people do not voluntarily avail themselves of these hospitals. These the people call "*Yamalokam*" or "kingdom of Death". Rightly or wrongly, people view these hospitals with great suspicion and say that persons are killed there purposely. No doubt, such a view is false, but no amount of arguments will convince them of the falsity of their view. The reason for such a belief is that very few patients recover. This again is due to fear on the part of the patients and want of care and attention on the part of the hospital authorities. These hospitals are mostly under-manned. The people of this country are not accustomed to live apart from their relations during sickness. Western ways of isolation are unknown in this country. Again, the removal of plague patients from their homes is generally done in an unskillful and rough manner. At any rate, it was so in this town. We all know how scantily a poor Hindu is dressed. A patient, with high fever on, with coverings (mostly a small bit of cloth) not worth the name, separated from all his people, is removed in an uncivil manner in a jolting wretched single bullock-cart, exposed to cold draughts all the way to the camp. It takes some time to reach the destination. Even there, he is not removed immediately. Consequently, the patient gets worse and his chances of recovery are scarce. In the camp, as the hospital is under-manned and, as often as not, there being no nurse, he is not given sufficient nourishment and not properly and carefully attended to. I would suggest some reward to the hospital assistant on duty, in every case of recovery.

Private hospitals will be availed of generally by the people, but, unless the Government be liberal in their contributions, such private hospitals cannot work satisfactorily.

I doubt very much if the plague staff detects a sufficient number of cases of plague to justify its costly existence. It is more a source of annoyance and oppression to the people, specially the poorer classes. Instances of misbehaviour and corruption on the part of many a member of this staff are not wanting.

During the plague season, it would be advisable to ask the municipal councillors and the honorary magistrates to form themselves into vigilance committees, to make daily rounds and detect plague cases. The people will have more confidence in these gentlemen than in plague inspectors.

I do not personally know what training the inspectors get. It is said that their training lasts only for a fortnight or so. There is a tendency to support the opinion of these ill-trained and half-educated men, even against certificated medical men. That only encourages their vagaries. The villagers do at present understand the danger of infection by means of contact with outsiders and their clothes, etc. In some villages, they don't allow the people from infected areas to enter their villages and they quarantine them for ten days outside their villages. Government may construct a few sheds outside villages near the infected towns for such a purpose.

The only improvement, which I would like to suggest, is to do away with the passport-system altogether. In theory, it is all well and good, but, in practice, it has done more harm than good, in villages especially. In seven out of ten villages, these low-paid village officials are reported to be charging not less than annas four, each passport-holder, for ten days' observation. I was living in a bungalow on the race-course here. A drunken pariah was a passport-issuing clerk at the toll-gate on the Avanashi road, just by the side of my bungalow. A barber used to come to my bungalow every Sunday. On a certain Sunday, he came rather late, and I asked him why. He said he came by the Avanashi road toll-gate, and the pariah inspector would not let him go, unless he shaved him or took a passpost in the alternative. After some conversation, the barber had to turn back and come to the bungalow by a more circuitous way. This is only an instance of his innumerable vagaries. He was a terror and a source of amusement to many of the passers-by. He is still at that toll-gate.

The passport-system has dislocated all business, and people scarcely move from one place to another, on account of these petty troubles. It has done much harm to the people and their business.

I don't think the law gives sufficient power to the authorities to insist on dead bodies being shown to the plague staff, in order to ascertain the cause of death. It should never be left to the plague staff to ascertain the cause of death. People all over the world are very sensitive on this point. Besides, it will only afford an opportunity to the low-paid and ill-educated members of the staff to squeeze out money from poor and helpless people. Further, Muhammdans will resent such interference and may take the law into their own hands, though the mild may obey any unreasonable law, with great reluctance and grumbling.

Again, it is the interest of the plague inspectors to report all cases of death as suspicious plague death, in that their living depends on the existence of plague.

The less said upon this, the better. Even the regular corps's work is condemned. During plague time, all sorts of people are clothed in Police uniform and pass for constables. It may not be a surprise, if some ex-convicts are also found in this make-shift police corps. I have heard a good lot, damaging to the reputation of this plague-police work. It is said that, at one of the toll-gates alone, about Rs. 700 or Rs. 800 were collected, in the months of January, February and March 1904, from the poor passers-by and divided among the constables and other persons on duty there. I have myself complained against the plague-police to the plague authorities here.

On the whole, the plague measures, though well-intentioned, work more harm than good and they are not proved to be effective in arresting this dire epidemic.

I don't think sufficient attention is paid to disinfection. For example, in Coimbatore, when all the native portion of the town was disinfected, no house in the "race-course", where mostly Europeans live, was disinfected.

Lastly, plague prosecutions have done more harm than good. They are more or less summarily dealt with. It is said that the Sub-Magistrates and the Tahsildars are instructed not to be lenient in punishing those that are brought before them for infringing Plague Regulations. It will not be uninteresting to ascertain what amount was collected by way of fines, since plague broke out here.

Another harsh measure is to compel the people to evacuate within twenty-four hours, without providing them with quarters elsewhere. Such compulsory evacuations have resulted in great hardships. Instances of dacoity and robbery are not wanting in the places where these poor unfortunate people were obliged to seek shelter.

On the whole, plague measures, however well-intentioned, have not produced much good. Almost all the theories regarding plague are more or less proved to be incorrect by sufficiently long experience. I am, therefore, of opinion that these measures may be relaxed, as much as possible, without detriment to public safety. It is better to leave the disease to run its course, and it is bound to die in time. To accelerate its end, I would suggest that strong measures may be taken to improve the sanitation of our town, by preventing over-crowding and by breaking open narrow, filthy and dark lanes.

LIEUTENANT S. BOSE, I.M.S.

GROUP A (1).

(a) Yes; recrudescence implies defective sanitary measures.

(b) No.

(d) Burning bratties should be considered as a very useful adjunct to chemicals in disinfecting processes. Sun-light is practically useless for most purposes.

(d_(ii)) Heat and antiseptics.

(e) Mainly due to revivification of plague germs.

It is the natural sequel of imperfect sanitary measures.

From 9 to 12 months (Calcutta, Bombay and Poona epidemics).

(f) Yes.

(f_(ii)) Yes.

(g) No.

(h) I think so.

(i) None, I believe.

(j) Yes, certainly.

(k) Plague germs live about 2 inches below the soil, devoid of virulence, probably as facultative saprophytes. Therefore, 4 inches of earth in the floor of a house should be taken off and disinfected.

GROUP A (2).

(a) Haffkine's vaccine has not attained the standard of scientific perfection. Till something better is found out, the present attention is sufficient.

(b) I think it should be continued, till something better than the present vaccine is found out.

(c) In a community, where most of the people are unprotected, the inoculated person, if he is properly protected, can carry about plague germs (in his clothes, etc.) and thus infect others.

(d) Inoculation does not protect a person for more than three months. Those who are actually employed on plague operations should be persuaded.

GROUP A (3).

(a) Under the circumstances, yes.

(b) No.

(c) Yes, after the commencement of an outbreak, indirectly, through the soil.

(d) Dogs may pass plague germs through their intestines in a living condition, although not apparently suffering from plague. Buffaloes and pigs, which often eat human fecal matter, may spread the disease.

GROUP A (4).

(a) Unpopular.

(b) Every patient should have a separate small hut.

GROUP B (1).

(a) Hospital assistants employed as circle inspectors have detected a fair number of cases. On the other hand, sanitary inspectors on similar duty have failed in their mission.

(b) Yes, by curtailing the pay of the supervisors and sanitary inspectors. So far as this district is concerned, the staff is satisfactorily distributed.

(c) Extra allowance is necessary for extra risk. Pony allowance should be allowed, if actually maintained.

(d) Yes.

(e) Sanitary inspectors should certainly be better trained. Training of the staff by the District Medical and Sanitary Officer will not be an improvement on the present system. They should be trained in a Presidency town, where they could study complicated sanitary arrangements. They should be trained for six months or more.

(f) Not very great.

(g) I don't think so.

(h) I should not think so.

(i) Village revenue officers, with the co-operation of hospital assistants, can do the work more satisfactorily.

(j) I don't think village officers, without the co-operation of hospital assistants, can be depended on, as a means of detecting plague cases.

(k) Very little.

(l) Yes, it is possible, but, very often, the sanitary inspectors do get the information from village officers.

(m) I am inclined to think so.

(n) No.

(o) Some do.

(p) I shouldn't think so.

(q) Such an attitude should certainly be encouraged.

(r) Yes, supervised by officials.

GROUP B (2).

(a) Yes, certainly.

In Madanapalle, out of 946 registered passport-holders, 457 were unaccounted for.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c_(ii)) Certainly; about twelve months.

(c) *Nil*, so far as I know.

GROUP A (2).

(e) 368 cases (from 30th September 1898 to 25th February 1899).

64 cases (from 5th February 1904 to 14th March 1904).

2 cases (19th June 1904).

GROUP A (3).

(d_(ii)) By spreading the disease amongst rats, fleas may indirectly infect human beings. I cannot corroborate the statement by facts observed by myself.

(f) I don't know of such cases.

GROUP B (1).

(i_(ii)) There is no such thing as a death-certificate in this district. The plague staff do not insist on seeing dead bodies.

(t) (I) Four annas. (II) One rupee.

(u) Certainly, not desirable.

F. A. COLERIDGE, Esq., I.C.S.

GROUP A (1).

(a) Not, if carried out properly, as it was by the sepoys in Madanapalle.

(b) No. They know nothing.

(c) Disinfection has not been proved to be effective or to get at all microbes, and the expenditure is therefore excessive, as it is merely experimental.

(d) I am in favour of sunlight and, where not practicable, of bratties, as, unless a very careful watch is kept on chemical disinfection, it is useless. For example, the floors are not properly soaked: the grease and filth are not removed from the walls; merely sprinkling grease with a solution is useless; besides, the roofs are never properly soaked, this being impossible, under the present arrangements.

The roof is made of woven bamboos and, over that, tiles or mud terraces. Rats and fleas get into them, and no mere throwing of the solution will do any good.

The bratty method is preferred by the people, and they can bear the cost of it themselves, as they have to do in the Mysore villages adjoining us. It is easy to check, as a thermometer shows clearly whether the heat is sufficient. All it requires is a reliable man in charge of the thermometer to insist on the correct heat.

In villages, open the roofs and do nothing, except clean up.

In towns and in terraced houses, clean out and then use bratties and, if the floor is filthy, use a very strong solution and let it soak in.

(e) Not at all, in my opinion.

(f) Yes, but they require some better means of getting at the roofs and ceilings—some kind of pump.

(f_(ii)) Yes. We had no trouble over this from outside and our internal organization insures prompt supply.

(g) Yes, because it was done under most careful supervision. When sanitary inspectors were left to themselves, they did not do it well and they are not to be trusted, without constant supervision by a European or by a well-paid revenue official, over whom one has a proper control.

(h) No. They object to it, as damaging their property, they think. It is new and therefore disliked. In Madanapalle, the towns-people believe fully in its efficacy, as no further cases have occurred.

(i) A simple circular has been issued to every village officer, explaining plague matters, and he is bound to hold panchayats and explain it.

I hold a village assembly in all my camps and explain plague to the people and my Tahsildars are, some of them, doing likewise.

(j) They will not, for a long time, do anything, except under official supervision.

(k) Efficiency and popularity cannot go hand in hand.

To be efficient, the roofs of thatched houses must be opened. This is unpopular. All dirty rags, old pots, odds and ends of grain in chatties must be destroyed. This is unpopular.

The house must be left uninhabited and open to the air for a month. This is very unpopular. Bratties will be less unpopular than anything, but, should a fire occur owing to them, they will become the most unpopular of all.

If the solution is still to be used, then pumps, to get at the ceilings and roofs, should be employed, as rats are always found dead in the roofs.

If bratties are used, the owners could and should be made to supply them and their houses kept locked till they do. This is done in the Mysore taluks adjoining us. I have recently seen it working well.

GROUP A (2).

(a) The arrangements are the best possible and the villagers are invited and advised to be inoculated.

The operations were performed admirably by Captain Atal and Captain Bose and left nothing to be desired.

I can suggest none. Apothecaries might be allowed to inoculate, but, on no account, hospital assistants.

(b) Yes, for it is the only specific against plague and every effort should be made to get people to protect themselves. I would make it compulsory on all Government servants in an infected part.

(c) I have no experience of inoculated persons carrying plague.

(d) I consider every persuasion possible should be used, as it is the only safety we can offer. Our experience of the protection it affords here is very favourable and, in the present outbreak, the only man attacked (who has survived) was inoculated in February. I do not believe there are any risks, when the operation is performed by a proper medical officer and, even if there were, the risk is nothing to the risk of plague.

GROUP A (3).

(a) No; I think it is being neglected and proper pressure is not brought on officials and Government servants and, more particularly, plague employes to be inoculated.

I would compel every plague employé to produce an inoculation certificate with his first pay bill.

(b) (I) Further advice and, better still, example is needed.

(II) Inducements might also be offered.

(c) Yes, most certainly, they carry the plague with them and spread it. I have killed many, while wandering from one house to another or migrating to another village.

Dr. Oliver of the South Indian Railway and myself witnessed this in Kadiri.

I am certain plague was carried by rats only, in some cases, and not by human agency.

(d) Yes. I have seen squirrels, cats and dogs all dead of plague in Madanapalle. But I cannot say if they carry the germ. I have no practical remedy to suggest, except to do as we did and kill every cat and dog found wandering about. Squirrels also we shot, whenever seen.

GROUP A (4).

(a) Most unpopular.

(b) Yes: by making them, as we are now doing, single huts for each patient and a hut at no great distance for their relatives.

(c) Not at all.

GROUP B (1).

(a) Not in the very least. I consider it worse than useless.

(b) Most certainly. There is no efficiency, though there is great outlay. Abolish the observation staff and you will be free of the outlay, and the village officers and the revenue officials can manage much better without the so-called sanitary inspectors. I have, in the

sub-division, framed a set of simple rules for the guidance of village officers and the higher revenue subordinates, and reports are received at once from the village officers and, if they fail to report, they are at once dismissed.

The sanitary inspector relies entirely on the village officer for information and not in a single case has a sanitary inspector found out a case for himself or got information elsewhere.

The supervisors, however, who are drawn from the Revenue, Police and other departments, have all succeeded in bringing cases to notice, that were being concealed.

I agree that plague staffs should be in relation to population, extent, difficulty of travelling, etc. So far as my division is concerned, I can say the circles are as badly constituted as they very well could be, though they are now better than they were. I sent up proposals for distribution of villages into circles, based on these points and specially with reference to convenience of roads and getting from village to village. It was supported by the Collector. The circles finally selected seem to have been made by means of a compass and the map, but I am making the best of them. I may instance one of these—Ghattu. It was supposed to have a 5-mile diameter. It consists of two villages and an uninhabited village, and these two villages are half a mile apart: the rest is Horsleykonda hills. Recently, I sent in further proposals, based on roads and an intimate knowledge of the country and how much work a man could do, but these were also rejected, and a compass and map scheme was worked out and sent for me to carry out. Then, again, I am burdened with six supervisors, who have absolutely nothing to do, if the sanitary inspectors do their work, but, as they do not, the supervisors do most of it for them. I would suggest the total abolition of all observation circles and have, in their place, two supervisors or, at the most, three supervisors for each taluk, to go round the villages and see that the revenue inspectors and village officers are doing their work properly. Preventive circles might be continued, if thought desirable, though, except where there is actual plague in the circle, I find them useless. I consider the Mysore system far better and much cheaper. They leave all reporting to the village officers and revenue officers and police and then, when a case actually occurs, the plague inspector is sent out and not till then. It is his duty then to do what our ambulance staff now does.

(c) Observation staffs should be abolished or, if kept, Rs. 25 and Rs. 10 for pony allowance is ample.

The preventive staff, if in touch with plague, to be given Rs. 30 per mensem extra.

The class of men we get as sanitary inspectors are dear at any wages, and it seems ridiculous to pay them more than a revenue inspector and disgraceful that they should be paid more than a hospital assistant.

I should be inclined to have a very large reserve of hospital assistants and to give them an extra plague allowance, as they will lose a "charge" allowance, by being on plague duty. I would also give them house-rent for their families and supply them with a tent, and these men I would employ rather than sanitary inspectors, who ought never to be used, except in observation circles—if they are to be kept—as disinfectors and corpse removers.

Supervisors seem to me to be all that is required, except where there is actual plague, and I should pay them Rs. 50, plus 30 travelling allowance, which is far better pay than that of a revenue inspector or station-house officer, and these men could do the work quite well.

If there are a large number of sanitary inspectors and supervisors, there must be an European, to do nothing else but keep them up to the scratch and prevent their black-mailing.

A pony allowance is not necessary in the present preventive circles; they are so small. It hurts no man to walk 2½ miles, and that is the radius of their circle.

Yes; I consider a special allowance for those actually dealing with plague cases to be desirable, but I would first of all reduce the pay to that of a hospital assistant.

(d) Not the least use, in my opinion, either to detect "dropping cases" or as a trained nucleus.

The village officers report any cases that occur and the sanitary inspectors are useless for this work.

They are quite untrained, and I do not see that, by being retained during the hot months, they become in any way trained for preventive staffs.

(e) The present training (so-called) is, in my opinion, an absolute farce, and anything that would improve it is desirable. Hospital assistants would be much more useful, and the training a medical officer could give in the district would be preferable to the present method of getting men sent from Madras.

One month should be the minimum training, and that is too little to make much difference in the present material. Practical training in Municipalities with the Municipal Chairman or sanitary inspector would be of use. To learn how to write a diary and what to do in a village, when they get there, would be of no small use.

A little practical work in municipal scavenging would teach them how to handle low caste servants and how not to handle them. Most of the sanitary inspectors set their toties and disinfectors by the ears, within 24 hours of being put over them.

(f) While there was plague, the whole staff was directly under me, and I had an Assistant Collector as plague officer, and one of the supervisors was an Eurasian and a good

worker. Dr. Atal also was always on the spot, when required, and his supervision was equal to that of any European. The other native supervisor was useless. At present, I have no European assistance to supervise the staffs and, as I have my other work and four taluks to tour in, they are rather neglected. If plague breaks out badly, a special officer will be imperative.

(g) Some do and some do not. The supervisors work well, as a rule, and a few of the sanitary inspectors, but the general ruck are useless. The disinfecting inspectors work well, if constantly supervised.

(h) No. The supervisors, being revenue officials, have a good effect: the sanitary inspectors are either useless or else levy black-mail, whenever they get a chance.

(i) More European supervision and the employment of hospital assistants for preventive work and sanitary inspectors only for disinfection.

(j) More now than before, but still they are lax. If the punishments of suspension and dismissal are upheld, the effect will be that they will all report cases properly. If decisions are reversed, the result will be fatal. There should be no appeal, except on the facts, in a plague punishment to village officers, and the least punishment should be two years' suspension.

(k) Very little, I believe. Not so much as the revenue inspector and Tahsildar and the fear of an inspection by the Divisional Officer.

(l) A tactful man can always get information, if he sets about it properly, but very few of the sanitary inspectors have any tact and hence they are dependent on the village officers.

(m) Cases have come to my notice of black-mail and, in disinfection work, favouritism was shown, until it was detected and severely dealt with. In passport work also favouritism is shown and in prosecution for evasion of passports. Not a single rich man has been charged and yet I am perfectly aware they go constantly to the Mysore markets and take no passports on their return.

(n) It was, but is not now, as I have no European or Eurasian supervisor. However, I think they are fairly well in hand, and nothing very serious is likely to occur.

(o) They disregard all advice on the point, until there is a regular epidemic, and then they try to prevent every one coming to their village.

(p) They can be trusted, as soon as there is an epidemic, but not in the early stages. When they are frightened, they manage their cordons very well indeed.

(q) Yes. I think that promptly notifying to them that villages near had plague would suffice, and they would do the rest for themselves. This only applies to villages. It seems impossible to keep infected people out of the towns, as their friends and hotel-keepers and choultries receive them.

(r) I would leave the villagers to work their own patrol and only encourage it.

(s) Yes. I consider money is being thrown away. I have given (above) ways of retrenchment—

(i) Disinfection by ryots themselves, under supervision.

(ii) No observation circles.

(iii) Less pay to plague subordinates.

GROUP B (2).

(a) Yes. The address from which the person comes should be fully given.

If he is a stranger, he should have a letter from his village officer or some means of identifying himself. A very large number of passports now received are useless, as the place of destination is false and there is no means of tracing the man back.

Thumb-impressions might be of use. A local man, if used as a passport-issuing clerk should know any man in the town or should insist on his being identified by some one.

In the trains, I see no means of remedying this.

I am having suspicious characters traced to their alleged destination in a few cases, and prosecution follows, if they are found to go elsewhere.

This is not possible generally, but can be done occasionally.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c_(i)) I do not know: apparently, from non-recrudescence of plague in Madanapalle and other evacuated villages, it cannot, though doctors say to the contrary, from actual experiment, I believe.

(c) I believe it is of use, as the sun kills the germs, if there are any; also rats do not, as a rule care to touch anything that has recently been handled by man.

GROUP A (2).

(c) About 50 cases, I think. Almost all Europeans and their servants.

(d_(ii)) I have no experience and no views.

(f) Yes. I believe my wife's ayah got plague in this way. A rat ran over her face in the night and, two days after, she began to show signs of plague and died of it. She had never been outside the compound, for fifteen days at least, and the whole town was evacuated. None of the other servants had plague nor did they leave the compound. Everything was brought in by rail and cart from Voyalpad, Kadiri, etc.

GROUP B (1).

(i_(i)) No. We do not insist on certificates. They see everybody, if possible.

(i_(iii)) No experience.

(t) I think it would lead to black-mail.

(u) They were allowed to attend patients in the camp and they did so in two cases. Most of the hakims fled, on the first appearance of plague. I do not think it would do any good, unless it were made criminal for them not to report every case that came to their notice.

GROUP B (3).

(a) Under a special head constable and, when not on actual plague duty, under the reserve inspector. When doing town patrol on evacuation, they are under the inspector concerned.

When on plague duty pure and simple, such as watching camps, they are under the plague officers direct.

They do their work indifferently. We are now keeping those not actually at work for the moment with the reserve, and they are being trained.

(b) We have reduced them to a minimum, using them only to patrol evacuated towns and to guard property, while being disinfected, and a few for urgent work, to watch contacts who are likely to bolt or plague patients whose relatives are likely to remove them.

(c) In watching plague sheds: for peon's work with the sanitary inspectors and hospital assistants, we now use peons.

M.R.Ry. R. GIRI RAO GARU.

GROUP A (1).

(a) Yes. All the houses and articles infected should be thoroughly disinfected by coolies working under the personal supervision of the Health Officer or a tried hospital assistant, who should be responsible for any neglect and its consequences. Drains, sewage, channels, wells and latrines should be properly disinfected.

(b) No. They should invariably be given practical training in a plague hospital and taught practically and not theoretically what plague is, its symptoms and the mode of dealing with it. The period of training should be one month. Men who are tried and found not wanting in courage and presence of mind should be chosen for plague duty. They should be men of character and social status and should not be fortune-hunters. Every man should not consider he is quite fit for the work and aspire for the post, which carries decent emoluments with very short training.

(c) Quite enough, if it be done in consonance with the rules.

(d) There can be no question about the absolute value of the chief chemical disinfectants, such as perchloride of mercury solution, etc. How far people like it is the question. People are still ignorant as to its tangible uses.

Desiccation by burning bratties will be welcomed by the people and will be cheap and efficacious, in the case of thatched buildings and cemented and mud floors.

Desiccation by sunlight will also commend itself more largely to the people.

Chemical disinfectants are necessary for stone floors, terraced roofs, plastered walls and superior buildings. People could be easily influenced to have their houses disinfected by burning bratties, for they know that all germs could be surely killed by fire and smoke, which generate intense heat.

(d_(ii)) (I) In towns, perchloride of mercury and burning of bratties and, in places where people like, permanganate of potash for wells too.

(II) Burning of bratties and desiccation by sunlight, by removing thatches of thatched buildings.

(e) I do not know. If disinfection is effectively done, I believe that the plague germs will die out completely. If plague appears afterwards, it must be due to importation alone. If any indigenous case should arise in a house disinfected, the inference is that it was not properly disinfected.

(f) Yes.

(f₁₁) Yes. At any rate, there should be a large supply in stock at head-quarters.

(g) (I) Yes, to a certain extent, when there is efficient and conscientious supervision. The impression, in some quarters, is that mere water is thrown, for the solution corrodes the skin. The inspectors and supervisors should feel their responsibility and not allow the coolies to do the work. Disinfection must be done in the constant presence of inspectors or supervisors. Thoroughly honest and independent non-officials should be taken into confidence in the matter.

(II) No. Sometimes through the opposition of the people, through ignorance and sometimes through the bad character of the sanitary inspectors and their men.

(h) No, on the whole.

(i) Very spasmodic efforts are made in that direction.

(j) Yes. The village officers must be thoroughly convinced. They must be approached patiently and sympathetically for the purpose. They must not think that, if they do not listen to the advice, they will run some risk. Honest and energetic non-officials must be taken into confidence and be prevailed upon to go to the villages and explain the matter to the villagers in a sympathetic manner.

The great point is to win their confidence, for which the safety of their property and proper handling of it should be guaranteed.

(k) (I) and (II) Desiccation, by burning bratties and by sunlight.

(III) Disinfection must, as far as possible, be done in the presence of the owner. If the owners are willing, let them disinfect their houses themselves under the direction and supervision of the inspector. If the owner does not come, through fear or any other cause, his property must be guarded properly. For a satisfactory solution of the question, the following suggestions are made:—

(1) There should be a special Sub-Magistrate, to be in charge of disinfection operations.

(2) Two clerks, one in the taluk office and another with the Sub-Collector or Plague Officer.

(3) One Police Inspector, with two or three station-house officers and twenty or thirty permanent constables.

Nos. 2 and 3 to prepare the list of articles found in a house to be disinfected. This should be done in the presence of the Sub-Magistrate and some honest non-official.

A note of articles to be made in triplicate, to be signed by the Sub-Magistrate, Police officer and sanitary inspector (or hospital assistant) in charge of disinfection work. One to be hung on the walls of the house, one with the Plague Officer and one in the office.

One sanitary inspector to be permanently entertained by each taluk board. He must know how to prepare plans and estimates. He should be primarily responsible for the sanitation of the town where he is made to stay by the President, as occasion requires.

People should be made to understand that no property of theirs will be lost. The police-guard must be held responsible, when once the list is made out and regularly put into their charge.

GROUP A (2).

(a) (I) Yes, but only to a very small extent. Public meetings must be held oftener and lectures delivered by medical men. Free interviews should be granted and every question must be answered with patience, however foolish it may be, for we are dealing with people who are ignorant of the benefits. Inoculation must be encouraged in observation circles, not so much in preventive circles, when there is actual plague raging. The inoculation patient should be kept completely free from infection. He should be examined thoroughly.

(II) No better arrangement is needed. District Surgeons alone should inoculate persons.

(b) Yes. The period should be raised to three years, if efficacy lasts so long, for frequent inoculation brings on, they say, weakness. Inoculation-leave should be extended to one week. Provision for medical assistance, till the patient completely recovers from fever, should be made. Every one, be he rich or poor, must be attended to without fail.

(c) I do not know.

(d) It should be left entirely to the option of the people. Example is better than precept. The person who inoculates should be a specialist.

GROUP A (3).

(a) No. Higher rates of rewards should be freely given to those who destroy rats.

(b) No—as regards advice.

Yes—as regards inducements.

(c) At the commencement, they act as indicators of the appearance of plague but, after the commencement, they tend to spread it. The dying of rats seems to be God's warning of the approach or existence of the disease. Once the town is infected, the rats are observed to leave the town in a body. Very likely, they carry infection.

(d) Squirrels—as far as I know.

GROUP A (4).

(a) Very unpopular, as they were not constructed or equipped on the lines suggested by Dr. King or Dr. Sinclair.

(b) They will only become more popular, when the hospitals are made attractive, by providing them with all necessary equipments and separate accommodation for the hospital assistant, so that medical aid may be ensured at any time in the day or in the night. People should not go away, with the impression that doctors are as much afraid of the plague as laymen. It is this fear to approach plague patients that makes everything unmanageable and unpopular. Men who treat patients boldly and successfully should be properly rewarded. If they die in the discharge of their duty, their widows must be properly compensated. Men who turn out good work should not be let go without their services being properly and adequately appreciated, by rapid promotions or by rewards or by a mention made in the gazette of their meritorious services and so forth.

The patients should have all comforts, in point of bedding, cots and blankets, so that they may not be exposed to wind at nights. There should be a place for keeping a stock of absolutely necessary medicines. There should be water conveniences and toties for cleaning the place. The servants should all be given boots, to give them confidence to do the work without any fear of catching contagion. Confidence should be inspired in the people, by looking carefully to the requirements of the patients and those who attend on them. Entertainment of tried men on higher pay, with special allowances and assurance of further promotions for loyal and courageous service, will produce better results. If plague should be considered a divine visitation, which cannot be combated, but which should only be avoided, these measures will fall through. A plague patient is, in that case, doomed to death.

(c) People in these parts cannot afford to build private hospitals.

GROUP B (1).

(a) I don't think they were successful. No case was ever detected by a sanitary inspector. The sanitary inspectors in observation circles are of no material use to the country. The village magistrate may be made to do the duties of a sanitary inspector.

(b) Yes—by the abolition of sanitary inspectors from observation circles altogether. Any village magistrate, who shows good work in regard to the finding out of the first one or two cases promptly, may be rewarded with a gold medal. Revenue Inspectors and Deputy Inspectors of Vaccination may be made to immediately supervise the work of the village magistrates in the matter of plague.

Observation Staff.

	Rs.
Two tried hospital assistants, two observation circles, each Rs. 75, plus allowances, not to exceed Rs. 25 a month	200
One orderly, each, on Rs. 7	14
Rewards or extra remuneration to village magistrates, when they detect cases. A reward of Rs. 5 may be given to a village magistrate for the first case he detects. It must be certified to be genuine	100
Total ..	314

No supervisor is necessary. This will effect a saving of about Rs. 153 a month.

A clerk on Rs. 15 for frontier stations, to issue passports only.

Pony allowance is only necessary, when he has to travel long distances. If he has to inspect an area of five miles in diameter, he must have a pony; otherwise, proper inspection cannot be ensured. For town duty, no pony allowance is needed.

Extra allowance is undoubtedly a good thing, for it gives them good inducement to work cheerfully and well, for, in plague, there should be good nourishment, and prices rise and, very often, articles have to be got from outside.

There should be only one class of sanitary inspectors. No special knowledge is needed, except what is necessary to keep the place in a thoroughly sanitary condition. They should possess hygienic knowledge. As for the diagnosis of the disease, it may be ultimately left to the hospital assistants. Of course, sanitary inspectors should be men who have undergone some training in a plague hospital.

Preventive staff.

	RS.
1 Sanitary Inspector for each circle	40
1 Orderly	7
1 Toti	7
	54
If there be 8 circles :—	432
8 Dhooly bearers to be in reserve	56
	542
1 Hospital Assistant on Rs. 100, to supervise the work of all Sanitary Inspectors	100
	642
Extra allowance for 8 Sanitary Inspectors	80
	722

Ambulance and disinfection staff may be as they are; I do not propose any reduction in the pay of these staffs.

The pay of the sanitary inspectors may be reduced to Rs. 40, pony allowance included. An extra allowance of Rs. 10 may be given, as the prices of articles rise during plague.

Road frontiers should be guarded.

There should be passport-issuing clerks. There should be clerks in the controlling offices, to check all passports carefully and to take prompt steps to bring the offenders to book.

(d) (I) and (II) Not necessary. Sanitary inspectors were never found to detect first cases at all.

(e) Yes. Sanitary inspectors and hospital assistants, taken for plague duty, should be men who have had training in a plague hospital for at least two weeks. They may be trained in theory by the District Medical and Sanitary Officer for one month. It may afford hands readily for duty in each district and the expense of training may also be reduced. A class of men who are physically fit and who have a decent knowledge of English should be formed and they may be taught a few lessons on sanitary science and on the theory of the plague bacillus, as to its rise, growth and decay and of the symptoms of plague and the uses of inoculation. They should, after the period of training, be examined, and whoever secures a minimum should be declared passed. They should not be declared fit for duty, unless and until they have had some training in a plague hospital for at least a fortnight. One able sanitary inspector for each taluk board should be engaged permanently. Whenever a portion of a district is affected, these men may be put on duty, until a proper substitute is obtained. They should be primarily made responsible for the sanitation of the towns where they serve.

The staff will only be efficient, when they have been trained in a plague hospital and when they know that there will be proper rewards for services rendered.

(f) The supervision was satisfactory. A sympathetic and energetic officer, like our popular Sub-Collector, Mr. F. A. Coleridge, will be very serviceable.

(g) No, barring, of course, a few exceptions.

(h) Yes, among a few of the preventive staffs, as far as Madanapalle was concerned. The majority do not exercise a favourable influence. Patience, tact, sympathy, absence of greed and of love of power and definite and clear knowledge—these alone can exercise a favourable influence.

(i) Persons who are certified by the people or by their accredited educated agents to have done good and loyal service during plague should be rewarded by an honourable mention of their names in the District Gazette and given very good promotion at the earliest opportunity.

(j) Yes, provided some inducements, by way of rewards, are offered to them for the first cases of genuine plague.

(k) I do not think they can serve as a stimulus to the village officers.

(l) Almost none, for the village officers are everything in the villages, unless there is faction. Tactful persons do, to a certain extent, get information from others, but such men are rare. Conquering by power is generally the method employed, but it is sure to end in failure.

(m) Yes. That is the impression. Abuse of power and wrong diagnosis, on the score of erring on the safe side, for selfish ends or to avoid future explanations.

(n) Yes, provided the officer is keen and sympathetic.

(o) To the fullest extent. They know how to guard themselves and do it successfully. There must be official help and sanction in such cases. Otherwise, disruption ensues.

(p) Yes, when plague invades their villages for the first time, but, when they become inured to it by frequent visits, indifference sets in and sometimes corruption may be resorted to by the braver folks of the village. As far as I know, they can be very well trusted.

(q) Yes.

Yes. The officials must not discourage, but should positively and distinctly assist them in the matter.

(r) Yes. It should be left to the villagers, but should be sympathetically supervised and guided by the officials.

(s) Yes. By removing the observation staff altogether and by reducing the salary of the sanitary inspectors from Rs. 75 to Rs. 40 for the preventive staff.

Payment by the results of the work done will be much better. A majority of the population of a village should certify to the good work done by the sanitary inspector, to entitle him to any reward or honorarium or to the honourable mention of his name in the District Gazette or to the award of any certificate of merit or to rapid promotions in pay and grade.

GROUP B (2).

(a) No.

(b) At every infected place or station, no ticket should be issued to any person, unless he produces a passport. Any person, who is found to hold a plague punched ticket without a passport, should be deemed suspicious. The booking clerk and the defaulter should, in that case, be severely dealt with.

There should be a proper check of all passports and the whereabouts of persons should be properly traced.

All railway stations, which are within 20 miles from an infected locality, should be declared passport stations, and the railway department should be made responsible for the issue of passports to the passengers. Such stations must issue only plague-punched tickets.

(c) No, except by cultivating the conscience of the people and by meeting out adequate punishments to the offenders, when detected.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c₍₁₎) I can't say.

(e) It is useful, no doubt, but attended with practical difficulties, inasmuch as people dislike it. It is not known how grain could be desiccated during the rainy season.

GROUP A (3).

(d₍₁₎) (I) I do not know.

(II) It was found, during disinfection, that, in houses where there were most dead rats, there were many deaths.

(f) One Dastagiri Sahib caught infection in a house, which he entered accidentally and where rats were found dead.

GROUP B (1).

(i₍₁₎) No, in observation circles.

Yes, in preventive circles.

(i₍₁₁₎) Yes.

(t) (I) Yes; Rs. 5, for each case reported in observation circles.

(II) Yes, Rs. 5.

(u) Yes, to a certain extent. Yes. Yes.

GROUP B (3).

(a) By a head constable.

They did their work very indifferently. Contacts were let loose upon the community by the police, and hence the spread of the disease. Temporary constables were very timid and did not do their duty properly at all. If these had remained at their posts boldly and done what they were told to do, there would not have been so many deaths.

Property was also lost, owing to their negligence.

Entertainment of a tried and honest Police Inspector to control the police would ensure better results. Permanent constables alone should be employed. With strict supervision and with surprise visits, this end is even now being attained to a great extent in Kadiri.

(b) No. The constabulary must be those who are on the permanent staff, so that they may be held responsible for anything that goes wrong. Temporary cooly constables should not be entertained or proper selection should be made.

(c) They are engaged for watching the contacts and plague patients, for guarding the several paths and evacuated houses and also as orderlies to the plague staff.

B. MACLEOD, Esq., I.C.S.

GROUP A (1).

(a) It seems necessary that, wherever disinfection is undertaken, it should be done thoroughly. Half measures don't seem of much use in disinfecting.

(b) The plague inspector may, like the poet, be said to be *born* not *made*. The instruction he gets in Madras benefits only the suitable class of man. He has to be courageous and zealous and tactful, so as to get on with inhabitants and avoid quarrelling with his fellow-workers. Only a small proportion of them correspond to this description, and the large majority are very little use. People trust officials of their own district more readily than foreigners. To my mind, hospital assistants are the best class of men for this work, and the sanitary inspector does not meet with my approval, being too often timid and lazy, a black-mailer and unable to deal with subordinates and coolies, occupying the time of his superiors with endless complaints about petty matters which he ought to settle himself.

(c) It should not be less than at present. Where cases are sporadic, the house of attack should be disinfected, with the adjoining ones. But, where a whole village is infected, all the houses should be disinfected. Without this thoroughness, the work is futile. People cannot safely go back to their houses, unless they have been made safe.

(d) Burning down the whole house is the most reliable method, but causes too much public alarm. Desiccation by sunlight is most advantageous. Perchloride of mercury (1 in 500) seems most likely to be successful.

(d(1)) In towns. My experience is limited to big villages of not more than five or six thousand inhabitants. Evacuation of the infected localities is desirable and it is well if the people do so early, as, otherwise, they go, carrying infection to other places. At Madanapalle, the scare took place after a few cases and, practically, no infection was carried from it to other places. When a scare prevails, it is most difficult to get local labour, and the aid of a company of sepoys is very valuable at such times. Disinfection of houses is necessary, and they should not be re-occupied, till a month or so after the work has been completed. Immediate free cutting of Government materials, for hutting and other purposes, is most necessary.

(e) In the Ceded Districts, the plague season extends over the cold weather and, after an infected village is attacked one season, indigenous plague does not remain in the following year. It may be re-imported from such large centres as Bangalore or Bombay.

(f) The perchloride of mercury seems good, and other apparatus is got locally, that is, somewhere within a hundred miles of the scene of outbreak. It is most desirable that all touring plague officials should be given a tent, a condemned one from the Madras Arsenal, as they cannot safely sleep in infected villages or build a hut wherever they go.

(f(1)) We have had no difficulties in getting what is required.

(g) House-owners invariably try to deal with the disinfectors, try to get them to leave them alone, and disinfectors generally try and get money from the house-owners, by threatening to do unnecessary destruction. Both parties want careful watching.

(h) A villager has an insane affection for preserving ancestral rubbish of no apparent use, such as cloths, baskets, pots, sticks, boxes, parts of furniture. He never indulges in an annual spring cleaning and would not voluntarily burn up such articles.

(i) They see from experience that disinfection prevents plague reviving; unless supported by visible facts, they lay little stress on the advice of officials.

(j) It is desirable that a man should clean his own house, but he must submit to supervision, to see that his rubbish is burnt.

GROUP A (2).

(a) I see no objection to hospital assistants performing the operation, which I believe in, as a most efficient prophylactic; certainly, every plague official should be given a dose. It gives one a great feeling of safety and confidence. On the other hand, many people have little faith in this system.

(b) I would enlarge the privileges and give a permanent life-exemption for every inoculated person. Six months is not worth the risk.

(c) Except through infected clothing, he would be harmless, so far as my limited scientific knowledge goes.

(d) I would make each inoculated person pay As. 2, as, in this country, no one pays money, without an expected benefit. Government officials could then be given a free hand in advising people to be inoculated. There seems to be no risk involved in the process, except a more or less severe attack of fever. I was personally operated on in 1898 and 1904.

GROUP A (3).

(a) The public seem well aware of the danger, when there is unusual mortality of rats, but are generally too much scared to spare the time to hunt for them. The offering of rewards all the year round in localities might be a good thing and would be money much better spent than encouraging poachers to destroy wild animals in forest reserves.

(c) Yes, I think they are an important feature in a crowded locality. One can control the movements of human beings, but rats defy one. Luckily, they all seem to die off in due course and do not carry on the infection to the next season.

(d) Probably, flies are capable of carrying some disease. Sweetmeat sellers seem very liable to the disease. Annual house cleanings would be desirable.

GROUP A (4).

(a) Not popular. In any case, all plague buildings should be separate, little huts, with 20 feet interval between them. Their size might be 10' x 8', sufficient for one person. In a large hospital already containing plague patients, the new patient, who hopes that he has not really got the disease, feels it an injustice to be put near those who have and would be much more contented with a separate little hut of his own. Contacts have this feeling still more strongly. Health camps should also be little huts, 20 feet apart, instead of the re-production of the crowded village street, which they have left behind. Often, a case develops in a health camp and, under the present system, the neighbours are better off than before.

(c) Not availed of.

GROUP B (1).

(a) Their work does not seem to me of any particular value. A village officer is equally useful for protection and a sanitary inspector, without medical knowledge, is valueless for suppression.

(b) I should have no objection to the abolition of the observation staff altogether, except perhaps in large towns of over 20,000 people. Villagers are quite ready to keep out strangers at plague times and Voyalpád, by its own efforts, successfully prevented the ingress of plague from Madanapalle, which is distant 13 miles or less. Popular opinion was most strongly against admitting sanitary inspectors to any outlying villages. At plague seasons, I would increase the staff to (say) four hospital assistants in the infected taluk, so as to have spare men available to send in any direction, where need arose.

(c) It seems to me improper that the sanitary inspector should get more than the hospital assistant. Speaking generally, the proper pay for a plague officer is that of a Government official suited to the work, with his percentage for the extra risks, the difficulties of travel and the extra prices. The percentage might be 25 per cent. or, under special circumstances, more. If the officer has to travel, fixed travelling allowance, at least equal to the hire of a bullock-cart, should be granted, say, Rs. 30 a month. At present, people who do the real work, namely the local officials, tahsildars, revenue inspectors, hospital assistants, village magistrates, taluk peons and taliaris, get no pecuniary reward; they might be given 25 per cent. extra.

(d) Seems an unnecessary luxury. After the epidemic of a cold season, the village official is quite alive to the advantage of immediately reporting any fresh case. I don't think such a person would be a nucleus for anything in particular, except idleness.

(e) There are persistent rumours that the obtaining of a certificate depends upon the illegal gratification of the subordinate officials connected with the class in Madras. The larger the institution, the more likely is this sort of thing to happen. I would prefer candidates locally trained, as being certain to have the knowledge of the language and geography. Of course, any District Surgeon could teach what an assistant sanitary inspector knows, but I doubt whether any self-respecting officer would dare to give certificates, in so important a matter, except to pupils who had long been under his observation. The tact, etc., of the candidate is the most necessary qualification and can best be acquired by years of official training and experience.

(f) Very slight. The Sub-Collector could only spare a certain amount of time. The Assistant Collector had to see to the proper disinfection of the town of Madanapalle, and the Eurasian salt inspector was apparently selected, in order that he might repent of some departmental irregularities he had lately committed.

(g) They are a very unequal lot, only a minority earning their pay. Much cannot be expected of the temporary police, as they are only recruits hired for the job.

(h) The public would be just as happy without them and I regard them as of no great use.

(i) I would prefer hospital assistants and trained policemen.

(j) Yes, as a general rule.

(k) I don't think they are any use in this direction. The village officer respects and obeys only his immediate superior in the Revenue department.

(l) I very much doubt it.

(m) Such is the general opinion.

(n) I suppose not.

(o) It was well-known in the Madanapalle sub-division. Each village barricaded itself, as much as possible, against outsiders, and I threw no discouragement in their way, knowing that "Heaven helps only those who help themselves". If I had acted otherwise, they would have said, "Here is the Government wanting to introduce plague among us". Village officials should be granted free supplies of wood and disinfectants for plague purposes, and the local authorities should be allowed to strengthen the menial staff of taluqars, where they are considered necessary.

(p) I think so, in villages of moderate size (of 5,000 people). In big villages, the authorities are too much divided and the local Government official, e.g., the head constable or revenue inspector, could be given the authority.

(q) I think so; distinctly. A little encouragement would do much towards this.

(r) I would leave the details to each village authority. I would leave it to them, but with the knowledge that Government would back them up and that anybody disobeying would be prosecuted.

(s) It seems rather a waste of money. I don't think the peripatetic assistant sanitary inspectors could be of any assistance. Extra zeal on the part of the local officials is required. If you must have an extra man, I would have another revenue inspector or hospital assistant or another head constable or another salt sub-inspector and not a whole-timed plague officer, who only frightens people. Give him some amount of ordinary rural work also.

GROUP B (2).

(a) It seems, in theory, a beautiful system, but wastes a large amount of stationery and causes a good deal of alarm to the public. Occasionally, imported cases are found out, but very rarely.

(b) It is most difficult to meet all the ingenious devices of old campaigners. Railway stations are very open places and, so long as they are not defrauded, railway officials are not very particular. The passport-system is more suitable to large towns, where the authority is divided. Any place under 5,000 inhabitants can be watched by its village officers, who must necessarily know, whenever any sick person or stranger arrives.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c(i)) I don't think so.

(e) One could discover if there were any dead rats in it.

GROUP A (2).

The European residents of Madanapalle and some of their plague staff and servants.

(d(i)) Nothing known. I think flies off a dead body are much more likely to carry infection.

(f) Nil.

GROUP B (1).

(i(i)) No.

(i(ii)) I think they are sufficiently effective.

(t) Not necessary.

(u) A native doctor very often combines giving medicines with some other business and has never had any special training. Very often, he claims semi-religious power to perform miracles. By all means, instruct him.

GROUP B (3).

(a) The plague police consists of temporary recruits, dressed in uniform. It would be far preferable to have properly trained members of the force. The present work is valueless. They take orders from the plague officer (Sub-Collector).

(b) I don't think so.

(c) Guarding evacuated localities and certain camps.

ADDITIONAL NOTES.

GROUP A (1).

(d) Unless chemical disinfection is most carefully done, floors are not properly soaked and grease and filth arrest its flow. Roofs cannot be well treated chemically. Burning bratties is generally effective and is popular and much used in Mysore.

(f) Some kind of pump is desirable, to get at roofs and ceilings.

(j) Sanitary inspectors require complete and good supervision by an European officer or superior subordinate, such as a Deputy Tahsildar.

(l) Circulars have been issued to village officers and, in camp, Revenue officers explain to villagers.

(k) Opening of roofs is unpopular and leaving houses unoccupied for a month after disinfection. Bratties are popular, but there is the danger of fire.

Rats reside mostly in roofs.

GROUP A (2).

(b) Inoculation should be compulsory on all officials and village officers dealing with plague: certificate to be produced with the pay bill.

GROUP B (1).

Observation staff of no great use. The sanitary inspector relies on the village officers for information. Supervisors, who are Revenue or Police or Salt officers, are the most useful sort. Circles should not be arbitrary map-drawn circles, but should have reference to hills, roads and villages. The number of supervisors is also too arbitrarily arranged. We really have too many.

Supervisors to go round taluqs would be the best plan, without subordinate sanitary inspectors.

In Mysore, a plague inspector is sent, only when plague is reported by the village officers or Police.

(c) There ought to be a large reserve of hospital assistants.

They should have tents. Sanitary inspectors black-mail, unless there is an European to supervise them.

(d) Observation staff not necessary in hot weather.

If pairs of men, one for observation, one for treating cases, were sent out, black-mailing would be minimised.

(e) Training in municipal scavenging would be useful.

Police should be required to enquire and enter in their diaries any cases heard of. A man doing other work also is more capable of getting information than a mere plague terrorizer.

(g) Supervisors work better than sanitary inspectors. Disinfecting sanitary inspectors require close supervision.

(k) Revenue inspectors are more useful.

(p) Not till they are frightened of plague, after it has come near their village.

(r) Leave it to the villagers.

(s) Let ryots themselves disinfect with bratties under supervision.

GROUP B (2).

(a) Address from which the person comes should be fully given. If he is a stranger, he should have credentials.

Thumb-impressions would be useful.

(t) Would lead to black-mailing.

(u) The Hakims fled. Unless they can be prosecuted for failing to report cases, they cannot be relied on.

GROUP B (3).

Plague police work indifferently.

(c) They are being reduced to a minimum. Used for patrol of evacuated villages, guarding property during disinfection, a few to watch contacts likely to decamp or patients likely to be removed by relatives, watching plague sheds. As orderlies of sanitary inspectors, we now use temporary peons.

B. SWIRE, Esq.

GROUP B (3).

(a) The plague police at present are put under a special head constable, who works directly under the plague officer and who submits a daily report of his work to that officer, who forwards it to the District Superintendent or Assistant Superintendent, as the case may be. With regard to the watching of plague camps and contacts, they take their orders from the plague officer, but the arrangements for guarding towns and villages evacuated on account of plague by means of the temporary constables are made by the Police Department. The constables are paid by the Police Department, the necessary cheque being sent to the Police Inspector of the division in which the temporary force is working. They are also punished by the Police Department, reports being made to the District Superintendent or Assistant Superintendent, as the case may be.

It will thus be seen that they are at present working under two different departments, the Revenue Department and the Police Department. The work of the plague police falls under two heads, namely—the watching of plague camps and the guarding of evacuated towns and villages. The former falls under the work of the plague authorities and the latter under that of the police.

I, therefore, think that the plague police should be divided into two distinct forces, one, for the watching of the plague camps, etc., to be under the plague authorities and the other, for the guarding of evacuated towns, to be under the Police Department.

Each would be under a special head constable, to be continually checking their work, and each head constable would send in daily a diary of the work done by him to the officer under whom he is working, namely the Plague Officer in the one case and the District or Assistant Superintendent in the other. Thus, the work of the men employed could be properly supervised by the officer under whose work it naturally fell. To distinguish between the two forces, it would only be necessary that some distinct badge be worn, for instance, the plague police to watch plague patients, etc., might be given a red cross badge to wear on the arm.

With regard to the disbursement of pay to the men, I think the cheque should, in each case, be sent from the district office to the head constable in charge of the respective forces and not to the Police Inspector of the division, as is at present done. It is of the utmost importance that the temporary constables should receive their month's pay promptly, otherwise it is not possible to expect a perfectly undisciplined body of men, such as they are, to work satisfactorily. The Police Inspector has his own duties to perform, which may take him to places quite different from where the plague police are, and it cannot be expected that he should neglect his proper duties, to run about paying plague police, whereas the head constable in charge of the plague police has to be continually on the move among them and would probably see every man almost every day. He could, therefore, disburse their pay promptly and without any extra work.

The plague police are, at present, a perfectly undisciplined force and, when it is found necessary to punish them (which, with such a body of men, is fairly frequent), if the punishment is to have any effect, it must be made at once, as soon as the offence is discovered. At present, the method is for the head constable to take the explanation of the constable at fault and forward it, with a minute, to the District Superintendent or Assistant Superintendent. This method means that there must ordinarily be considerable delay in receipt of the final order. This could be remedied, if the head constable were given certain powers of punishment, such as the awarding of a fine, say, up to one rupee, subject to the confirmation of the District Superintendent or Assistant Superintendent. He would thus take the explanation of the constable on the spot, write a minute and award a small punishment, if necessary, and inform the constable of the same. The papers would then be sent up to the District Superintendent or Assistant Superintendent, who would either confirm the punishment or make such alteration as he thought fit. The punishment would then have some effect and, if the head constable abused his powers of punishment, it could easily be detected.

(b) Their number could not be reduced, with due regard to efficiency.

(c) At present, they are engaged in watching plague camps and plague contacts and also in the guarding of towns and villages evacuated on account of plague.

J. F. GRAHAM, Esq., I.C.S.

GROUP A (1).

(a) The prescribed methods of disinfection seem scarcely severe enough and, only in towns or villages, where there is European or competent Eurasian supervision, are they properly applied. Personally, I do not think chemical disinfection much use and this is practically the only form of disinfection to which much attention is paid. Increased attention to disinfection is decidedly desirable, if by this we understand increased attention to disinfection by fire and sunlight.

(b) Judging by the knowledge new sanitary inspectors bring to bear upon plague work, I should think the arrangements very far from adequate.

In fact, sanitary inspectors, when without previous experience of plague work, i.e., when fresh from the hands of the Sanitary Commissioner, know nothing but the Plague Inspector's Manual of Dr. King. This they know by rote.

(c) The expenditure on disinfection might very well be increased. In Madanapalle town, quantities of chemical disinfectants (perchloride of mercury and phenyl) were used, but, unless these liquid disinfectants are used in such large quantities that the place to be disinfected is absolutely drenched and saturated, I should not think it is much use using them at all.

(d) I should consider that desiccation by sunlight is much more efficacious than that by bratties and also than disinfection by chemicals. As regards the relative value of the two latter methods, I should always use bratties, in preference to chemicals, were it not that, in the majority of cases, the houses to be disinfected are of so flimsy a nature that burning bratties would probably burn the house down.

In my opinion, sunlight and fresh air are the only reliable disinfectants. If any house can be unroofed and left exposed to the sun for a month, I should consider it absolutely safe for re-occupation at the end of that time. This, of course, applies only to one-storied buildings. In pukka houses, where the floors are cement and the walls brick covered with chunam, burning bratties (all apertures being closed) should be most effective. But this form of disinfection can only be applied to strongly built buildings, as the heat engendered is very great.

I have the smallest possible opinion of the value of chemical disinfection, for there must be places on the walls and floors, which escape actual contact with the chemical. In addition, the fluid evaporates in a very short time and plague bacilli may even live through a short bath of it.

(d₍₁₎) If disinfection is to be attempted at all, it should be thoroughly done.

(I) I would, therefore, recommend, in towns, that every house, in which a plague case has occurred, should be unroofed, whether pukka or not, and left so for about a month. (In the rainy season, I would not unroof, as there is generally no sun then and the bacilli thrive in wet.) If the house be pukka, I would burn bratties in every room. If, from the nature of the walls, this would not be desirable, drenching with perchloride of mercury (1 in 500 solution) might be adopted. But such application of disinfectants would need to be very thorough. No part of the walls or ceiling should escape.

The houses, on each side of the infected house, should be treated in the same way.

If the roofs be straw, the straw should be burnt. Prompt evacuation of the surrounding houses, within a radius of 80 or 100 yards, would be highly desirable, if possible. In the case of the first appearance of plague in a large town, evacuation within 24 hours of the local area surrounding the place of first attack should be made compulsory.

(II) In rural parts, evacuation is much the most effective method of stopping the spread. Not voluntary evacuation—that is always so tardy, that its efficacy is largely discounted by the delay—but prompt and immediate compulsory evacuation of:—

- (1) the whole village, where the number of houses does not exceed, say, 300 (three hundred) and of (2) the area within a radius of 50-100 yards, in villages where the number of houses exceeds this number. Subsequent to the evacuation, the plague-infected house, if a thatched hut, should be burnt down standing, i.e., the roof should be crushed into the hut and then set fire to. This process is suggested, to avoid a general conflagration. The surrounding evacuated houses, in case (2) above, should be treated as the houses in large towns, i.e., should be unroofed and disinfected.

In the case of evacuation of an entire small village, all the houses should be unroofed.

The villagers themselves will generally do this, on evacuation, if it be made clear to them that, if they do not do so, the roofs will be burnt, when taken off. The thatch of uninfected houses might be removed outside the village by the house-owners.

Immediate evacuation and unroofing seem to me the real foundation of successful stay of plague and thorough disinfection.

Chemical disinfection is mere playing at disinfection.

Of course, in addition to the above measures, everything likely to be infected should be burnt, e.g., clothes, bedding, upholstery (seldom seen) and small quantities of grain: cess-pits could be filled in and the whole village whitewashed for cleanliness—before re-occupation.

(e) Being a layman, I cannot give an opinion worth consideration. Such as it is, I think that a thoroughly cleaned, unroofed and evacuated village can only be re-infected by importation.

But, unless all cloths, mattresses, bedding and other things of this nature found in the village are burnt, plague germs may always remain quiescent in these articles, at any rate for some months. I don't think plague germs can ever be *revivified*, meaning re-endowed with life. A plague germ, once dead, is always dead.

A recrudescence of plague indigenously can only mean that some plague germs escaped extermination at the time of disinfection and, during the time of evacuation, remained in some nidus, where there was sufficient damp and dirt (decayed animal or vegetable matter) to support their existence, until a fresh opportunity for rapid multiplication was afforded them.

No.

(f) They seem all right. Perchloride of mercury was always used, where I was on duty. The apparatus consisted of small wooden chatties for throwing the disinfectant about.

(f₍₁₁₎) Yes. We never ran short.

(g) (I) In Madanapalle. A decided "no", until the arrival of the sepoys deputed there. Local labour is very poor and fluctuating. The work may have been done conscientiously enough by the sanitary inspectors and local coolies, but it was done very inefficiently. No amount of European supervision will take the place of skilled and disciplined labour.

In the villages under my care, the work was done in a sort of way.

I always insisted on complete unroofing of the village, so that chemical disinfection, badly done, did not matter much.

The sepoys worked very well. They disinfect in a thoroughly efficient way and I consider every village or town, which is infected, should be disinfected by such skilled labour; otherwise, it is not much use thinking it will be done properly.

(h) No. They look on unroofing as an unnecessary trouble and expense to them and they understand little of chemical disinfection.

(i) I should say none.

The sanitary inspector, in whose charge the village is, if in an observation circle, merely tells them to keep the village clean of manure heaps, etc.

He gives no advice as to procedure with regard to disinfection.

(j) I should say, "no." They would make a mess of the whole matter. An infected village, disinfected by the villagers themselves, would not be properly done at all.

(k) (I) (1) By compelling evacuation, as noted in (d).

(2) By always completely unroofing every house and taking away doors and shutters, to allow ingress of air.

(3) By a liberal use of fire, i.e., burning everything which could possibly be infected. Steeping in lotion is no use. It is never done properly.

(4) By burning every infected hut or collection of huts.

(5) By not relying much on chemical disinfection.

(II) By doing away with sanitary inspectors on Rs. 40, plus 15 horse allowance, plus 15 travelling allowance, and substituting hospital assistants.

With this exception, I am afraid my suggestions would rather tend to increase of cost.

(III) By granting compensation for houses destroyed by fire and free passes to the forest lands for grasses for re-thatching unroofed huts.

GROUP A (2).

(a) (I) I cannot say. I have seen no arrangements to this end, beyond the public inoculation of a few Government officials.

(II) They seem adequate and proper. The District Medical Officer, being a medical man, takes every necessary precaution.

With regard to (I), statistics should be collected, showing the small percentage of attacks amongst those inoculated and the large percentage of recoveries from such attacks. Such statistics might be printed in pamphlet form, with an explanatory note in all the vernaculars necessary, and distributed broadcast in infected areas. Pressure should also be brought to bear on all Government officials to be inoculated—as an example to the people. The relaxation of plague rules granted to inoculated persons should also be noted.

(b) Yes. Certainly. If the Government believe in inoculation, they should not be afraid to put it to a practical test.

(c) I cannot say. I should think, personally, that an inoculated person might very well be immune from plague himself, yet carry infection to others in his clothes.

(d) I do not think compulsion should be approached, except in the case of Government servants, towards whom very strong pressure should be used. If the serum is properly prepared

and bottled and sealed in the laboratory, there should be no risks, as the operation of inoculation can, like every surgical operation, be made perfectly safe, by proper antiseptic precautions being taken.

The degree of protection afforded is of course unknown to me. Personally, I considered myself quite safe after inoculation, and probably such a feeling of security is worth a good deal.

Scientifically speaking, inoculation is very good, reasoning from vaccination against small-pox.

From experience, I know nothing of the value of inoculation, except that no one whom I saw or knew to be inoculated was attacked. Also, the 100 sepoys, who came to disinfect Madanapalle, were all inoculated before coming and, though all were exposed to the greatest possible risk of infection in so dirty a town as Madanapalle, not one was attacked with plague.

GROUP A (3).

(a) There seems to be no doubt that rats carry plague germs from house to house. This being the case, I think a decided "no" should be the answer to this question. Every Union and Municipality should organise a crusade against them, before the town is infected. It is useless, afterwards. Every village munsif should be ordered to exterminate those in his village.

(b) (I) I cannot say.

(II) I think the present system of awards is quite inducement enough.

(c) Judging from the number of dead plague-stricken rats, found scattered all over Madanapalle and throughout the plague-infected villages under my observation, it would seem as if rats exercised a spreading influence to a great extent. I should think that, unless the first plague case is treated properly immediately, the chances are greatly in favour of the infection getting amongst the rats with which native houses usually swarm: if this should occur, nothing but evacuation can prevent an outbreak of plague. For it is impossible to trace plague-stricken rats. Judging by the curious way in which the cases occurred in Madanapalle (i.e., the first two or three cases all in the same place, then a case a street off, then a case two or three streets away, then cases dotted here and there over the town, until, finally, every part of the town was thoroughly infected), it would point to rats as the agents of dissemination of infection.

Another point is that, when the town (a town of between 10 and 20 thousand inhabitants) was being disinfected, every house, in which a plague case had occurred, was found to be full of dead plague rats, as many as 30 being found in one house. Whereas, although dead rats were found in houses in which no plague had occurred, these were only found singly or perhaps two or three in one house, and also every house, which was found free from dead rats, had also been free from any infection.

(d) With the exception of flies and mosquitoes, I should not think any other animal or insect acts as a disseminator of plague.

Household animals, like dogs and cats, do not stray in the same way as rats and they are also always visible and therefore more or less under observation. And, though I have seen cats and dogs tearing at the corpses of plague rats, I have never seen a dead cat or dog in the plague infected areas.

GROUP A (4).

(a) There were no definite buildings, designated plague hospitals, in Cuddapah district.

Plague camps—collections of small huts, one to each patient—were very unpopular at first. After a time, owing to either familiarity with the disease or a better appreciation of the benefits to be derived therein, patients and their relatives became much less averse to going there.

Except where the distance of the place of seizure from the plague camps was very great, a plague patient was always brought to the camp—with the exception of very few cases, which were isolated and treated at or near the place of seizure.

(b) The dhoolies or palanquins, in which patients were taken to the plague camps, were not particularly inviting, as they were locally made. Proper ambulance dhoolies might be supplied from Madras.

There should also be a responsible person in charge of the plague camps and always present, to inspire confidence. Of course, the only thing to really make a plague camp popular is to cure every body who goes in as a patient.

Double and treble the ordinary dose of carbolic cured a very high percentage, about 80 per cent. of patients in the Madanapalle camps, at the close of the outbreak there.

(c) Not at all.

GROUP B (1).

(a) I was not present at Madanapalle, when the outbreak of plague occurred there: I arrived shortly after.

On the whole, the observation staff was only very moderately satisfactory. So far as I could see, a plague case was rarely detected, as such, until the patient was dead or dying and, in consequence, until the infection had had plenty of time to spread amongst the inmates of the house concerned.

Where suppression of the plague, *i.e.*, limitation of the outbreak to the first case, followed such detection, I think it was largely due to luck, rather than to prompt action on the part of the observation staff.

I think we had specially bad material in Cuddapah in the way of sanitary inspectors. I know that they were usually quite helpless, in the face of any opposition to their inspection of or searching a village. Without the co-operation of the villagers and village officers, the observation staff is of little use.

I noticed that, whenever a plague case arose in an observation circle, prompt evacuation alone seemed to prevent its spread. The villagers seldom or never objected to such evacuation.

My definite opinion, on this point, is that, where village officers and villagers co-operate with the sanitary inspectors and hospital assistants, an observation circle may really be of some use, provided the sanitary inspectors and hospital assistants are energetic men. Otherwise, a plague case is seldom detected, until dead or dying, and so, until it is very difficult indeed to stop further spread of infection.

(b) It has all along been my opinion that sanitary inspectors are ridiculously over-paid. As a rule, they are broken down headmasters, miscellaneous clerks without posts, etc., who become sanitary inspectors—*i.e.*, within my experience, which has been a limited one.

Expenditure could be reduced and efficiency not lost, by doing away with most of the sanitary inspectors and by putting Revenue officials on plague duty—or, if expenditure were not reduced, efficiency could be increased by this plan. Revenue inspectors and Rs. 20–30 clerks from Government offices could be employed, on the understanding that employment on plague duty would be taken into consideration, when the question of promotion came up. Revenue inspectors ought to be specially useful, owing to their intimate knowledge of their firkas. The necessary training could be obtained, by placing them as assistants to some actual subordinate plague officer for three or four weeks.

Hospital assistants might also be drafted to plague work, to work in pairs with the revenue official concerned. Of course, salt assistant inspectors and inspectors would be very useful, as plague supervisors.

I think a radius of 5 or 10 miles, as the case may be, is not a good rule. In 10 miles of Madanapalle taluk, less villages would be met with than in 3 miles of Cocanada taluk. Some unit of population, rather than a limit of area, should be taken, or else a revenue limit of area, *e.g.*, a taluk or firka, and to each such area so many plague officers might be allotted. Local conditions vary so much that the number to be allotted to each taluk or firka would have to be decided separately for every such area.

(c) If revenue or medical officials be placed on observation and preventive duty, I would suggest, as their pay, the pay of the appointment from which they are taken, with an extra allowance of 25 per cent. of this pay.

If the present system of using sanitary inspectors be continued, their maximum pay should be Rs. 35 and they should commence at Rs. 15–20 per month. A revenue inspector on Rs. 30 or Rs. 35, *plus* 25 per cent. allowance, would be much more useful as a plague officer, in the firka of which he had been revenue inspector, than two or three sanitary inspectors from Madras, who know nothing of the people or district.

The principle should be—local men for the subordinate posts and salt assistant or pukka inspectors for plague supervisors' posts.

I think it quite useless making natives supervisors, except in very rare cases. Natives of India have no real backbone, when it comes to insistence on a plague measure being carried out.

I have noticed, time after time, in Cuddapah district, that, whenever the least opposition arose, the plague official, if a native, either gave in or did nothing but talk. Such cases always meant the Sub-Collector or myself going to the spot. For this reason, plague supervisors should be, at least, superior officers of, say, the Salt department. As a rule, these are hardy and active and used to authority. Of course, Europeans preferred. If this were always done, a plague supervisor could be given a very much larger area to control than at present and, in consequence, the number reduced.

One great grievance of the hospital assistants on plague duty was the pay of sanitary inspectors. A sanitary inspector of one or two years' service would draw Rs. 35–40 pay, *plus* Rs. 15 travelling allowance and Rs. 15 pony allowance, *i.e.*, Rs. 65–70 in all, whereas a hospital assistant of 10 or 12 years' service would draw Rs. 25–30 pay, with similar allowances. The former would have had a fortnight's training in Madras and one or two years' experience and the latter two or three years' training and 10–12 years' experience—a manifest injustice. This is one of the reasons why so much friction is always appearing between the hospital assistants and sanitary inspectors.

A pony allowance is necessary, in an observation or preventive circle, but not when the official is on disinfection duty in a large town. An extra allowance, such as that proposed above, *viz.*, a maximum of 25 per cent. on the permanent salary, is desirable, in my opinion, for plague duty is extremely repellent and disagreeable duty.

(e) The only training that sanitary inspectors apparently get is a course of instruction in Dr. King's 'Plague Manual'. Subsequent training is merely experience. This is all right of course, but I would suggest that the full pay of a sanitary inspector or plague official of this standing should not be given (in the case of revenue officials, the extra allowance) until after a period of training of from one to three months, in some place like Bellary, where plague measures are in constant operation. I cannot say what the District Medical and Sanitary Officer could do in the way of training. The younger men in the Indian Medical Service might be able and willing to efficiently train the plague staff, but, as this would require a good deal of personal trouble and travel round the district, I should think, in some districts, the idea would not be welcomed. In any case, I dare say the District Medical and Sanitary Officer could give a better training than that received in Madras, for the training could be given on the spot—in the district, where the official would have to work.

(i) As I have previously mentioned, European supervision (instead of, as at present, partly European, partly native) should be universal. If this were adopted, European plague supervisors could be given a greater area of control than is at present possible with native supervisors, and the work would be much more efficiently seen to.

Also, the practice of sending men from one place to another should, as far as possible, be discontinued: local men, with local knowledge and influence, should be used in the lower grades of the staff. This does not apply to the higher grades, *e.g.*, supervisors and plague officers.

(j) Not much. An isolated case of plague will be hushed up, if possible, in order to avoid the sanitary trouble and vacation, consequent on plague arising in the village.

Village officers would be most useful, if always to be depended upon, but, from my experience, I should say they were not to be relied on at all.

(l) I do not think so. In many cases, sanitary inspectors and hospital assistants and even supervisors (native) have been unable, in my experience, to obtain admission to a village.

And, even in the case of village inspection, the staff mostly depend on the village officers: actual house-to-house inspection rarely produces much result. Then, when females are gosha, the staff must depend on the village officers for information with regard to these women.

(m) No: I don't think so. Favouritism may be exercised, when disinfection is going on and the destruction of cloths, etc., is in question, but, on the whole, "no" would be my reply to this question.

(p) Decidedly, they can. In Cuddapah, frequently, or at least in two or three instances, I have had to go personally, in order to obtain admission to a village for the sanitary inspector and hospital assistant. It is a severe attitude, but should be encouraged.

(q) Yes; certainly. I have seen small villages, which adopted this attitude of rigidly excluding *everybody*, remain quite free of plague, though, all round them for miles and within half a mile of them, other villages have had bad plague in them.

I think this policy could scarcely be applied to the largest villages. I have seen it successful in small villages, but I do not think it would be practicable in large villages, which carry on a constant trade with other places and to and from which there is a general flow of merchants and labour.

GROUP B (2).

(a) In an uninfected area, the present passport-system seems to work well enough, but, in an infected area, it is not much use. The only road or means of arrival at any place, which can be effectually checked and guarded, is the railway. Travellers by road cannot be observed properly.

Within an infected district, much of the traffic is by road and, as a consequence, the passport-system is of little use. Only important high roads might be checked, as at the Customs or Sayer stations on the Mysore frontier, but experience has shown this to be of not much practical use.

One suggestion I might make, *viz.*, that, under the present system, the period of observation be extended to 15 days, instead of, 10 days. I have seen a case in Cuddapah of development of plague 16 days after leaving the area of infection—though, fortunately, such cases are rare.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c₁₁) From a small experience of bacteriology at home, I should think there is no reason why the plague bacillus could not exist and reproduce, or rather multiply, in the floor of a hut, provided an adequate supply of nutriment and moisture be present therein. Vegetable or animal remains or *debris* should be sufficient to constitute such nourishment, taken in conjunction with the minerals to be found in every soil—though I am not sufficiently experienced to say whether the bacillus could assimilate these minerals.

It is my opinion that the bacillus could remain alive, though perhaps in a quiescent state, in damp soil, for months at a time—provided sunlight be not allowed to act upon it. But, really, my opinion, not being based on experiment, is not worth consideration.

E. I. CHALKE, Esq.

GROUP A (1).

(a) Yes.

(b) Yes.

(c) I am of opinion that there should be an increase of expenditure on disinfection work and that a tax should be levied on all persons who are in a position to pay for it, as the cause of an outbreak of plague is generally negligence and wilful suppression of information on the part of villagers to inform the authorities at the outset of any sporadic cases of plague. This information, if obtained at the beginning of an outbreak, would enable the officials to stamp out the disease, before the epidemic became general.

(d) Burning of heaps of bratties, each heap containing 60 or 70 bratties, so as to have one heap for every 25 square feet, appears to be the most reliable form of desiccation. Sunlight, of course, is very good, but all parts of a house cannot be exposed to it, however wide openings may be made in the roof. The chief chemical disinfectant is perchloride of mercury, which has been tried and found efficacious. Formalin is considered a very reliable chemical disinfectant, strength 1 in 100, but its cost is rather heavy.

(d_(ii)) In well ventilated houses with proper flooring, viz., Cuddapah slabs, Mangalore tiles, disinfection by the perchloride of mercury solution or by formalin, with the doors and windows closed, appears to be the most effective. In all other dwellings, whether in towns or rural tracts, desiccation by burning heaps of bratties, followed by the use of the perchloride of mercury solution, is necessary.

(e) There are no data for coming to any conclusion; it is only *believed* that the plague germs can lie dormant in infected soil and become virulent; when conditions are favourable, I cannot say. There are no means of gauging, with any degree of probability, the interval within which this revivification can take place.

(f) Yes.

(f_(ii)) Yes.

(g) I think it is more effectively done in municipal towns, under the superintendence of medical officers, but not so in rural tracts.

(h) Yes.

(i) Advice is generally given by all the officials and plague officers, when they visit infected localities.

(j) No.

(k) I think desiccation by burning bratties would be effectual and popular. The villagers would be inclined to do the disinfection at their own cost.

GROUP A (2).

(a) Inoculation is unpopular in Anantapur district, and I believe all natives are averse to it.

(b) No.

(c) Cannot say.

(d) I would advise no persuasion.

GROUP A (3).

(a) No.

(b) I would suggest that villagers be advised, by printed circulars in the vernacular, to attend to the prompt killing of rats in the neighbourhood, for which purpose some reward may be granted for each rat produced, necessary precautions being adopted to prevent cheating.

(c) Yes, rats are important agents in spreading plague, both at and after the commencement of an outbreak.

(d) Squirrels and bandicoots help in spreading plague. It is believed that dogs, cats, fowls and other domestic animals also act in the same way, but of this I cannot speak from personal knowledge. There must be a regular organization for destroying rats, and every rat should be examined bacteriologically, if possible, and the places where infected rats come from should be thoroughly disinfected.

GROUP A (4).

(a) Not popular.

(b) No, as the people are under the impression that it is a visitation from their goddess and that they should submit to fate.

(c) I do not know of any instance. They prefer leaving the villages and residing in huts built at their own expense in their own fields, where they take their chance to live or die.

GROUP B (1).

(a) Very rarely.

(b) I think the arrangements in force for observation circles should stand, viz., one sanitary inspector for a 6 miles radius. If the reddis of the villages could be relied on to give timely information of any suspicious cases of plague at any village to the plague sanitary inspector without delay, I should think that some good would result from having these observation circles.

(c) The pay of sanitary inspectors of all grades should be reduced to two-thirds, *plus* Rs. 15 pony and Rs. 10 fixed travelling allowance. This would in no way lead to any serious loss of efficiency. Acting allowances should be granted to inspectors in observation circles. An extra allowance during plague is not a good thing.

(d) Yes and for both purposes.

(e) No. There is no need for the District Medical and Sanitary Officer to do so, when trained by the Sanitary Commissioner.

(f) There was none in the Anantapur district, but there ought to be European supervision on a more extended scale.

(g) Nil.

(h) I should think European supervision would be most reliable.

(i) None.

(j) No.

(k) None whatever.

(l) Yes, on rare occasions.

(m) Yes, there are reasons.

(n) I think it would.

(o) They are ignorant on this matter and advice is of no avail.

(p) No, although in some few villages it has been so.

(q) Yes, certainly; by Tashildars and high revenue officials encouraging the people to adopt this measure.

(r) Yes, officially worked under European supervision.

(s) Should not be reduced, as the staff entertained in the Anantapur district was worked according to requirements and was economically done.

GROUP B (2).

(a) None.

(b) No.

(c) No.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c_(ii)) Yes; plague bacilli could flourish in the floors of huts, especially if cowdung is used for smearing the floors, and here, in cowdung, the plague bacilli can exist for months without losing virulence.

(e) Grain is not likely to become infected for a long time, as the plague bacilli would soon die, if such grain were exposed to sunlight for some hours. Dirty gunny bags may retain infection for a longer time. They should be destroyed or disinfected, the former preferably.

GROUP A (2).

(e) No inoculation was performed in Anantapur district.

GROUP A (3).

(d_(ii)) Fleas are said to carry infection from rats to man, but of this I cannot speak from personal knowledge.

(f) No.

GROUP B (1).

- (i_(ii)) No, this is not the practice in the Anantapur district.
 (i_(iii)) Yes; no change in the regulations is desirable.
 (i) No.
 (v) No. It would be desirable to obtain the co-operation of native doctors during outbreaks of plague, and they should be instructed in the diagnosis of plague.

GROUP B (3).

(a), (b) and (c) These are under the control of the Revenue department, so I have no opinion to offer.

COLONEL P. H. BENSON, I.M.S.

GROUP A (1).

(a) Yes. To the method to be adopted.

I consider that too much money has already been thrown away in disinfection, especially chemical. The great objections to chemical disinfection are—

- (1) It is most unpopular;
- (2) It is very costly;
- (3) Unless carried out in a very efficient manner under European supervision, it is of no value. Even when carried out in this way, we have no proof whatever that it destroys the plague bacillus.

(4) It is totally inapplicable to native houses with mud floors, which constitute the majority of houses requiring disinfection.

In houses with tiled or stone floors, it must, I think, act as a sufficient germicide. Bombay and lots of other places have been simply flooded with chemical disinfectants, with what result? Practically, nil. Adóni was most thoroughly disinfected by chemicals under a most costly supervision, but plague re-appeared next year. It may have been due to re-importation, most possibly it was, but, if, as it must be, a house is liable to re-infection immediately after disinfection, why employ the most costly form of disinfection?

If all the money spent on chemical disinfection and its application to houses had been spent on sanitary improvements of towns, the money would, in my opinion, have been put to a better purpose and we should now have less plague.

(d) The advantages of disinfection by desiccation and sunlight are :—

- (1) It takes less time;
- (2) Is more efficient, as greater heat is acquired and is more uniformly applied.
- (3) The house is inhabitable shortly after;
- (4) It can be done in the rainy season.

Its advantages over chemical disinfection :—

- (1) It is very much cheaper, for many reasons (cost of material, staff required, etc.);
- (2) The house is not rendered damp and uninhabitable;
- (3) It destroys vermin, fleas, bugs, cockroaches and drives rats away;
- (4) It destroys organic matter on the floors and walls to a certain depth (not known);
- (5) Lastly and most important of all, it is popular.

Whether it is more efficient than disinfection by chemicals or sunlight, it is extremely difficult to say. There is no proof that disinfection by means of chemicals renders a house sterile. In the same manner, there is no proof that disinfection by desiccation does. Such being the case, it is clearly the duty of every Government to employ that remedy which puts the people to the least possible trouble and inconvenience and is at the same time least costly.

I enclose a copy of a report drawn up by Dr. M. Srínivása Rao on certain experiments carried out by him, at my request, to determine the effect of heat, as applied to houses, on plague cultures placed in different parts of the house [vide appendix VII].

In towns.—Houses with tiled or stone floors—chemical disinfection.

Houses with mud floors—desiccation by burning bratties.

In rural tracts.—Desiccation by bratties, combined with evacuation and desiccation by sunlight.

(e) This is a very difficult question. Personally, I believe the theory of recrudescence in some cases, but by what means it is effected I am not prepared to say. Re-importation is, in my opinion, the most frequent cause of a second outbreak. My own impression is that plague has a more or less definite course in each place and that many people become immune to it. It then dies down and re-appears, either from recrudescence or re-importation, and affects those who were not rendered immune or who have, in the interval, lost the power of resistance (immunity).

(h) Yes; in Mysore.

(i) Nil.

(j) Yes. Every effort should be made to make them independent of official help.

(k) (I) Disinfection would, I am sure, be more effective, if the people could be induced to allow all their effects, especially clothes, to be thoroughly disinfected. I believe infection is carried by clothes, far more than by the house.

(II and III). Disinfection by means of desiccation, which is as efficient, cheaper and more popular.

GROUP A (2).

(a) There are practically no arrangements, other than that the State is provided with Haffkine serum, which, when wanted, is supplied; they are sufficient. People will not be persuaded.

(b) and (c) Inoculated people are as likely to carry infection in their clothes, etc., as the uninoculated. Relaxation of plague rules, in connection with the inoculated only, holds out an inducement to people to get themselves inoculated. The privileges they would get now-a-days are so few that it is not worth while undergoing the inconvenience of being inoculated, in order to obtain them, as far as the Mysore State is concerned. Inoculation is practically dead.

GROUP A (3).

(a) No.

(b) Advice is usually disregarded. I do not know what inducements it is possible to hold out.

(c) Yes. A most important influence. My own opinion is that man conveys the disease in the first instance to rats, but, very possibly, after rats are once infected, they may keep up the disease and may possibly give rise to a so-called recrudescence. Every conceivable method should be adopted to destroy rats.

GROUP A (4).

(a) Yes. Very popular.

Very great care should be taken, in selecting a good man for medical charge of them. They should be made comfortable and provided with ample nursing establishments; the diet should be liberal and arrangements should be made, as far as practicable, to meet caste prejudices.

(c) No private hospitals were erected in the Mysore State.

GROUP B (1).

The observation system was started in 1898 in Bangalore City, but on an entirely wrong principle, in that it was not made compulsory on the people to report themselves, but medical officers were employed on the futile task of trying to observe people in their houses. I am a strong believer in observation and I advocated the introduction of the passport-system into the cities of Mysore and Bangalore in 1901, when they were both free from plague, but the Government declined to adopt it.

(p) Villagers in Mysore are fully cognisant of the danger of infection by means of contact with outsiders and their cloths. Many villages in Mysore keep a guard, to prevent outsiders from coming in.

(p) They cannot be entirely trusted to keep outsiders from coming in, as they can very easily be bribed, and the patel (reddi) will frequently smuggle in his friends and influential people.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c_(ii)) So far as I am aware, the plague bacillus has never been detected in the floor of a hut.

(e) The examination of grain is of no use, but desiccation by exposing it to the sun's rays may be of some use.

GROUP A (2).

(e) Inoculation is a dead letter. Any figures that might be obtained would not be worth the paper they were written on.

GROUP A (3).

(a) I do not believe in infection by fleas, either from rat to rat or from rat to human being.

(f) No.

GROUP B (1).

(i_{ii}) and (i_{iii}) No. No certificate is now required in Bangalore or Mysore. Corpse inspection was made compulsory in Bangalore and Mysore cities and the people had quite got over any aversion to it. As, however, it was abolished in British India, the Government of Mysore were only too glad to take the opportunity of abolishing it in their province. In the absence of reliable registration and notifications of infectious diseases, it was an advisable measure. So far as the cities of Bangalore and Mysore are concerned, reforms in the registration of births and deaths, as well as compulsory notification of infectious diseases, are urgently called for.

MAJOR H. BONHAM CARTER, R.E.

GROUP A (2).

(d) I discussed the question of pressing inoculation on the railway staff with the heads of departments of the railway and the chief medical officer, but the conclusion we came to was that, on our present knowledge, the protection afforded was not sufficient to justify the railway in embarking on the expenditure which would be involved in any general system of inoculating the railway staff, even if it had been possible to arrange for it, in view of the fact that each man must probably be off duty for two or three days.

GROUP B (2).

(a) Ever since coming to the Madras Presidency, I have been most strongly of opinion that exceptions to the passport rules might be made in favour of Europeans, if not generally at any rate in favour of those travelling first and second class.

I understand that Europeans are distinctly less susceptible to plague than natives; they live in a more sanitary way and the first thing that they do, when they fall sick, is to send for a doctor, who is bound by law to report the case, and doctors, such as these people would employ, would probably do so.

A district is rather a large unit to adopt, in prohibiting people being booked to feasts, e.g., we were prohibited from booking from the Cuddapah and North Arcot districts to Tiruttani the other day, though there was only one village affected in the whole of the Cuddapah district and very few in North Arcot.

DR. W. R. GIBSON.

GROUP A (1).

(d) Disinfection by burning bratties, hydrocarbon, etc., is essentially disinfection by fire and is most effectual, where it can be applied, but this method is of limited application.

Disinfection by sunlight I consider also very effectual, when the infected part or thing can be thoroughly exposed to the direct rays of the sun, but the exposure must be continued for hours or days to be satisfactory. It is not safe to rely on this method for disinfecting clothes, which can be easily boiled in water or soaked for a few hours in perchloride of mercury (solution of 1 in 1,000) and then washed with water, either of the latter methods being absolutely reliable.

Disinfection of the interior of houses by sunlight is not in most cases practicable, without removing the whole of the tiles or other roof and, in very many cases, this cannot be done without great expense and considerable damage to the houses. In disinfecting earthen floors by sunlight, the earth should be turned over from time to time. Disinfection by sunlight is not satisfactory during the rainy season.

Of chemical disinfectants, perchloride of mercury (solution, 1 in 500 to 1 in 1,000) is, in my opinion, the best.

The relative values of the above-mentioned disinfecting agents varies with the facility and thoroughness with which they can be applied and the nature of the thing to be disinfected.

Disinfection by fire is most effectual. The relative values of direct sunlight and chemical disinfection with perchloride of mercury solution are indicated in the foregoing.

(d_{ii}). The following combinations of disinfective measures may be recommended:—

1. *For disinfecting the person—Town or rural tract.*—Washing with soap and water and then using chemicals, preferably a solution of perchloride of mercury (1 in 1,000), paying special attention to the hands and feet. The hands should be finally cleaned from excess of perchloride, by plain water.

2. *For disinfecting clothes—Town or rural tract.*—Soaking, for two or three hours, in solution of perchloride of mercury (1 in 1,000), then washing in water and drying in the sun or boiling the clothes in water.

3. *Exposure for many days to the sun and air, where the above cannot be applied.*—Rags, cheap clothing, bedding, etc., when infected, should be burnt.

In towns, the disinfection of bedding, etc., could be effectually performed on a large scale, by using one of the many varieties of steam disinfectors. Those in which a current of steam is used are the most effectual.

4. *For disinfecting furniture—Town or rural tract.*—Washing with soap and water, then with plain water, followed by solution of perchloride of mercury (1 in 1,000) or washing with perchloride of mercury solution only, where soap destroys the surface of furniture. If the above cannot be applied, exposure to sun and air.

5. *Disinfection of books.*—It is safest to destroy any book, which has been handled by a person suffering from plague. When, however, the books are valuable, exposure to the vapour of formaldehyde might be recommended.

6. *Disinfection of ordinary houses—Town or rural tract.*—When the houses are constructed of non-combustible materials, disinfection by fire, as by burning cow-dung cakes, which have been previously soaked in kerosine-oil, or by sprinkling the floor and walls liberally with hydrocarbon and setting fire to it, would be effectual. The danger, however, in handling hydrocarbon rather lessens its usefulness. The walls and ceiling, if any, should then be thoroughly scraped and whitewashed.

In the case of houses which cannot be disinfected by fire, the walls should be thoroughly moistened with a solution of perchloride of mercury (1 in 1,000), scraped while damp and then whitewashed. The scrapings should be burnt.

Earthen floors can be effectually disinfected by fire. Cow-dung floors should be moistened with water to keep down the dust, dug up to a depth of a few inches, removed and buried. A new floor can easily be made with earth, and the inmates left to put on cow-dung, if they wish.

Cement or tiled floors can be disinfected, by washing with perchloride of mercury (solution 1 in 500 or 1 in 1,000).

A thatched roof should be removed and burnt and replaced by a new one.

A tiled roof, when rats have been found in it, can be disinfected by removing the tiles and exposing them to the sun.

The foregoing houses should be evacuated, to enable the disinfection to be done.

7. *To disinfect better class houses, chiefly in towns.*—Chunam walls may be washed down with soft soap and water, then with plain water, followed by perchloride of mercury (solution 1 in 1,000).

If papered, the paper should be moistened and scraped off, the scrapings burnt and the wall afterwards re-papered. The ceilings should be whitewashed; wooden, cement or tiled floors should be washed with soft soap and water, then with water, followed by perchloride of mercury (solution 1 in 1,000).

GROUP A (2).

(b) The present relaxations of plague rules are ample and should be continued.

(c) Since inoculation against plague consists in injecting under the skin dead cultures of plague germs, together with the nutrient medicine in which they have grown, no infective disease can be produced in the inoculated person.

The poisons, both intra-cellular and extra-cellular, produced by the plague germ, together with the other substances resulting from the breaking up of the constituents of the nutrient medicine, are organic but non-living materials and are not transmitted from one person to another.

It is only when a disease in one person or animal is due to the growth and multiplication of germs in that person or animal's body, that it becomes infective, the process of infection consisting in the transference, direct or indirect, of these germs from the one to the other.

It may confidently be stated that an inoculated person cannot give rise to plague in another person, simply because he has been inoculated, and he is therefore harmless in this respect.

Again, since an inoculated person is much less liable to develop plague, the greater the number of inoculated persons, in any given community where plague is raging, the safer the uninoculated must be, because there are fewer infecting units in the population. The inoculated person is, therefore, not only harmless to his neighbours with regard to infection, but is really beneficial.

(d) The duration of protection afforded by inoculation is so short, lasting, it is thought, only about six months, that the expense incurred in inoculating persons, repeatedly on a large scale, would be prohibitive.

Again, it would probably be very difficult to get people to submit to serial inoculation every six months for, say, three years, since one cannot confidently state that they will not be inconvenienced by the inoculation and cannot guarantee permanent immunity after that time.

It would, perhaps, be well to determine, by definite experiments with carefully standardized inoculating fluid and accurately measured dosage, whether the duration of protection cannot be increased and, to this end, I would suggest that inoculation be given a trial in a few circumscribed plague-infected areas. The importance of obtaining information on this point is so great that inoculation should be pressed in these places.

The risk of anything serious developing after inoculation is not great, if the inoculated fluid is carefully prepared and the inoculations are performed by competent persons.

(e) I have, on several occasions, intimated to railway employés, living in or near plague-infected areas, that they could be inoculated against plague, if they would go and register their names at one of the railway dispensaries, but, up to the present, few have volunteered and no inoculations have been done by me.

GROUP A (3).

(a) The poor results obtained tend to discourage attempts in destroying rats. Traps were tried at many stations on the Madras Railway, especially in goods sheds, but without much success.

Poison (arsenic and oatmeal) was also tried, but the results were also very poor.

It was found that rats failed to take either the bait in the traps or the oatmeal with the poison, because plenty of other food was available in the shed.

GROUP A (4).

(a) I have encountered little difficulty in persuading people to go into plague hospitals, but my experience has not been large.

(b) In some instances, I think the huts might be made more comfortable, by having them substantially constructed and made wind and water-proof.

The nursing or attendance has also, in some cases, struck me as being inadequate.

GROUP B (1).

(a) In my experience, villagers, even the more educated classes, such as Brahmin clerks, do not understand the danger of infection by contact with outsiders, clothes, etc. They are too careless or indifferent to carry out instructions, even after being told what to do and, to get them to do anything, one has to provide competent persons to supervise.

I have even met with Eurasians, who acted as if they did not believe (even after being instructed) in infection by contact with plague patients (members of their own families) and their clothing.

To take one instance which recently occurred, a woman was found suffering from bubonic plague and she was suckling an infant. The patient was placed in a shed, with the husband to attend to her. The children were placed in an adjacent shed with a friend, another contact to look after them.

Full instructions were given to the husband that the child should be weaned, etc. Next day, on going my rounds, I found the child again feeding from the breast of the patient.

(p) Not until some attempt is made to instruct them, by pamphlets or otherwise, about the nature of infectious diseases.

(u) The co-operation of native doctors is not obtained in connection with plague among Madras Railway employés.

Since many natives still go to native doctors for treatment when they are ill, it would seem desirable that the native doctors should be instructed in the diagnosis of plague.

They could then be directed to report any suspicious case to the local authorities.

GROUP B (2).

(a) Where passports are issued to native workmen working in large shops or works and where numbers are allotted to their employés by their employers, it would facilitate early recognition, if the department to which the employé belongs, his number and the particular shop or office in which he works were given on the passport. This could be done, if a space could be left on the front of the passport and headed "Further remarks to facilitate identification."

A. R. KNAPP, Esq., I.C.S.

GROUP B (1).

(j) I think they could, if the system were adopted, as recommended by the Coimbatore Conference, of employing, as circle inspectors, clerks and others who, as regular subordinates of the Collector, would have some authority over the village officers.

(k) Of very little use, I believe, so far as experience in this district goes.

(l) They have many opportunities of obtaining information from cartmen, tollgate-keepers, etc., but I believe that these opportunities are not much used in the circles in this district.

(m) No complaints of this kind.

(o), (p), (q) and (r) Plague has not yet come near enough to this district to give any experience bearing on these points.

(s) An obvious method of reducing the cost of staff, with, I think, an increase in general efficiency, is by ceasing to employ temporary sanitary inspectors on Rs. 40+15+15 (Rs. 70) and using instead revenue or medical subordinates, temporarily detached for plague work. A Rs. 35 revenue inspector, trained for a short period by the District Medical and Sanitary Officer, would, in many ways, be an improvement on the present temporary inspectors in charge of observation circles: he need not be paid more than Rs. 60 in all. His plague knowledge would, later on, be extremely useful to him.

As regards the expenditure on observation circles in rural tracts, in districts where plague has not appeared, I think the comparative advantage of inspection and passport stations, for the protection of the larger centres, deserves more consideration than it now receives. We now have proposals for adding a large number of observation circles in the north of this district. They will cover a sparsely populated area and will be of practically no use in detecting infected passengers passing through to the larger town. Unless the towns are protected, rural circles appear to me to be of doubtful efficacy.

GROUP B (2).

(a) and (c) The system, in my opinion, does not work well, so far as this district is concerned. Scores of passports (triplicates) are received, the holders of which have not reported themselves. When enquiry is made, the holders are found to have passed on elsewhere or to have given false addresses. So long as false addresses can be given with impunity, so long will the system be unsatisfactory. I am informed that persons coming from Hyderabad are supplied with some kind of identification passport and I think it would be an excellent thing, if every traveller from an infected area could be made to get such a passport from the head of his village. The passport would be produced before the plague passporting officer, who would copy into the plague passport the holder's proper name and permanent address. Failure to report himself for plague inspection would then be followed by a reference to the defaulter's place of origin, and a prosecution and punishment would be comparatively simple. As regards towns, the taking of an identity passport would not be simple, but there is generally a local Tahsildar or Sub-Magistrate, who could issue such passports. The proposal is a somewhat extensive one, but I believe that in course of time the native would come to value his identity passport. It would save him trouble at inspection stations. Europeans too might be induced to welcome them, owing to the simplification of the process of taking passports at railway stations, etc.

As regards failure of passport-holders to report themselves, I have had much trouble at Kodaikanal this year, especially with Europeans. I think that the difficulty of working the system and its unpopularity would be much reduced, if the Collector and Municipal Chairman were allowed to exempt persons of respectability from personal appearance, except on the first day, and if such persons were allowed instead to send a certificate signed by themselves, stating that they were in their usual health. Any misconduct, in regard to the giving of such a certificate, would be a more serious offence and more easily punished than mere failure to present themselves on one or more days.

(b) No instances of fraudulent re-booking have come to notice in this district.

ADDITIONAL NOTE.

In my replies to your plague questions, I made some remarks about the kind of men we got as temporary sanitary inspectors. Two imported cases of plague near Palni took me there this week and I found that the circle inspector, sent us by the Sanitary Commissioner, was a dismissed salt sub-inspector. He is about to be removed for inefficiency and insubordination. Don't you think we ought to be protected from such men? If only they would let revenue inspectors be trained as temporary sanitary inspectors, we should have a reserve, always ready for emergencies. Of course, I would only use revenue inspectors for preventive and observation work. The real plague work, as a rule, wants a man with more definite training.

J. K. LANCASHIRE, Esq., I.C.S.

GROUP A (1).

(e) I was informed that, at Nátrampalli in the Tirupattūr division of the Salem district, plague broke out in three consecutive years in the same house; this appears to point to revivification of the germs, if true.

(g) (II) Many houses contain tatty shelves, supported on the beams of the roof, and wood and pots are frequently left there, when villages are evacuated. Unless they are taken down, I do not think the disinfection can be called satisfactory, as rats probably frequent that part of the house. Unless special orders are given to the disinfecting staff, these latter are generally left untouched.

GROUP A (4).

(a) At Vániyambádi in the Salem district, I believe, even at the time when the epidemic was raging, the only persons who went to the hospital were those who were practically homeless.

GROUP B (1).

(a) There has been only one case in Palghat taluk—at Pudunagaram. I am unable to say, at the present moment, whether that was detected by the circle inspector or by the adhigári. It appears, the family came from Coimbatore and had passports. So probably the adhigári detected the case.

(b) I see no direction in which expenditure can be reduced, except reduction of pay of supervisors and circle inspectors. I do not think the staff should be reduced in number. Even now, all inspectors, etc., are aiming at procuring permanent appointments under Municipalities, Unions, etc., and men who have such permanent appointments are liable to be told off for plague duty. They are probably the most efficient part of the staff, and reduction of the scale of the pay would lead to reluctance among them to incur the expense of transfers for no compensating advantage. When the regular reduction of staff, which takes place every hot weather, is considered, the precarious nature of the appointment as plague inspector must necessarily lead to a rather high scale of pay, if men of a good stamp are to be obtained.

I am unable to suggest any way in which the plague staff could be more satisfactorily and economically distributed.

In the particular case of Palghat taluk, a scheme is now under consideration for enlarging the areas of the circles under observation.

(c) I have no argument in support of any scale of pay, different from the present. The strict adherence to the rules of the Civil Account Code leads to great delay, at present, in obtaining pay.

This is particularly the case, when a new set of observation circles is opened or a supervisor appointed. (Instructions for preparation of pay-bills were circulated from the Salem Treasury in this matter, I believe, but still delays occurred.) The frequent changes in the staff, with the necessity for last-pay certificates, certificates of handing over charge and certificates that serviceable ponies were maintained, cause much time to be lost, before the pay actually reaches the circle inspectors.

In the Palghat division, there have been frequent changes of hospital assistants at Kollengode and at the Wálayár frontier inspection station. Each change means a delay in the hospital assistant drawing the pay.

For example, if the hospital assistant at Wálayár is transferred to Kawai (under the Tellicherry Taluk Board), then, until the new hospital assistant at Wálayár has got his last-pay certificate, he cannot submit the pay-bill for the month. Until it has been countersigned by the District Medical and Sanitary Officer and forwarded to the President, Taluk Board, the last-pay certificate of the hospital assistant who went to Kawai cannot be issued. When the hospital assistant (now at Kawai) gets his last-pay certificate, he can then send up the bill to the District Medical and Sanitary Officer for counter-signature and forwarding to the Taluk Board President, Tellicherry, who is then in a position to grant a last-pay certificate to the hospital assistant, who was relieved at Kawai. (This is probably a month afterwards and may be more.) As the Treasury Deputy Collector tells me that last-pay certificates cannot be granted in anticipation of payment, I have made a reference to him to ask how such delays can be avoided.

(d) The observation staff is really useful under both (I) and (II), I think. It is indispensable that we should know the geography of the country and, consequently, if the entire staff is got together in a hurry, when plague appears, they cannot be expected to cope properly with the work.

Even where plague has been raging for some time, the work of searching out defaulting passport-holders and getting them to give intimation of change of address is not perfectly done. The observation staff is particularly useful in waking up the local authorities to their duties in these matters. I think it may be said that, if there is no observation staff, the plague is likely to get quite out of hand, before the preventive staff can be collected and put in working order.

(e) I have no suggestions to make, as to any improvements in the method of training the staff.

Ponies are hardly necessary, I think, for circle inspectors of observation circles. All supervisors in rural areas should have ponies. In towns, (preventive) circle inspectors do not require ponies.

I am unable to express an opinion as to extra allowances during plague.

(f) At present, the extent of European supervision in Palghat taluk is the reviewing of the diaries of inspectors and supervisors.

(g) The working capabilities of the staff vary; in the case of those who have had previous experience of plague work (and have been specially selected, with knowledge of their qualifications), the work done is satisfactory.

(h) I am unable to express any opinion of value on the point.

(i) I regret to say, I have no suggestions to make.

(j) I think not. The antipathy against the precautions taken, when a place is found to be infected, is so great, that a case is much more likely to be hushed up with the connivance of the village officers than to reach the ears of the higher authorities.

(k) Without the influence exerted by the circle inspectors, I think that the village officers are seldom of much use. They have many other duties to attend to, and visits from the inspectors, who have no other business, keep them up to the mark.

(l) Circle inspectors, after a very short time, are quite independent of villagers. Of course, their work is simplified by the passport register, fever register and death register kept by the village headman.

(m) In some places, I believe, the people dislike the aniline dyes, with which the disinfecting solution is coloured. In Palghat taluk, I am not aware of any bad influence wielded by the observation staff.

(n) Not probable, in my opinion.

(o) The danger is not realized to any appreciable degree, at least, not until the people have suffered from the epidemic several times.

(p) In Palghat, I have not heard of any reluctance to welcome the refugees from Coimbatore. I do not think the villagers are to be trusted in the matter at all.

(q) The plan is certainly desirable, but at the same time impracticable, in my opinion—particularly in Malabar.

(r) Any system of village patrol should be left to the villagers.

The really necessary thing is to work up the village officers to insist on the *kólkárans* ferreting out information about new-comers with greater persistence.

(s) I have no suggestions to make on the point.

GROUP B (2).

(a) Greater efforts should be made by local authorities to get passport-holders to give intimation of change of address. This is, I think, seldom done.

Heads of villages, in all amsams in observation circles, should be supplied with books of passport forms.

(b) and (c) I have no suggestions to make on these points.

ADDITIONAL QUESTIONS.

GROUP B (1).

(i) (ii) I have no suggestion to make, as to any alterations in the plague regulations.

(t) I am not in favour of a system of rewards for reporting cases of plague.

(u) There is, at present, no occasion for native doctors to render assistance. I think, however, that some measures are desirable, to obtain their co-operation. It appears hardly probable, however, that information of the first outbreak of plague would be obtained from them. If anything was done in this direction, the doctors would have to be instructed in the diagnosis of plague.

GROUP B (3).

(a) Station-house officers, as a rule, do not understand their duties as local authorities. They do nothing, without the orders of their superior officers; unless a station-house officer is instructed definitely that he should passport any person he finds arriving from a plague-infected area without a passport, he will not do so. When plague is spreading, therefore, the District Superintendent of Police should be asked to issue instructions, calling the attention of the police to their duties in the matter, and care should be taken to see that all police stations are supplied

with a copy of the plague regulations. Then, many station-house officers do not understand English, so that instructions should be issued to them in the vernacular. The efforts made to trace defaulting passport-holders are, I think, feeble, where the station-house officer is the local authority, than elsewhere.

(b) I have no suggestions to make for reducing the number of police on plague duty.

(c) There are police in the Palghat division, to assist the hospital assistant at Wálayár frontier inspection station. They patrol the frontier also to catch stragglers entering by by-paths.

S. W. G. I. MAC IVER, Esq., I.C.S.

GROUP B (1).

(a) I believe there have never been any authenticated cases of plague in this division; none have been discovered, nor is there any reason to think that any have occurred, since I have been in charge; there have been a few cases, where persons arriving from infected areas have been attacked with illness, and these cases have been promptly reported.

(b) Unless the observation staff is to be altogether abolished, no reduction can be made in this division.

(c) I see no reason to alter the present scale; I do not think the scale can be reduced; pony allowance may be necessary in some cases, where the inspectors have a large area to watch, but probably nine out of ten of them are unlikely to ride, whether they get the allowance or not. I should think an extra allowance during plague is advisable, as it is likely to lead to greater efforts to prove that plague exists.

(d) (II) It is not advisable to get rid of the whole staff at any part of the year, as there is no time when plague ceases and it would be impossible to get an entirely new staff into working order, when required, without a good deal of delay.

(e) When there were suspected cases in this division, it was difficult to get a decided opinion from the subordinate medical officers as to whether the disease was probably plague; how far it is possible to teach the hospital assistants to recognise the symptoms of plague is a question for experts. I think it would be very advisable to transfer hospital assistants, in such a manner as to provide for the presence of at least one man with practical experience of plague in each revenue division; as to the non-medical members of the plague staff, I suppose they cannot be expected to do more than search for persons obviously ill and with high temperatures. They might probably be instructed with advantage as to their duties in connection with the segregation and disinfection of houses, etc., by the District Medical and Sanitary Officer. This instruction could be given, without sending the men out of the district, and could be repeated as often as necessary and the result might also be tested by the District Medical and Sanitary Officer, when he goes on his tours of inspection.

(f) The inspectors here wander about and send diaries containing remarks about advising people to keep their houses clean, etc.; the supervision by superior officers cannot be very thorough; in the absence of any cases of plague, they have not much to do in this division, and it is difficult to say whether they do their work thoroughly.

(g) I do not think they exercise any appreciable influence, good or the reverse, on public opinion.

(h) If the people's interest in the question were aroused by the occurrence of plague, the matter would no doubt be different; on the whole, what I have seen makes me think that the people would be glad to assist the plague staff, in case of necessity, to save them from danger; the population of every part of this division contains a fair proportion of persons of considerable intelligence.

(i) If really good men are to be obtained for these temporary establishments, the only way to get them is to appoint men already holding permanent posts in Government service and to appoint temporary men to do their ordinary work.

(j) No, but no other agency is available in every village.

(k) I cannot say, as no cases have occurred.

(l) They can make independent enquiries.

(m) Nothing of the sort has come to my notice.

(n) Ditto.

(o) The villagers here do not seem to have thought on the subject.

(p) Certainly not.

(q) No.

(r) No.

(s) So far as this division is concerned, no.

GROUP B (2).

(a) The 'local authority' is necessarily, in the vast majority of cases, a person of too small a position to exercise any useful supervision over persons of influence and their dependents; for instance, if a native District Judge or a big jemmi goes to his village from an infected area or, similarly, if a Colonel goes on a *shikar* expedition, I suppose no one imagines that the village headman is likely to insist on inspecting him or, what is more important, his followers very carefully, either at his place of residence or elsewhere. I believe this is a real source of danger and think that the remedy is to make all such persons legally bound to report what followers accompany them to an uninfected area from an infected area and then to report on the condition of health of such of them as they do not send to the local authority for inspection. All servants of Government on salaries of say Rs. 50 per mensem and upwards, whether on leave or on duty, might be made departmentally responsible for observing the above-mentioned rule, and I think that a list of other persons might also with advantage be made for each district and brought under a similar regulation; the list might include all income-tax payers and all those who pay not less than a certain amount of land revenue, say Rs. 100, and perhaps other people of position, such as members of District Boards and of Municipal Councils. I do not suggest this as a privilege to be granted, but as a necessary precaution, in the case of a class of persons, who, with their followers, are otherwise certain to escape effectual supervision; many, who now consider themselves aggrieved by the passport rules, would feel it an honour to be put on such a list and would therefore be much more likely to obey the rules cheerfully.

ADDITIONAL QUESTIONS.

GROUP B (1).

(i) I have no experience of plague and do not know.

(t) (I) I should think not.

(II) Ditto; they could not be trusted.

(u) There has been no occasion. If native doctors (vaidiyans and hakims) come forward, they might be instructed, but this is very unlikely and they cannot be compelled to receive instruction. In this division, there are several private native practitioners of the European system of medicine. I have not questioned them about the subject, but, probably, in case of need, they might be of considerable use and might be willing to receive instructions from the District Medical and Sanitary Officer.

GROUP B (3).

(a) The Chairman and plague officers have not complained; so I presume the constables do their work fairly well.

(b) Their numbers could not be reduced.

(c) A few constables are employed, to detect cases of evasion of passport rules in the two Municipalities and to assist the frontier inspection officers.

MAJOR C. H. L. PALK, I.M.S.

GROUP B (1).

(a) To a great extent. In fact, all the imported cases (21), except two or three in the district, were detected by the observation staff, through the medium of passports.

(b) The expenditure cannot be reduced; on the contrary, to carry out observation efficiently, the staff should be materially increased. This is specially desirable in districts bordering on plague-infected areas. My experience is that the plague staff have, as a whole, worked very well, but there is no doubt that the area of work and number of houses under each observation circle inspector is too large for him to cope with properly.

(c) There is no preventive staff in this district. In Municipalities, the circle inspectors are paid Rs. 20; without any allowances, and the divisional inspectors Rs. 35, with a pony allowance of Rs. 15. I think the pay of the former might be reduced from Rs. 20 to 15 and the latter from Rs. 35 to 25, with Rs. 15 pony allowance, provided natives of this district are trained and employed for work here. In rural parts, the observation circle inspectors are each paid Rs. 25 + fixed travelling allowance Rs. 15 + horse allowance Rs. 15, irrespective of their being certificated, temporary or assistant sanitary inspectors. I think the pay might be reduced to a salary of Rs. 20 per mensem, plus Rs. 15 fixed travelling allowance. The pony allowance I would cancel, as I know that men in this district keep a pony nominally, for the sake of the allowance, but find they can perform their duties better without one, as they often have to travel

over ground (paddy for instance) where a pony is an encumbrance and they are moreover quite accustomed to walk long distances. An extra allowance during actual plague is a good encouragement and, I am sure, tends to induce better work and more content.

(d) I think it is useful in both the cases. It is a question for consideration whether the observation staff might not be reduced with safety during the hot-weather months, which, in Malabar, would be 15th March to 15th June.

(e) The candidates should be selected from the districts in which they are to be employed. I do not think the District Medical and Sanitary Officer can undertake the work, in addition to his multifarious duties. The present system seems to be working well. But I think the period of training is too short and might be extended with advantage.

(f) There are no special officers to supervise the staff. The Collector and the District Medical and Sanitary Officer, in a general sense, supervise the whole district and, in the Palghat and Tellicherry Taluk Boards, the Divisional Officer is the controller.

(g) They have worked well.

(h) Yes.

(i) I have already suggested an increase of the observation staff, in order to attain more detailed efficiency.

(j) No.

(k) Circle inspectors check the birth and death registers constantly and so at once recognise any unusual mortality and, further, their supervision tends towards more accurate registration.

(l) Yes; they can get information from respectable residents and the police.

(m) No.

(n) I think so.

(o) Little or none.

(p) No.

(q) and (r) The only efficient patrol possible, in this scattered district of amsams and desams, would be to call upon the services of the police.

(s) Yes; by curtailing the pay and allowances of plague inspectors, as indicated in item (c).

GROUP B (2).

(a) Yes; at present, intimations are received in this office from passport-issuing officers and are sent to the various Tahsildars, Deputy Tahsildars and Chairmen of Municipal Councils. These statements are, in several instances, received late, sometimes from two to four days after the issue of the passport and, by the time they reach the respective authorities, the period of observation is over. Further, the passports and intimations are written illegibly and incompletely. (This is the case only with those that are received from outside the district.) Consequently, difficulties arise in tracing defaulters.

I would strongly suggest that intimations be sent direct to the Tahsildar of the Taluk or the Chairman of the Municipality to which the travellers are proceeding and that he (the Tahsildar or the Chairman) be made responsible for the supervision of the passport-system in his Taluk or Municipality. This arrangement, if approved of, will not only save delay in receipt of the intimations by the local authorities, but will also do away with the clerical establishment entertained in the District offices on account of the passport-system. Tahsildars and Chairmen can do this work without any additional establishment, as they do at present, and I cannot see why these intimations should go through the Collector or the District Medical and Sanitary Officer. I am fully convinced that the existing system of sending intimations through this office is a waste of money, time and labour in every way.

With regard to illegible writing, there should be a distinct ruling that passport-issuing officers, who fail to write out passports legibly and completely, will be liable to punishment.

(b) No, I cannot suggest any.

(c) No; travellers must be entirely depended upon for this.

GROUP A (2).

(e) No inoculation has been performed, since my arrival. 306 cases were inoculated, during Colonel Hackett Wilkin's time in the district.

GROUP B (3).

(a), (b) and (c) The police are employed in certain frontier and railway stations, in Municipalities and in certain ports, in connection with vessel inspection. They work under the

direct control of the medical officers, maintain discipline and order in frontier and railway stations, trace defaulting passport-holders in Municipalities and prevent unregistered coolies from boarding ships, etc.

The ways in which they are employed work satisfactorily. The staff of police is not a fixed one, but as many as I consider necessary are ordered by the Collector.

A. F. PINHEY, Esq., I.C.S.

GROUP B (1).

(a) The observation staff in this district appear to have detected very few cases:—

Municipal—Total 5.

One detected by observation staff.

Four detected by hospital assistants on plague duty.

Outside Municipal Limits—Total 6.

One detected by observation staff.

Three detected by officers in charge of frontier stations.

None the less, the staff is necessary and does useful work. Our present staff cannot be reduced. We may have to increase it. It is being increased in Palghat town. I have not sufficient experience to give valuable advice.

(c) There are no preventive circles at present in this district, but only observation circles. The inspectors in charge of observation circles are paid as follows:—

In Municipal Areas.

Divisional inspectors, Rs. 35, plus 15 pony allowance.

Circle inspectors (except three men in Cannanore, who are untrained), Rs. 20.

In Rural Areas.

Plague inspectors, Rs. 25, plus 15 travelling allowance, plus 15 pony allowance.

Supervisors, Rs. 80, plus 30 travelling allowance, plus 15 pony allowance.

I do not think that the above scale of allowances can be reduced.

As regards the pony allowance, it may be necessary in some cases, but I think that nine out of every ten inspectors are unlikely to ride, whether they get the allowance or not. Pony allowance is hardly necessary for circle inspectors. The supervisors in rural areas should have a pony and be paid the allowance.

(e) The candidates for training should be selected from the districts in which they are to be employed. The present system of training the staff in Madras appears to be working well. I think, however, that the period of their training in Madras is too short and might be extended with advantage. As regards the training of the staff locally, the District Medical and Sanitary Officer states that he cannot undertake the work, in addition to his multifarious duties: I agree with him.

(f) There are no special European officers to supervise the staff. The Divisional Officers of Tellicherry and Palghat check the diaries of the inspectors.

(g) I should doubt it.

(h) Indifferent.

(i) If really good men are to be obtained, the only way is to appoint men holding permanent posts in Government service and to appoint temporary men in their places.

One supervisor in Palghat, imported from Salem, is an experienced man and an enthusiast, and I make an exception in his favour.

(j) The District Medical and Sanitary Officer and the Divisional Officers of Tellicherry and Palghat think that village officers cannot be depended on as a means of detecting plague cases, but, within the last year, information of some four imported cases was received from village officers.

(k) The village officers are seldom of much use, without the influence exerted by the circle inspectors. They have many other duties to attend to, and occasional visits from the circle inspectors keep them up to the mark.

(l) Yes; from the people generally. At Pudukottam, the circle inspector detected a case, through information given by other passport-holders.

(m) Not in this district, I think.

(n) Yes, apparently.

(o) The danger is not properly realised, I think, at any rate in Palghat. In Calicut, on the other hand, when plague was bad in Coimbatore, fugitives could get neither food nor shelter, after the first two or three imported cases had occurred. In despair, they went to the Chairman, who sent them all to the plague camp.

(p) Probably not.

(q) By all means.

(r) Leave it to the villagers.

(s) I fear not.

GROUP B (2).

(a) Under the plague regulations, triplicate passports are sent direct to the local authorities concerned, while intimations are sent to the District Medical and Sanitary Officer, who, in his turn, sends them to the Chairman, Tahsildar or Deputy Tahsildar. Thus, there is delay in the receipt of intimations by these officers. The District Medical and Sanitary Officer suggests that the intimations may be sent to the Chairman, Tahsildar or Deputy Tahsildar concerned direct. I endorse the suggestion.

Another suggestion is made by my Sub-Collector (his answers are being forwarded to you in original). It is to the effect that officers of Government on salaries of, say, Rs. 50 and upwards and certain classes of the public might be made legally responsible for reporting the health and condition of their followers, who may accompany them from an infected area and who are not sent to the local authority for inspection. The suggestion seems to deserve consideration.

(b) and (c) I have no suggestions.

ADDITIONAL QUESTIONS.

GROUP A (2).

(e) Since the year 1898, 380 persons were inoculated in this district. The figures are as shown below :—

By whom inoculated.	No. of cases.
District Medical and Sanitary Officer, Calicut	226
Civil Surgeon, Cannanore	74
Civil Apothecary, Palghat	70
Do. Sultan's Battery	10
Total	380

I do not believe there has been any inoculation in the past four years. When plague becomes indigenous, it will be time enough to think about it.

GROUP B (1).

(u) No, to all, if you mean by *native doctors* unqualified men.

GROUP B (3).

Police constables, in this district, are chiefly employed on the following duties :—

(1) *In Municipalities.*—Two police constables are employed, in each of the Municipalities, to assist the medical officer in tracing out defaulting passport holders.

(2) *At Road Frontier Inspection Stations.*—To assist the officers in charge in the inspection of passengers and traffic. There are two constables employed at the Wálayár station. There were one head constable and six constables at the frontier stations of Kanwáyi and Perumpuzha in Chirakkal taluk, but this staff was recently reduced to one head constable and four constables.

(3) *At important Sea-Ports.*—To prevent any but registered coolies from boarding ships and to otherwise assist in the inspection of vessels, under the sanitary rules for prevention of plague on inward and outward bound vessels. Two constables are engaged on this duty, at the ports of Cannanore and Tellicherry. At Cochin, one constable is employed for every forty men employed in a vessel.

The police constables work under the direct control of the medical officers and are reported to be working satisfactorily.

The present number of constables on plague duty cannot be reduced.

CAPTAIN P. P. ATAL, I.M.S.

GROUP A (1).

(a) No, not to chemical. (See remarks under (d).)

(b) Yes.

(c) I should like to see the houses "disinfected" with plenty of light and sun, rather than with chemical disinfectants.

(d) The way chemical disinfection is done at present I think is no good. It is mere waste of money. And I do not think it is absolutely necessary to use chemicals. For disinfecting the houses, all the doors and windows should be opened and a few openings made in the walls, if there are no windows.

If it is a thatched house, the thatch should be removed: if a pukka-built house, openings should be made in the roof. As regards disinfecting clothes, they should be boiled in water for an hour and then dried in the sun. Soiled and dirty clothes should be burnt.

(f) The simpler the apparatus, the better. Nothing more than a few wooden buckets and coconut shells is necessary, for chemical disinfectants.

(f_{ii}) Yes.

(g) Under supervision, yes.

(h) No, not much; they do not like it.

(i) No.

(k) See reply to (d).

GROUP A (2).

(b, (c) and (d).—I do not think this will ever be popular with people. It is sheer waste of money and not much good after all.

(c) Yes.

(d) Most of the domestic animals are said to carry the plague germ about them. It would be a good thing to get stray dogs and cats killed.

GROUP A (4).

(a) People do not like plague hospitals. They think that, if a person is taken to the plague hospital, he is poisoned there.

(c) No body did at Madanapalle. The rich people clear out of the place, on the outbreak of plague. The poor, left behind, cannot afford to build one and do not much care what happens to their sick and dead.

GROUP B (1).

(a) They have succeeded fairly well in detecting, but not in suppressing plague, as the contacts, in a large number of cases, are allowed to get away.

(b) Yes. I think it is mere waste of Government money to keep the so-called trained plague sanitary inspectors. A majority of them are good for nothing. I think the village magistrates, revenue inspectors, etc., can give all the necessary information, if they are properly handled. And, as a further inducement, some sort of reward should be given to them.

(c) A pony allowance is necessary, but somebody should see that a pony is kept and used and that it is fit for work. Better still, if they ride a bicycle. It would be cheaper for the Government to buy bicycles and make these people use them. They will be better than ponies and cheaper. A great saving can be effected in this way. An extra allowance, during plague, unless a man has to do plague work in addition to his other duties, is not necessary. Most of the plague inspectors never go near a plague case and do not run any risk.

(d) Not necessary, if the local village authorities are made to report cases.

(e) For all practical purposes, the District Medical and Sanitary Officer can give the necessary training, for which 10 to 15 days ought to suffice.

(f) It is necessary.

(g) Yes, if looked after.

(i) Yes, provided the Collector uses a firm hand.

(k) Not much, as far as I know.

(l) I should not think so.

(m) I am afraid it is true to some extent.

(o) They know the danger and do not allow outsiders in their villages. Of course, they do not know that infected clothes are dangerous.

At Madanapalle, during the plague outbreak, people would not allow outsiders in their villages. They even went so far as to prevent Government officials entering their villages. At the same time, it is true that, if the outsider was related to the village magistrate or any rich Komatti, he got in.

(p) Yes—to a certain extent. But the local revenue authorities must help them.

(q) Yes; the revenue authorities might be asked to help them.

(r) Left to the villagers.

(s) *Vide* remarks under (B) 1) (b).

GROUP B (2).

(a) The present passport-system does not strike at the root of the evil. To prevent the disease spreading, contacts should not be allowed to leave the infected territory for ten days or not allowed to enter a non-infected area, till they have been under a ten days' quarantine.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c) It is useful.

GROUP A (2).

(e) Inoculation was not popular in Cuddapah district.

GROUP B (1).

(t) No.

(u) They all disappeared, on the outbreak of plague.

GROUP B (3).

(a) Badly. They are useless individuals. On the outbreak of plague, extra hands should be engaged to do the routine duty. Only regular police should be used for plague work.

(b) No.

(c) To guard contact-sheds and plague hospitals and to prevent people getting back into infected houses.

MAJOR G. C. BIRDWOOD, R.E.

(a) No. Not at this depôt.

(b) The temporary staff, which is employed here as occasion requires, is adequate. Population, about 3,000: the temporary staff is about half a dozen men.

(c) The existing provision, *i.e.*, about Rs. 1,000 per annum, is found sufficient here.

(d) Each has its respective value and each form is adapted to certain conditions.

Desiccation by burning bratties is the quickest form of disinfection and is suitable to buildings with cracked and fissured walls.

Desiccation by sunlight is the best form, when combined with free ventilation. It takes longer than the aforesaid process, but is to be preferred to it, when the buildings are ill-ventilated, dark and damp.

Disinfection by means of a chemical disinfectant, such as perchloride of mercury, is very effective and, when combined with desiccation by sunlight, has been found to be the surest method.

Chemical disinfectants are suitable for disinfecting drains, cess-pools, the walls, the roof and the flooring of houses.

We have found perchloride of mercury to be the best chemical disinfectant. A solution of it can be easily and thoroughly syringed into cracks and crevices in the walls and it can be mixed up with the dug-up soil of the flooring.

It can also be used for disinfecting furniture and cloths.

Sunlight and air are the best disinfectants. Perchloride of mercury, though very good, is not always sure, for it sometimes forms a compound with organic matters and, when this occurs, its disinfecting power is reduced. To obviate this, the perchloride of mercury can be dissolved in an acid solution, such as hydrochloric acid.

(d₍₁₎) I have no experience of this epidemic, in towns or in rural tracts, other than this depôt.

(e) If the disease is allowed to become indigenous, recrudescence will occur. We have found that the monsoons are favourable to it.

(f) Yes.

(f_(ii)) Yes.

(g) Yes, as regards this depôt's village.

(h) Yes; those in the villages where plague has been prevalent.

(i) The men were clearly given to understand that the measures were adopted in their own interests and for their benefit.

(j) Yes.

(k) (I). Advance disinfection, under the personal supervision of duly qualified permanent hospital assistants (not temporary plague inspectors), under the control and guidance of a competent medical officer.

As soon as plague appears likely to infect a district, disinfection should be at once resorted to, taking up about a dozen houses at a time, till the whole are done. A dozen or so empty houses should be kept in each village, so that they can be used as others are evacuated. A week or ten days should elapse, before a disinfected house is re-occupied.

(II) Desiccation by burning bratties is, of course, cheaper in cost than chemical disinfectants, though the latter are certainly more effective, when plague has manifested itself in the place.

(III) The carrying out of plague measures, in other words, means that a certain amount of interference with the liberty of the subject must be undertaken, but I have found that, if this is done tactfully and with due regard to caste prejudices, it is not resented by those concerned.

GROUP A (2).

(a) (I) Yes, in this depôt.

(II) I can suggest none.

(b) Certainly.

(c) I cannot venture an opinion.

(d) So far as this depôt is concerned, inoculation is carried on annually, with little or no risk, the men being carefully looked after by the medical officer after the operation; this, I consider, is of great importance.

GROUP A (3).

(a) Yes, in this depôt.

(b) The people here seem satisfied with things as they are.

(c) Dead rats and bandicoots have been found to be a sure precursor of plague.

(d) Squirrels, mice and fleas. These can be got rid of, by offering rewards for the two former, and the latter, by free use of disinfectants.

GROUP A (4).

(a) Most unpopular, from all I hear.

(b) This would appear to me to depend very greatly on the person who is in medical charge; if more tact and consideration were shown, I do not think the people would resent plague hospitals as much as they now undoubtedly do.

(c) I have no experience of this.

GROUP B (1).

(a) I do not think they have succeeded in suppressing plague to any noticeable extent.

(b) To a considerable extent, in the upkeep of the observation staff on the frontier roads and on the railways, for I would abolish all of these, only maintaining the passport-system in the vicinity of Madras. I do not think that the inspections at Jalarpet, Raichur and Guntakal can claim to have prevented plague from spreading beyond those stations. It is well known that plague has penetrated beyond Jalarpet in the direction of Madras. As before stated, the maintenance of the passport-system at Perambore, for the detection of any cases of sickness in Madras, would, in my opinion, be quite sufficient.

(c) I would suggest that, as far as possible, permanent Government officials should alone be employed on plague duty in towns or those who have been in Government service and taken pension. I strongly deprecate the introduction of temporary hands for these duties, but, should

the permanent men be unable to carry out their own duties as well as plague work, temporary assistance might be called in to relieve them in the former. As regards pay, I have no experience.

(d) One or two chowkidars (according to the size of the place), to be under the orders of the local medical officer, would be useful in detecting possible dropping cases.

(e) Locally, our men have done very well, under the instructions and supervision of the Depôt Medical Officer.

(f) This is left entirely to the Depôt Medical Officer, in whom I have full confidence. He is assisted, in every possible way, by the European overseers and by Mr. Narasimha Aiyangar, the Depôt Manager.

(g) As regards this depôt plague staff, they have worked most conscientiously and efficiently.

(h) Yes.

(i) As I have said before, I do not consider the preventive staff at frontier and railway stations necessary, except the passport staffs on the outskirts of Madras.

(j) Yes, under the immediate supervision of permanent Government officials.

(k) I see no use in them at all, provided the local staff is well chosen.

(l) They appear to be solely dependent on the village officers for their information.

(m) Yes and to a great extent.

(n) I cannot say.

(o) The villagers have, to a great extent, realised the danger of infection, to which they are liable, and I find they are very careful here to keep out all strangers and outsiders coming from infected districts.

(p) Yes, I think so.

(q) Yes, certainly.

(r) I would leave it to the villagers.

(s) Yes, in making people do the work themselves.

GROUP B (2).

(a) No.

(b) The passport inspectors should satisfy themselves that passengers, who intimate their intention of leaving, have actually left the place.

(c) I do not think so.

ADDITIONAL QUESTIONS.

GROUP A (1).

(c) For about 2 weeks.

GROUP A (2).

(e) Inoculation with the plague prophylactic has been carried out in this depôt from the year 1898 and, since then, once a year, in the case of all who are willing to be operated on.

In 1898	..	..	..	..	..	..	2,078 cases inoculated.
In 1899	..	..	..	..	..	..	730 "
In 1900	..	..	..	..	..	..	157 "
In 1901	..	..	..	..	..	..	389 "
In 1902	..	..	..	..	..	..	367 "
In 1903	..	..	..	..	..	..	300 "
In 1904	..	..	..	..	..	..	32 "

GROUP A (3).

(d₁₁) I believe fleas carry infection from rat to rat and from rats to human beings. I have had no experience of any cases.

GROUP B (1).

(i₁₁) All cases of death in this depôt are examined and a death certificate is given by the medical officer, for the information of the civil authorities.

GROUP B (3).

(a) They are, at present, controlled by the plague authorities.

(b) I cannot say.

(c) I do not know.

MR. J. DUGHARD.

The plague has been sufficiently long in this district and more keenly felt during this period in the Tiruppattūr taluk. This fact has greatly contributed to the villagers making themselves interested and they have carefully watched all the necessary official instructions and help given, so that it would not be here wrong for me to positively affirm that nearly all the villagers, with very few exceptions, are quite conversant with the mode of disinfection required by the plague authorities and also quite understand all the human preventive measures adopted by them. There is, therefore, very little necessity, in this taluk, for further training of the villagers. I have personally spoken to and moved about among the villagers of the plague-infected villages of Jalarpet, Kādīyūr, etc., and find that they quite understand the preventive measures to be adopted, as also the mode of disinfection. What is necessary is a free supply to all the village munsifs of the acid lotions and the other necessary implements to facilitate disinfection. The village munsif is the local authority of each village and he has generally such knowledge as would be sufficient for the proper conduct of disinfection; now this work is done by plague inspectors, drawing a salary of Rs. 70, plus 15 horse allowance or 85 in all, supervised by an officer drawing much more. This, I beg to submit, may be done away with and the village munsif made responsible for the express report of a plague case and thorough disinfection of the infected house or area, if one European Inspector, with a pukka knowledge of plague work, be appointed to supervise those village munsifs so entrusted.

GROUP B (1).

Referring to note (j), from personal experience at Jalarpet, I have learnt that the villagers are crying out for more independence in measures for prevention, disinfection, etc. The respectable Hindus and Muhammadans object to a rabble of all castes of plague coolies investing their houses at a rush and topsy-turvy all their property and chattels and over-doing their work by utilizing a greater portion than necessary of the roofs of their houses. Yes; I strongly advocate more independence from official help in the prevention and disinfection work of the plague staff. Many a villager would readily and quietly remove the necessary portion of the tiles of his roof, with little or no damage, and carry out the disinfection of all property, etc., but here again the village munsif should be made responsible that the work is properly done and the one supervising officer should check the same.

The above leniency, i.e., independence in the measure noted above, is the only move towards making disinfection more effective and cheaper, with no material loss of efficiency, and may add in the high road to popularity.

(c) As far as I can see, at Jalarpet, the plague inspectors, the observation staff, etc., are chosen from the same standard of men as can be found in the other departments, such as police and salt (subordinate grades), and I am of opinion that similar grades of pay would meet these appointments. If the same plague staff as now exists is kept up, I think it is quite necessary that a pony allowance be given, but it is of greater necessity that it should be seen that these officers maintain their pony, for, in the absence of a pony, it is not possible that the number of villages required daily to be visited by them can be done.

(d) I understand that, during the hot months, plague is considerably on the decrease, but, when opinionating that a staff may be kept to detect any "dropping cases", I would employ other officers than those who were retained in regular plague work as a means of livelihood.

With reference to paragraph (e), I must state that the present staff is far below the desirable. Training is necessary, with greatly increased European supervision.

(e), (h) and (l).—I regret to state that the subordinate plague staff are exceedingly corrupt and far from gaining a favourable public influence; they work with such stupid rigidity and impatience, with no regard to politeness. These are more easily looked upon as enemies than sympathetic and aiding officers. The public have learnt to detest them for the above reasons and their bad influences are more than can be expected in the abused "Bobby".

Villagers can be trusted, of their own motion, to keep out outsiders, merchandise and baggage, etc., if some power were given them. In this case, a Rs. 7 police constable would suffice.

GROUP B (2).

Superior officers of the railway, when travelling, are now subjected to the teasing treatment of being disturbed and asked to patrol the platform, till they are intimated or otherwise dealt with. This, I submit, can be easily rectified by exemption cards being issued to them. These can be shown to the passport officers by the officer's servant, travelling in the same train. This will not only save much annoyance but prevent further friction between the railway and the plague staff.

From a railway point of view, I suggest that the subordinate railway staff and officials, running men, etc., be given passports and may be permitted to go on with the same passport for 10 days, rather than have them changed and fresh ones taken, if addresses are temporarily changed. Passport work may be carried out with more consideration, with regard to women, who may be inspected in the train and not dragged out on the platform, as is now done, as, for every ten passengers in a compartment of a third-class carriage, six or eight are men and four or two women and, if six women can be examined inside a compartment of a second-class carriage, there is no reason why three or four cannot be examined, when seated in a third-class compartment. This concession was allowed at Arkonam in 1899, when plague was at its zenith.

The intimation work, which was proved to be nearly futile, may be done away with and detention of trains reduced to $\frac{1}{4}$ the time at present occupied. This can be proved from statistical returns, showing that over 30 per cent. of people intimated give false addresses and cannot be afterwards found.

The present arrangement of re-booking of passengers is most unsatisfactory and, as you may be aware, there are numerous complaints from passengers of fraud, but they have to be suppressed, for want of evidence against the constables and others.

COLONEL W. F. THOMAS, I.M.S.

GROUP A (1).

- (a) No, as far as this station is concerned.
- (b) There is no training of the plague staff here.
- (c) The present expenditure is adequate.
- (d) Desiccation by sunlight. Corrosive sublimate.
- (d₁) The disinfective measures now in force are quite suited for ordinary use, both in towns and rural tracts.
- (e) No experience.
- (f) Yes.
- (f₁) Yes.
- (g) (I) Yes. (II) Questionable.
- (h) Yes.
- (i) The village officials advise the people, as opportunity offers.
- (j) Yes, if they can be relied upon to carry out the measures.

GROUP A (2).

- (a) As inoculation has not been practised up to date in this district, I am not in a position to offer any opinion on (I) and (II).
- (b) Yes.
- (c) An inoculated person does not convey infection.
- (d) No experience.

GROUP A (3).

- (a) Yes.
- (b) When in doubt, they had better get advice.
- (c) Yes.
- (d) Yes; fowls, poultry in general, pigeons, cats, monkeys.

GROUP A (4).

- (a) There are no plague hospitals, which have, as yet, been used as such in this district. They are generally unpopular.
- (b) If people are allowed to erect hospitals for their own castes and have them manned by their own caste people and treated by their own doctors.
- (c) The upper well-to-do classes alone appear to be willing to avail themselves of the privilege.

GROUP B (1).

(a) As far as this town is concerned, the few imported cases that have occurred were promptly detected and the scourge suppressed, by all the available means for segregation, isolation, disinfection, etc.

(b) This is very doubtful.

The plague staff in this town is satisfactorily and economically distributed.

(c) The present pay of the observation and preventive staffs seems adequate. It is doubtful whether the salaries and allowances of the different classes of officers could be curtailed, without serious loss of efficiency. Pony allowance is not always necessary. Extra allowance during plague is a good thing.

(d) (I) Yes. (II) Yes.

(e) Where the observation and preventive staffs consist of certificated sanitary inspectors, a little training is practicable and desirable. Training at a district head quarters could be substituted for training in Madras, without disadvantage. The District Medical and Sanitary Officer could give the practical training required at considerably less cost.

Yes.

(f) In this town, the European supervision is done by the Collector and Assistant Collector and District Medical and Sanitary Officer.

(g) Yes, except that, occasionally, there are complaints about the ignorance of some of the lower subordinates, such as passport-clerks, etc.

(h) Not always.

(i) It would be expedient to have most of the observation and preventive staffs composed of medical men and women or, at least, as under-subordinates, those possessing qualifications as midwives and compounders, who may be given a small course of 3 months' training, before being appointed to these posts.

(j) I do not think so. Their "suspected cases" turn out to be something else.

(k) To the extent of impressing upon them the advantage to the community at large of at once discovering cases of plague and the imminent risk to themselves and to the population that is run by any negligence or carelessness on their part in detecting such cases.

(l) In some cases, they may obtain information from the villagers themselves.

(m) Yes.

(n) No.

(o) To a very small extent.

(p) No.

(q) Yes.

(r) Yes. Worked first officially and, when the object and the nature of the work are thoroughly understood and the confidence of the villagers is gained, it may be first tentatively, and then, if advisable, permanently left to the villagers.

(s) No.

GROUP B (2).

(a) Yes. In the matter of recovering and tracing several cases amongst the natives only, where false addresses are given and the difficulty of tracing them is rendered very great and, in some cases, impossible.

(b) Yes.

(c) Yes.

R. H. CAMPBELL, Esq., I.C.S.

GROUP A (1).

I think that we go quite far enough, in the way of disinfection. With the utmost care, we cannot guarantee the destruction of every single plague-germ in a native house. Why therefore waste more money on what is, at best, an imperfect process? I am not aware whether the roofs of houses are still removed in course of disinfection. In my time, the roofs would be taken off in strips, a useless measure, which only incommoded the inmates. Disinfection, unless personally supervised by a sanitary expert, can never be thorough. It is impossible to obtain such supervision in rural areas and it is no use spending a lot of money on expensive modes of disinfection. I would continue "spraying" with perchloride of mercury and would insist on ventilation, so far as it is compatible with the comfort and convenience of the inmates.

(d) Desiccation by burning bratties I know nothing about. The kiln method of burning floors was found impossible to carry out in my time. Desiccation by sunlight is impossible unless you take the whole roof off, and then the house is rendered uninhabitable.

(e) I have never come across a proved case of recrudescence of plague owing to the revivification of plague germs.

(g) (I) "Yes" in municipal towns. (II) "No" in villages.

(h) and (i) Villagers will never understand disinfection, and it is no use trying to teach it to them.

(j) They will do nothing, without official "driving."

(k) Disinfection cannot be made more effective, for completeness can never be guaranteed in every case.

It might very well be cheapened, by using a less costly chemical and insisting only on ordinary ventilation. No appreciable loss of efficiency is likely to result from a cheapened process, for I maintain that "bad is the best" and that complete disinfection can never be guaranteed.

Disinfection will always be highly unpopular and can never be anything else, among an ignorant native population.

GROUP A (2).

(a) I cannot suggest any improvement.

(b) I think the present relaxations may be continued.

(c) I cannot say.

(d) I am not much of a believer in inoculation, for the following reasons:—

(1) It is a loathsome operation, judging from my own experience, and is dangerous, in the case of delicate persons.

(2) It gives only partial immunity from plague and that only for a limited period.

(3) It is practically impossible to inoculate the whole population in an infected area.

I do not believe that plague will be stamped out by wholesale inoculation, such as that attempted by the Panjab Government.

My conclusion is that voluntary inoculation should be encouraged to a certain extent, but that an elaborate inoculation campaign is a waste of money.

GROUP A (3).

(c) I am a firm believer in the "rat-infection" theory. I remember that, in the villages of Bellary, dead rats always preceded an outbreak of plague, and the people themselves recognized this.

(d) Squirrels and monkeys caught the infection in Bellary, but they did not spread it among human beings, in the same way that rats did, as they live chiefly in the open air.

I would strongly encourage the destruction of rats, in all areas visited by or threatened with plague.

GROUP A (4).

(a) In my experience, plague hospitals are most unpopular and always will be.

The average native would rather die at home than be cured in a plague hospital. At least, this is my experience.

(c) To a very small extent. To build a pukka hospital costs money and it is always difficult to get money for any public purpose. However, the fear of being compelled to go to public plague hospitals has induced certain castes to build private hospitals.

GROUP B (1).

(a) Hardly at all, in rural areas.

(b) Certainly, a large reduction could be made in rural areas, without any loss of efficiency. During the whole two years that I spent in plague districts as Collector, I can scarcely remember a single case in which the rural observation staff detected a case of plague. It is impossible to patrol a rural area efficiently, and I strongly advocate that our efforts in the way of observation by means of special staffs should be confined to municipal towns or other compact areas. It is possible to prevent plague from establishing a footing in a municipal town, but utterly impossible in rural villages, and it is a mere waste of money to attempt to guard whole districts. Try how you will, plague refuses to be stamped out and persists in recrudescing and moving about. The sooner we realize that it cannot be stamped out, but has come to stay like cholera, the better for the tax-payer.

(c) I have no information on this point.

(d) I should say it was useless.

(h) and (i) In rural areas, the staff did little good and were not popular. They certainly did not influence public opinion and sentiment favourably.

(j) They can be depended on to report suspicious cases, *provided that there is no panic* in regard to the remedial measures (disinfection, segregation, etc.), which are likely to be adopted.

(l) Circle inspectors are useless, as a stimulus to village officers, nor have they any means of obtaining information, apart from village officers.

(m) To my knowledge, there was a good deal of favouritism and black-mail. There is no way of preventing this, in India.

(n) No. People willingly pay black-mail and are slow to complain.

(p) They can be trusted to keep out outsiders, when cholera is about. This I know from experience. They do not realize the danger of infection through clothes and other merchandise.

(s) It ought most distinctly to be reduced. If you abolished this staff altogether, very little harm would be done.

GROUP B (2).

(a) It would be hard to improve on the passport-system.

(b) This is extremely hard to prevent.

(c) I should say, "no."

ADDITIONAL QUESTIONS.

GROUP A (3).

(d_(n)) I have never come across a case of infection by means of fleas.

(f) It was certainly spread by rats spontaneously in the rural tracts of Bellary in 1882.

GROUP B (1).

(t) If plague preventive measures are unpopular and there is a panic, rewards are useless. If there is no panic, people readily report cases and do not need the stimulus of a reward.

I do not advocate a reward system.

GROUP B (3).

(c) In North Arcot, in 1899–1900, the police were extensively employed in guarding infected houses, so as to prevent segregated contacts from coming out. I have often wondered whether it is necessary to segregate *healthy* contacts. Why shut up a lot of healthy people in an infected house? Why not let the contacts alone, so long as they remain healthy? They could be examined every day, without being shut up. Plague officials, who go into an infected house, are not segregated. Besides, segregation (by posting a constable over the door) is, as a rule, a mere farce. A small bribe would ensure egress and ingress to anybody. I do not know what the practice now is, in regard to home segregation.

APPENDIX VII.

MISCELLANEOUS.

Report of the President of the Madras Municipality regarding rat-killing in the City of Madras (No. 80 P., dated 7th June 1902).

Rat-killing was undertaken in the City of Madras on 3rd July 1898 and a reward of 6 pies for every dead rat or bandicoot produced and three pies for each mouse was fixed and the money was paid to the rodent-killers through the Commissioner of Police, who caused the same to be paid at the police stations. This system worked till 31st March 1899, during which time 249,905 rats, 61,787 bandicoots and 51,399 mice at a cost of Rs. 10,543-7-9 were destroyed. Finding that the numbers destroyed were largely on the increase, it was suspected that these rodents were bred up by a certain class of people, who wanted to make their living by it. To put a stop, as far as possible, to this objectionable practice, a reduced scale, fixing the reward at one anna per dozen for rodents of every kind, was introduced and was in force from 1st April 1899 to 10th May 1899, during which time 6,000 rats, 1,791 bandicoots and 1,397 mice were killed at a cost of Rs. 47-13-8. This change of scale produced a striking difference, bringing down the numbers killed for April 1899 to 5,472 rats, 1,661 bandicoots and 1,222 mice, against 29,148 rats, 7,932 bandicoots and 7,028 mice in the previous month. The killing of the rodents was then discontinued for about six months, but was resumed again in December of the same year, under instructions from the Sanitary Commissioner, and continued up to 31st March 1901 at the following rates:—3 pies per rat or bandicoot and one pie per mouse, during which period 234,980 rats, 64,463 bandicoots and 11,286 mice were killed at a cost of Rs. 4,745-10-2. The total number killed, from the commencement up to 31st March 1901, when the rat-killing finally ceased, amounted to 490,885 rats, 123,041 bandicoots and 64,082 mice at a cost of Rs. 15,336-15-7 to the Municipality.

Proceedings of the Government of Mysore on disinfection by desiccation (No. 15251-2 L. B. P.—741, dated 22nd April 1903).

READ AGAIN:—

This office docket No. 6914—L. B. P. 326, dated the 5th November 1902, to the address of the Senior Surgeon and Sanitary Commissioner with the Government of Mysore, forwarding copy of a report by Dr. B. R. Sawhney, Chief Medical Officer, Jammu, showing the effects of desiccation of dwellings and effects in the Jammu City and Province, with a request that the system referred to therein may be carefully experimented in Bangalore and Mysore and the result watched and reported.

Also:—

Letter No. G. 356, dated the 2nd April 1903, from the said officer.

1. I have the honor to forward, for the information of the Government of His Highness the Maharaja of Mysore, a report on the value of the disinfection of houses by means of fire, as a remedy for the prevention and suppression of plague. I may mention that these experiments were carried out at my request and partly under my direction. This method of disinfection was first introduced by Dr. Sawhney of Cashmere, and the results said to have been obtained by him in the suppression of plague at Jammu were so assuring that it was considered worthy of a trial here.

2. Dr. Sawhney claimed that his method was capable of destroying the plague bacillus, not only in dwellings, but also in infected clothing, and that bugs, fleas and other vermin were also killed. Before recommending the introduction of this method of disinfection in all towns and villages in the Province, it occurred to me desirable to put it to a practical test, for which purpose I asked Dr. M. Srīnivāsa Rao, Government Bacteriologist, to carry out certain experiments (as detailed in his report), to prove, if possible, whether the application of heat, in the form recommended by Dr. Sawhney, possessed the power of destroying the plague bacillus in living cultures or not.

3. From his first experiments, it will be seen that all the bouillon agar cultures which had been exposed in the rooms were eventually found to be sterile, whilst only 50 per cent. of the petri dishes containing infected cowdung and clothing were rendered sterile. This we both

attributed to the fact that the heat evolved was not sufficient to sterilise the infected cowdung and earth and rags and that, if arrangements could be made to generate more heat, more satisfactory results might be arrived at.

4. In the second set of experiments, five rooms were operated on as follows:—

In No. I room, there was a heap of cowdung cakes to every 25 square feet of floor area. The temperature registered was 80° C. In this room, the following cultures were exposed:—

Three petri dishes (with covers on), containing infected cowdung and earth	Two were rendered sterile.
Three tubes of agar cultures	All sterile.
Three tubes of bouillon	All sterile.
Three petri dishes of infected rags	All sterile.

In No. II room, one heap of cowdung cakes was employed for every 29 square feet of floor area. The temperature of this room was not ascertained, as, being an inside room, access could not be had to it.

The following cultures were exposed:—

Two petri dishes of infected cowdung	One was not rendered sterile.
Two tubes agar cultures	Both sterile.
Two tubes bouillon	Both sterile.
Two petri dishes of infected rags	Both sterile.

In No. III room, one heap of cowdung cakes was employed for every 29 square feet of floor area. Temperature 65° C.:—

Two petri dishes cowdung	One not sterile.
Two tubes agar cultures	Both sterile.
Two tubes bouillon	One not sterile.
Two petri dishes of infected rags	Neither sterile.

In No. IV room, one heap to every 29 square feet of floor area:—

Two petri dishes cowdung	One not sterile.
Two tubes agar cultures	Both sterile.
Three tubes bouillon	All sterile.
Two petri dishes infected rags	Both sterile.

In No. V room, one heap of cowdung cakes to every 33 square feet of floor area:—

One petri dish cowdung cake	Not sterile.
One tube agar cultures	Sterile.
One tube bouillon cultures	Sterile.
One petri dish infected rags	Not sterile.

5. From the above results, it will be seen that, in room No. I, with the exception of one petri dish containing infected cowdung, everything was rendered sterile. In this room, the temperature registered was 80° C., and this I consider due to the fact that one heap of cowdung was used for every 25 square feet of floor area.

In No. II room, the results were equally satisfactory.

In No. III room, the results were not so satisfactory, and this is attributed to the fact that a pane of glass was missing from the window and it is probable that the heat escaped.

In No. IV room, the results obtained were, on the whole, satisfactory.

In No. V room, results unsatisfactory, most probably due to the fact that the amount of fire per floor area was insufficient.

6. I enclose a letter received from Assistant Surgeon, Mr. P. Palpu, D.P.H., Health Officer of the City of Bangalore, in which he records his experience of the efficacy and popularity of this method of disinfection.

The advantages of this method over chemical disinfection may, I think, be summed up as follows:—

- (1) It is extremely popular among all classes.
- (2) It is more economical and does not require a large and costly staff.
- (3) It does not require highly trained persons to supervise it.
- (4) The material is readily available in all villages.
- (5) It does not require any prolonged absence from the house on the part of the inmates, as the house can be occupied shortly afterwards.
- (6) If properly applied, it possesses the property of destroying the plague bacillus, as proved by practical tests on living cultures.

7. It may possibly be argued that it does not and cannot destroy the plague bacilli, which are supposed to exist in the floors of houses, especially those where cowdung is employed as the heat cannot penetrate into the earth in the same way that perchloride of mercury would. This objection might be met, by applying chemical disinfectants to the floors, prior to employing heat.

8. Taking everything into consideration, I am inclined to believe that, in this method of disinfection, we possess, not only a very valuable remedy, but one that is easy of application and readily available in all towns and villages in the Province. I have therefore the honor to request that the Government of His Highness the Maharaja will be pleased to empower me to sanction such sums as may be required from time to time for this object. I am of opinion that this method of disinfection should be made compulsory in all infected houses and that houses on either side should also be compulsorily disinfected.

9. Since writing this, I have received a further communication from Dr. M. Srinivasa Rao (herewith enclosed) on the value of Dr. Sawhney's Desiccator. He tried it in a room having a superficial area of 44 square feet, in which three tubes of bouillon and agar cultures of the plague bacillus were kept and the desiccator became red-hot: the temperature, registered only 2½ feet from it, was only 50° C. and, after three hours, none of the cultures were rendered sterile. From this he concludes that the desiccator is of no use whatever for disinfecting purposes. Possibly, if two desiccators had been used, the results might have been different. My own experience of these desiccators is that they are very cumbersome; the fuel required for their use is more costly and not readily available. I question if the same degree of heat can be obtained by them as can be got out of cowdung cakes arranged in the manner shown above, viz., one heap to every 25 square feet of floor area, which standard should invariably be adopted.

(ENCLOSURES TO THE ABOVE.)

(a) *Endorsement No. 547—Pg., dated the 29th January 1903, from Mr. H. H. Sparkes, Deputy Commissioner, Bangalore District, forwarding letter No. 1368, dated the 28th January 1903, from Mr. P. Palpu, L.M. & S., D.P.H., Health Officer, Bangalore City, to the address of Lieutenant-Colonel P. H. Benson, M.B., I.M.S., Senior Surgeon and Sanitary Commissioner with the Government of Mysore.*

In forwarding this letter to the Senior Surgeon, I would strongly recommend the adoption of this method of disinfection by heat. I have demonstrated this method to many towns and villages in the district and, in every single instance, the people have declared themselves ready to adopt it and help with the aid of bratties, etc., if some one is present to show them what to do. Colonel Foreman, who witnessed an experimental case in the Fort one morning, appeared to be strongly in favor of it. If anything is going to be done, now is the time to do it, as just at present the plague appears to be at its worst in the district and the towns, and villages are evacuated and they should be disinfected, before the people are allowed to return. I would recommend beginning being made with the Bangalore City, after which the trained staff will be available for the towns and villages.

Letter No. 1368, dated the 28th January 1903, from Mr. P. Palpu, L.M. & S., D.P.H., Health Officer, Bangalore City, to Lieutenant-Colonel P. H. Benson, M.B., I.M.S., Senior Surgeon and Sanitary Commissioner with the Government of Mysore.

With reference to your No. 59-60—P., dated the 6th November 1902, calling for a report on the result of disinfection by desiccation, I have the honour to state that, since the 6th of December, when the new method was commenced to be given a trial, 20 houses and two chattrams were disinfected by heat and that, in none of these houses, has there been any fresh case reported, although, out of 735 houses disinfected in the usual way with perchloride of mercury lotion during the same period, the disease recurred in nine instances. In one of the chattrams referred to, the inner rooms were disinfected by heat, while the outer ones were done with lotion. The disease recurred in one of the outer rooms, while, among the families occupying rooms in the interior, no fresh cases occurred. This speaks well of the new method, but, till further statistics are available, it may be premature to give any definite opinion. The method, however, has many advantages. In the first place, it is popular. People do not feel any great inconvenience, as they need not find temporary accommodation for themselves and are not put to the trouble of having to move out their "saman" and re-arrange them afterwards. These are left in the rooms during disinfection. It does not also want a large staff in arranging the bratties and setting fire to them. When bratties are properly arranged, the temperature can easily be raised to the point required. The heat pervades every part of the room and there is very little chance of infected material, if any, in nooks and corners, being left as they are, as occasionally happens in disinfection with chemicals. In addition to destroying disease germs, the heat kills also fleas, bugs and other vermin, which, in many of our houses, are a constant source of annoyance. Cockroaches, lizards, etc., drop down dead during the process, while rats either die in their holes or run away, if that be possible. The smoke generated is also an advantage, for it blackens the walls and ceiling so much as to necessitate subsequent whitewashing, which is a useful adjunct. Another advantage of disinfection by heat is that it destroys or dries up the organic matter, with which the walls and floor of most of our houses are usually saturated and which probably forms a favourable medium for the growth of germs, and thus prevents their further development, at least, for a time.

The cost of the method is not much. The 20 houses and two chattrams have cost only Rs. 1-8-0 each, on an average, and it is believed that, when more houses are done, the cost would go down still further. As bratties are easily procurable and are available in most houses, people occasionally supply them themselves free of cost. In villages, I am informed, any amount of these can be had for the mere asking and that, when the new method is explained to them, the villagers readily supply the bratties, arrange them themselves and have all the houses disinfected at the same time, if that be required, and that most willingly.

(b) *Letter No. 350, dated the 9th March 1903, from Dr. M. Srinivasa Rao, M.A., M.D., C.M. and B.Sc. (Edin.), Chemical Examiner and Bacteriologist to the Government of Mysore.*

I have the honour to state that eight houses in Appajayya's Agraharam in Chamrajpet, Bangalore, were disinfected by the method of burning heaps of bratties (cowdung cakes). One room in each of these houses was chosen for the purpose of experiment. The areas of the rooms varied from 108 to 300 square feet. Heaps of "bratties" were so arranged as to have one heap for every 40 square feet. Each such heap measured, on an average, 2 feet in diameter and was one foot high, containing about 150 "bratties". Thermometers were kept in each room, both at the level of the floor and at heights varying from one foot to eight feet. The readings of the thermometers were noted, half an hour after the "bratties" were set on fire and also after they were completely burnt. Those on the floor registered temperatures varying 60° to 75° C. and those above the level of the floor 70° to 90° C. Petri dishes, containing a dried mixture of cowdung and earth previously sterilised, and others, containing pieces of sterilised rags, both infected with an emulsion of plague bacillus, and agar and bouillon cultures of plague bacillus in test tubes were exposed in the rooms, both on the floor and at heights varying from ½ foot to 4 feet 5 inches. In the two mud-roofed houses and in the other six tile-roofed houses, petri dishes and test tubes were taken out, at the end of one hour and three-quarters of an hour respectively, and bouillon cultures were made from them. These were incubated for 48 hours and examined. The results were as follows:—

All the bouillon and agar tubes were found sterile. Fifty per cent. of the petri dishes, containing a mixture of infected cowdung and earth and rags, were not sterile.

I am of opinion that the heat evolved was not sufficient to sterilise the infected cowdung and earth mixture and rags and that, if arrangements are made to generate more heat, a more satisfactory result may be arrived at.

(c) *Letter No. 356, dated the 16th March 1903, from the same officer.*

In continuation of my letter No. 350, dated 9th March 1903, I have the honour to state that further experiments were made in a house (of five rooms) in Chamrajpet, Bangalore City.

In room No. I, nine heaps of "bratties", containing 60 in each heap, were arranged, so as to have one heap for every 25 square feet. In rooms Nos. II and III, there were four heaps, having one for every 29 square feet. In the IVth room, there was a similar arrangement, but with 7 heaps. In room No. V, there were two heaps, one for every 33 square feet. Thermometers were placed only in rooms Nos. I and III, it being impracticable to take their reading, if kept in other rooms. The thermometer in room No. I registered 80° C., three-quarters of an hour after the "bratties" were set on fire, while that in room No. III showed only 65° C. Infected rags and cowdung and earth mixture and agar and bouillon cultures of plague bacillus were exposed in the rooms and bouillon cultures were made from these as before. In rooms Nos. I and IV, which contained 9 and 7 heaps of bratties respectively, the results were more satisfactory than in others. In these, all the bouillon and agar cultures and rags were found sterile. One petri dish in each, containing infected cowdung and earth, was not rendered sterile. In room No. II, only one petri dish, containing infected cowdung and earth, was not sterile. In room No. III, one bouillon culture, two petri dishes with infected rags and one with infected cowdung and earth remained unsterilised. In room No. V, one petri dish containing infected cowdung and earth and another with rags remained unsterilised. From these results, I consider that the heat was more evenly distributed in rooms Nos. I and IV, in which all the agar tubes were melted. Houses will, I think, be efficiently disinfected, if the heaps of "bratties", containing 60 in each, are so arranged as to have one heap for every 25 square feet of a room.

(d) *Letter No. 368, dated the 26th March 1903, from the same officer.*

I have the honour to state that the desiccator was used in a room measuring 44 square feet in a house in Chamrajpet Agraharam, Bangalore City. The desiccator was first filled with pieces of coal and "bratties" to the depth of about an inch and with the aid of kerosine oil were set on fire. Ten minutes afterwards, the desiccator was filled to the top with coal and, an hour after, the lid was put on. Plenty of smoke was given off through the flues for an hour and a half and the desiccator became red-hot, three hours after the coal was set on fire. Three bouillon and nine agar cultures of the plague bacillus were kept in different parts of the room, at the commencement of the experiment. Two thermometers, which were kept at about 2½ feet from the desiccator, registered only 50° C. at the end of three hours. Cultures were made from

the exposed tubes and incubated for 48 hours and, on examination, it was found that none of the tubes exposed had been rendered sterile. I am therefore of opinion that the desiccator is of no use whatever for disinfecting purposes.

No. 15,251-2—L.B.P. 741, dated Bangalore, the 22nd April 1903.

ORDER THEREON.—Government have read with interest the report of the Senior Surgeon and, though nothing definite can be said, at this stage, on the utility or otherwise of disinfection of infected houses by desiccation generally, yet the results of the experiments already made justify its continuance for a further period, say six months. The Senior Surgeon is accordingly authorized to incur such small expenditure as may be necessary in the initial stage and within his powers of sanction and include the same in the probable monthly statement of expenditure. The Senior Surgeon will give such instructions as may be necessary to supplement this desiccation with the chemical disinfection of the floor, in cases where such a course may be deemed advisable or necessary.

2. Government hope that detailed statistics will be maintained in every case and be available as to the number of houses so disinfected, with particulars showing the number of them wherein there have not been fresh cases since such disinfection.

3. It is desirable that the Cities of Mysore and Bangalore should be completely disinfected in the manner above mentioned, and the Senior Surgeon is requested to take early action.

H. V. NANJUNDAYYA,
Secy. to Govt., Gen. & Rev. Depts.

To—The Senior Surgeon and Sanitary Commissioner with the Government of Mysore.
The Comptroller to the Government of Mysore.

Report by the District Medical Officer on Plague Duty in the Civil and Military Station of Bangalore, on the various fuels used (1st May 1903).

Fuel.—The various fuels used were bratties, wood, charcoal and coal.

Smoke nuisance.—There was a great smoke nuisance from the first two fuels, and the people living in surrounding houses were put to considerable inconvenience, having to turn out from their rooms, while the desiccator was in use. The smoke was somewhat less with coal and was not present to any marked extent with charcoal.

Effect on walls, etc.—The effect of smoke on whitewashed walls was to leave them a dirty yellowish color and the difference in the general appearance of a room—between chemical disinfection and desiccation—is very noticeable, as far as a cleanly appearance is concerned.

Fire-risk.—There is always a risk of fire, when bratties and wood are used in the desiccator; flames have been noticed protruding about two feet from out of the flues on the cover and, in the cases where rooms cannot be made air-tight, there is every possibility of a spark being blown on to some combustible object (as bedding, clothing, wicker baskets, etc.) and resulting in a fire. The attached record of experiments shows the results obtained in raising the temperature at different altitudes with various fuels.

Pucka flat-roofed houses.—It will be seen that pucka flat-roofed houses gave the most successful results, owing to their being easily made air-tight.

Tile-roofed houses.—Only in one case was a tile-roofed house treated with success. There are many houses which cannot possibly be made air-tight to such a degree as would allow a successful rise of temperature.

Dimensions of rooms suitable for one or two desiccators.—Provided that a room can be made fairly air-tight, the dimension which one desiccator will successfully heat is from 8 to 10 feet in length, breadth and height and two desiccators from 18' to 20' × 12' × 12'. Large native houses, containing a court yard and five or six rooms, would require as many desiccators, burning simultaneously.

Time.—The time occupied for a desiccator to throw out a successful heat, i.e., 130° ground temperature and 158° mid air temperature, is from 30 to 45 minutes.

Cost.—The cost per room is roughly:—bratties As. 8, charcoal As. 14, wood As. 9 and coal As. 9. These average rates have been calculated on the total expenditure of the different fuels in 14 experiments.

Referring to the experiments, only in 5 instances can the results be claimed to have been successful. They were all pucka flat-roofed houses. Four houses contained rooms of a suitable size for one desiccator: the fifth house contained suitable rooms for two desiccators.

REMARKS by Captain R. F. Standage, I.M.S., the Residency Surgeon.

A consideration of the above facts, collected after a series of carefully conducted experiments, leads me to the following conclusions:—

(1) Desiccation, if effectively carried out and in suitable rooms, is a more thorough germicide than disinfection by chemicals, for, provided the proper heat is maintained, the plague bacillus is reached and killed in every part of the room, not escaping, as it might during a careless disinfection, in clothing or rags or other debris lying about the room.

(2) Desiccation has the further advantage of being applicable by the house occupiers themselves, so that, in houses where objection is raised to the entrance of low caste disinfecting coolies, the desiccator and the thermometer could be much more easily worked by the owner, under instructions from a medical officer, than could chemical disinfection.

(3) Desiccation also compares favourably with disinfection, as regards cost. The cost of the chemical disinfection of a room 10' × 10' × 8' would be as follows:—

Chemicals required—

1 perchloride of mercury lotion 1—1000.
12 gallons.

This equals.. { acid hydrochloric, 4 oz.
hydrarg: perchloride, 2 oz.

2 Quick-lime 1 parah.

4 oz. hydrochloric acid at 12 annas

2 oz. hydrarg: perchloride at Rs. 3-4-0

1 parah quick-lime

per lb.	0	3	0
"	0	6	6
"	1	0	0
	1	9	6

or, roughly, from Rs. 1-4-0 for a small room to Rs. 2 for a fairly large room. This cost compares unfavourably with the cost of disinfection by heat given above.

(4) On the other hand, desiccation cannot always be relied on to produce the requisite degree of heat, though results in this direction may of course improve with practice.

(5) Desiccation too does not give the same clean wholesome appearance as chemical disinfection. This could be remedied by subsequent lime-washing, but at a greatly increased cost.

(6) Desiccation involves some risk of fire.

(7) It must not be forgotten too that, in the event of desiccation being carried out on a large scale, the price of fuel would be sure to rise and would proportionately affect the prices quoted above.

(8) In conclusion, I am of opinion that desiccation could be, with advantage, used, in combination with chemical disinfection and with a considerable reduction of the total cost. The choice of rooms suitable for the process would have to be left largely to the disinfecting officers. The process is of course quite inapplicable to verandahs and to rooms which cannot be rendered sufficiently air-tight to prevent escape of heat.

Letter from the Superintendent of Police, South Canara, to the Chairman, Municipal Council, Mangalore, requesting that reports on cases of neglect of duty on the part of the Plague Police should be made to him (26th May 1903).

I have the honour to request that you will be so good as to point out to your subordinates that, if any plague duty constable is found neglecting his duty, his number should be reported to me and I will punish him. Your subordinates need not demand explanations from such men.

Proceedings of the Government of Mysore, issuing certain instructions for the disinfection of houses (No. L.B. 628-38, dated 19th November 1903).

READ AGAIN:—

Government Proceedings No. L.B.P. 248-258, dated the 1st September 1903, directing the due enforcement of the disinfection rules in the State.

READ:—

Further correspondence, ending with docket No. 1227 P., dated the 10th November 1903, from the Officiating Senior Surgeon and Sanitary Commissioner with the Government of Mysore, submitting a memo. of instructions in regard to the disinfection of houses, etc.

No. L. B. (P.) 628-38, dated Bangalore, 19th November 1903.

ORDER THEREON.—In supersession of Government Proceedings No. L. (B.P.) 248-258, dated the 1st September 1903, the attention of the Senior Surgeon and Sanitary Commissioner with the Government of Mysore, the Deputy Commissioners of Districts and the Presidents of the Bangalore and Mysore City Municipalities is drawn to Regulations 6 and 4, issued with

Notifications Nos. 9383—Mis. F. 21-96 and 9384—Mis. F. 21-96, dated the 10th February 1898, respectively, under the Epidemic Diseases Regulation, II of 1897 and to the Officiating Senior Surgeon and Sanitary Commissioner's Memo. of Instructions approved by Government and hereto appended and they are requested to see that the directions therein contained, regarding the disinfection of houses, etc., are duly enforced.

2. The attention of the officers concerned is also invited to the procedure prescribed, in regard to the treatment of deserted or vacated houses, in Notification No. Pg. 5235—21-96, dated the 15th October 1898, as amended by Notification No. 706, dated the 21st December 1898, and Notification No. Pg. 524, dated 23rd November 1898 and No. 708, dated the 21st December 1898, and also to Regulations 6 A and 6 B of the Regulations issued under Government Notification No. 710, dated the 21st December 1898.

H. V. NANJUNDAYYA,
Secy. to Govt., Gen. & Rev. Depts.

To—The Senior Surgeon and Sanitary Commissioner with the Government of Mysore.
The Deputy Commissioners of Districts.
The Presidents of the City Municipalities of Bangalore and Mysore.

*Memo. of Instructions drawn up by Lieutenant-Colonel J. Smyth, M.D., I.M.S., Offg.
Senior Surgeon and Sanitary Commissioner with the Government
of Mysore, for the Disinfection of houses, etc.*

1. The underlying idea in disinfection is that by it sterilization of the thing disinfected is accomplished. Disinfection is a slipshod sort of word in this connection and ought to be abolished. Sterilization is what is sought and what should be our endeavour to accomplish and is the word that ought to be used. It is a word which impresses the operator with a sense of the exactness with which the procedure must be carried out and its comparative futility, when not carried out exactly. It must further impress us with the idea that this procedure must be but auxiliary to general hygienic measures, for who shall say that by any of them the sterilization of a house, not to mention a hut, can be accomplished? But, if we cannot sterilize a house, we can, by great exactness of method, enormously diminish the amount of contagion and hope that the added means of drying and ventilation will do the rest.

2. In Mysore, three methods of disinfection are carried on, side by side, now one and again another being used, as circumstances indicate. But, when possible, air and sunshine are availed of to the fullest extent, and clothing and furniture receive equal attention with the house itself.

3. The methods are:—

- I. *The method by Chemicals*—the Chemical mostly used being the acid solution of the perchloride of mercury.
- II. *The method by Desiccation* and
- III. A combination of these two methods.

In all methods, the disinfection of clothes and furniture should receive the first attention. It is the disinfection of these that gives the most trouble and, as it is often, in spite of every effort, exceedingly incomplete, leaves the worker with the melancholy thought that, despite all his efforts, the work has been done in vain. If we could get at all the clothes and furniture and subject them to our processes, things need not be quite so bad, but, despite all precautions, clothing and furniture will be spirited away, to be returned in their foul infected condition with the re-occupation of the building.

However, in the huts of the very poor, there is not much to be removed and little clothing to be disinfected, beyond what the people are wearing and perhaps a change of clothing in the hut. It is probable that these articles are about the worst infected things about the habitation and they should therefore receive the most careful attention. It is very often a problem, how their disinfection may be best secured, especially in wet weather, when, unfortunately, plague is generally most prevalent. An ideal method—but purely ideal—would be to send round a hot air or steam disinfectant, to deal solely with clothing. But this is of course quite impracticable, except in the very earliest stages of an outbreak in large towns. And, under these circumstances, this attempt should certainly be made. However, for general purposes, it is impracticable.

So the first thing to see about is the *disinfection of clothing and furniture*.

If the desiccation method is used, the operator should first see that something in the way of a change of clothing for every inmate is included amongst the articles shut up in the house about to be desiccated. The thermometers are then set and the fires lit. When the proper heat (70° C.) has been maintained for about half an hour, the change of clothing is to be taken out and handed to the occupants, who don them and hand over their infected clothing, to be shut up in the house and kept there till the fires die down. (It has here to be admitted that even this is not perfect, for the inmates possibly still have the infection on their persons, unless they have been washed with a disinfectant—again an impracticable procedure). To this procedure people raise little objection.

If, however, it is disinfection by chemicals that is in use, there is no known method of satisfactorily disinfecting wearing apparel by its means, except soaking it in the solution. To this people raise the greatest objection, which is not to be wondered at, if the weather is wet.

Having disinfected the change of clothes, the next thing is the disinfection of the house:

I. *By Desiccation*.—Disinfection of a house can be conveniently done with heat. The articles required are:—(1) A supply of bratties or dried cow-dung sufficient for the whole house. (2) A few ounces of kerosine-oil. These two can occasionally be had in the houses themselves. (3) A sufficient number of thermometers. In the absence of graduated thermometers (Mercury), paraffin ones, made for the purpose, may be used. These can be had, on application to the Health Officer, Bangalore. The object aimed at is to raise the temperature of all the rooms in the house to a point above that at which germs die, that is, 70° C. It is found that this temperature can be easily reached, without damage to the house or property, by burning bratties. The bratties are arranged in every room of the house, in circular heaps of from 1½ to 2 feet in diameter and about 1 or 1½ feet in height; one or more such heaps have to be made, according to the size of the room. Roughly, there should be one heap to every 40 square feet of floor area. In tiled rooms, more heaps will be required to raise the temperature to the required point than in mud-roofed houses. Bratties without straw in them give greater heat than those with it. The height of the heaps should vary according to the height of the roof or ceiling. In thatched houses, the heaps should be as low as possible. The maximum height need not in any house be more than 2 feet. The number of bratties that go into each heap will vary according to their size and the size of the rooms. From 70 to 150 bratties are required per heap as a rule.

When the floor is of a material that would be damaged by fire, the bratties should be arranged in desiccators or on sheet iron trays placed on stands a few inches above the ground.

When all the heaps have been made, the furniture in the rooms should be so arranged as to be exposed to the heat but not damaged by the fire. Inflammable materials, if any, such as kerosine-oil or gunpowder, should be removed altogether. Clothes may be spread out and hung on the walls. Boxes or clothes may be left as they are, with the lids open.

Thermometers are kept in convenient corners away from the fire. Those registering below 100° C. (or 212° F.) should not be used, as they are likely to burst, when the temperature goes high.

A few bratties may then be soaked in kerosine-oil and inserted into the sides of all the heaps at the lower part and set fire to, and the heaps allowed to burn. The doors and windows are kept closed, so that the heat may not escape and get diffused. If thick black smoke is given out, some air must be let in to help the combustion. The smoke generated, however, is not altogether a disadvantage, for it necessitates subsequent cleaning and lime-washing of the house, which is a useful adjunct to the disinfection.

If the bratties are properly arranged and lit, it will be observed that the temperature will go up to the required point in something less than half an hour. Very often the temperature on the floor can be raised to 203° F. or 95° C. When the maximum temperature required is reached, the fire is not put out. It is allowed to go down of itself, so that it takes about half an hour or more for the heat to go down to normal. This is sufficient to kill most microbes. It also kills fleas, bugs and other vermin, which, in some houses, are a constant source of annoyance to the unfortunate inmates. Spiders, cockroaches and little creatures, if any, also die; rats either run away or die in their holes. Apart from killing germs and small insects, the application of heat in this way has another very important use, that is, it dries up or destroys organic matter, with which the floors and walls of houses are often saturated and which probably is the medium in which germs lived. This tends to prevent or delay subsequent infection.

After the fires have burnt to red cinders, the door should be opened and the red-hot coals raked over the floor right into every corner and then let die out.

It is well to place the thermometer just inside the door, where it is generally most difficult to raise the temperature to the proper height. If the proper temperature is registered there, the operator may be quite satisfied that it has been reached everywhere else in the room.

This method is not applicable to houses or huts that cannot be made fairly air-tight. Any considerable escape of the heated air through holes in the walls or broken doors will prevent the temperature being attained and desiccation will not be effective.

II. *Disinfection by Chemicals*.—The preparation used is an acid solution of perchloride of mercury. The solution is prepared as follows:—

Perchloride	..	..	..	..	..	..	..	..	½ oz.
Hydrochloric Acid	..	..	..	..	..	..	..	..	1 oz.
Water	..	..	..	..	..	..	..	..	3 gallons.

This equals about 1 in 1,000 parts.

Before applying the disinfectant, the room should be completely emptied. The solution should then be doused over walls and floors, not merely sprinkled.

The furniture should be doused with the solution. Cotton cloths are disinfected, by soaking them in a solution containing no acid, i.e., in a neutral solution. Silk, wool and leather are much damaged by chemicals and, where they cannot be desiccated, exposure to the sun must be trusted to, for disinfecting them—which can be done, when there is sunshine. But, when there is no method of desiccation or when there is no sunshine, any disinfection, short of the destruction of such articles, is very difficult, if not impossible and, in proportion as their disinfection is imperfect, so much is the whole operation rendered of less value.

This method is applicable to solid smooth-plastered houses and is the only method for habitations which cannot be shut up for desiccation purposes. Chemical disinfectants are very useful in the sick room of a plague patient and throughout the house. The solution should be applied freely over the floors during the illness, whether it is proposed ultimately to disinfect by chemicals or by desiccation.

III. What may be called a third method of disinfection is a combination of chemical and desiccation methods, which is recommended for use in the frontier villages and must be as near perfection as such processes can be.

4. To prevent re-infection by rats, a circular has been issued, recommending the use of a mixture of one part of sulphuric acid to 9 parts of tar, with which the border of the floors and suspected rat-holes and rat-runs should be smeared weekly.

But a much more satisfactory course to adopt would be to make an attempt to destroy the rats. This may be done by traps or poison or both together. Poison should be placed in every house in poison tubes. These are made of tin, about ten inches long and three inches in diameter. A ring of paste, made of rice, flour and ghee and impregnated with "Rough on rats," is then smeared freely on the interior, midway between the ends. Rats and mice can easily get at it thus, but not dogs or fowls.

Report from the Tahsildar, Gooty, regarding dead rats (No. 221 P., dated 1st March 1904).

Dead rats were found in Gooty town in the following places:—

(a) *In the Sub-Registrar's Office.*—A rat was found in an ink-jar yesterday. It does not seem to have died of plague, but, to be on the safe side, the rat was burnt and I am getting the office disinfected.

(b) *In the Assistant Sanitary Inspector's house.*—This is a lonely building, far out of the town. I have asked him to evacuate and disinfect the house.

(c) *In barber Rāmāyā's house.*—The owner stealthily vacated it and removed himself to a house opposite, a few days ago. On being adjured, he said to me to-day that a dead rat was found being eaten by a cat. More must have happened than he is willing to admit. I am getting both his old and new houses disinfected, with ten inmates and their property. I shall passport them also.

Note by the Sanitary Commissioner, Madras, regarding desiccation by heat (No. 55 P./T., dated 21st March 1904).

* * * *

I trust that, although the action of the patentees at Home, as explained to Mr. Cardew by me, has prevented my getting locally made readily portable steam disinfectors, on the arrival of the Sny-Scheerer pattern of sterilizer intended for the King Institute, it will be possible to imitate it locally—there being no patent in India—and thus solve the difficulty of better attention to clothing. As to desiccation by heat, experiments by Dr. Parsons (a Medical Inspector, Local Government Board), as far back as 1884, show that uniform heating—without which, nothing is possible—of any compartment is out of the question, by means of dry heat, even when it is specially made for the purpose. When it comes to heating a native house, it is obviously a futile experiment or, at least, leaves far too much to chance. At any rate, I enclose for information experiments by the Bacteriologist of the Mysore Government, showing how very variable—as might be expected—are the results secured. If heat is to be applied successfully at all, it must, I think, be applied direct, and this I have shown as possible, but the time consumed is greater than with liquid disinfectants. I propose causing the Superintendent of the King Institute to carry out a series of experiments on this point with a more powerful flame and, for this purpose, I have entered a small sum in the Plague Budget for the next quarter.

Letter from the Superintendent of Police, South Canara, regarding the control of the Special Plague Police (17th June 1904).

Has the honour to point out that the temporary police are under the orders of the Superintendent of Police and by that officer only can orders of transfer, leave, etc., be issued. Were it otherwise, there would be endless confusion and discipline would be at an end. In this case, the constable cannot be punished, as the Vice-Chairman had no authority to transfer the man, without reference to the Superintendent of Police. It is requested that, in future, the Vice-Chairman will refer all such men to the Superintendent of Police. In cases of great emergency, when the Superintendent is far away, reference should be made to the District Office, where orders will be issued, pending the Superintendent's sanction.

Letter from Mr. Marden, Coimbatore, giving the result of his experiment with "phosphorus paste" regarding rats (21st June 1904).

I regret to say that, within a week of your filling the rat-holes in my store room with tar and sulphuric acid, the rats had made their way in or out of those holes. A few weeks before this, I put a paste called "phosphorus paste" (brought from the Nilgiri Pharmaceutical Co.) on bread and left it about the house, with the result that about half was taken during the night and the rats and mice disappeared for a fortnight or so. I have not since tried a second lot of the phosphorus paste.

Reports from certain Plague Supervisors, Coimbatore, regarding the difficulties in evacuating certain Toddy and Arrack Shops and Post Offices in Infected Villages (15th July 1904).

POST OFFICES, TODDY AND ARRACK-SHOPS OF THE INFECTED VILLAGES.

Vadavalli Toddy and Arrack-shops.—The evacuation of the village was completed on 20th March 1904. The toddy and arrack-shops were not evacuated till the middle of May, when the contractors were actually forced to get their shops evacuated.

Tondamuttūr.—Both the arrack and the toddy-shops were not evacuated at all, in spite of repeated orders.

Perūr.—Arrack-shop was not evacuated at all.

In other villages, the contractors were made to get their shops evacuated, after a good lot of persuasion and threatening.

The chief objection to the removal of these shops was the apathy shown by the Salt and Abkārī officers. The contractors were afraid that they would be prosecuted, if they removed their shops from the sites fixed in the license.

Post Office.—The evacuation of the Post Office was delayed for a long time, for want of departmental permission for the removal, according to the sub-postmaster. A concession was given, by allowing the removal of the office to a *Madam*, seeing that the departmental permission would be coming at a very late hour. The postmaster, instead of utilizing the building for his office, made it his residence and lived therein with his people. He was prosecuted for this and fined Rs. 5.

I beg to bring to your kind notice that much difficulty is experienced in evacuating the toddy and arrack-shops in the villages which are indigenously affected with plague and the following instances will convince you of the same.

2. Kāramadai was the first village to be indigenously infected and, when the evacuation of the infected blocks was ordered by the Special Plague Officer, all the owners of inhabited houses and shops obeyed the order and the only building, which remained to be evacuated, was the toddy-shop. When questioned, the owner refused to evacuate, saying that, in the shop-license, the limits of the building are defined, that, in case the shop is transferred to some other building, he will be prosecuted and that nothing can be done, in the absence of any orders from the officers of the Salt and Abkārī Department. I then explained the danger of holding the shop in the infected block and persuaded him, after much discussion.

3. Again, Méttupālaiyam was infected and the owners of a toddy-shop and another arrack-shop there refused to evacuate their buildings, putting forth the above excuses, while other inhabited houses and bazaars in the infected block had been evacuated, under the orders of the Special Plague Officer. Any amount of my personal advice have had no effect. Thereupon, a written notice was issued to the owners concerned to evacuate the shops within five hours' time, on pain of prosecution, and this had the desired effect.

4. I beg to submit, therefore, that definite orders may be issued to the officers of the Abkārī Department to instruct the shop-keepers (arrack and toddy) to evacuate their shops, whenever they are required to do so by the plague officers.

I beg to bring to your kind notice that, in Group A, the toddy and arrack shop-keepers of the following villages were obstinate and stubborn in evacuating their shops, when the villages were infected with plague.

My kind advice and warnings to evacuate their shops proved of no effect. They were pleading then that they could not be evacuated without the special sanction of the Collector or of the departmental authorities.

As for the post office at Annúr, I beg to state that the same was also not evacuated, when Annúr was infected. The postmaster concerned pleaded that it could not be vacated, without the sanction of the Postal Superintendent. Detailed reports were already submitted about these persons for your honor's perusal.

Annúr	Toddy and Arrack-shops.
Do.	Post Office.
Kunnattúr	Toddy and Arrack-shops.
Sravanampatti	Toddy-shop.

Letter from the Collector of North Arcot, forwarding communications from the Sub-Collector and Head Assistant Collector, pointing out certain defects in the Passport-System (No. 9, dated 15th July 1904).

1. Most of the officers consulted consider that the present passport-system is defective in certain points, in that it leads to evasions. I enclose in original my Sub-Collector Mr. Dutt's report in the matter, as it contains some very useful suggestions. I also enclose Mr. Bardswell's report in original. He points out that the absence of definite instructions in the rules in regard to the issue of passports to those arriving at one infected place from another and from the second infected place at an uninfected place has led to an uncertainty of procedure. If the rules are altered, this point may be made clear. It is desirable that every one should be under observation, for the full 10 days after he leaves any infected area.

2. The Head-Quarters Deputy Collector is of opinion that the large number of evasions that now occur is mainly due to the restriction about the compulsory appearance of the passport-holders every day for observation for 10 days. He thinks that, if arrangements could be made for their observation in their residences, the difficulties that now exist in the working of the system would be greatly minimised. I have made a somewhat similar suggestion to you already, in regard to observation in rural areas.

3. There is no doubt that the passport-system is not perfect. The wonder is that, with so many loop-holes for escape, so few people really evade the rules. In most cases, a man can easily evade them and escape punishment. The people are by nature law-abiding, and to this the comparative success of the system must be attributed. I am not personally in favour of passport gates.

ENCLOSURES.

Letter from A. C. Dutt, Esq., I.C.S., Sub-Collector.

1. The plague work in this district is being done by a special staff and I do not know the details of it well. I have, however, worked in other districts, where Divisional Officers have to do the work and I trust that it will not be considered irrelevant, if I base my remarks, to a large extent, on my experience elsewhere.

2. My opinion is that people do not find much difficulty in evading the passport rules, if they like. My opinion is based on the fact that I have found that the number of tickets from an infected locality delivered at a certain station is frequently in excess of the number of passports issued at the station. Thus, on inspecting the passport books of Gudiyáttam, I found that 40 passports were issued to persons coming from Bangalore on 1st January 1904. On inspecting the ticket collection books (which the Railway department usually permit me to see), I found the number of Bangalore tickets delivered on 1st January 1904 at Gudiyáttam to be 50. It is unlikely that 10 exempted persons should come into a station on the same date and the figures seem therefore to show that many persons are evading the taking of passports. If we constantly check the passport books with the ticket-collection books, we can usually secure a good paper result, but there is always then a suspicion that the station-master and the passport clerk are taking their books together. The number of cases of objectionable and deliberate evasions of the passport rules that are discovered is exceedingly small and the Sub-Magistrates do not pass adequate sentences in such cases. In my opinion, it is absolutely necessary to make the Sub-Magistrates see that a distinction should be drawn between a deliberate and a possibly careless evasion. Thus, if a man, on coming from Bangalore to Vellore, refuses to take a passport, he should be heavily punished. If he gives a false name and address at Vellore, he should rarely be given the option of a fine. I find, however, that Sub-Magistrates usually treat such persons in the same way as persons who take out passports and give their true names and addresses, but fail to appear before the observing authority for three or four days out of 10.

3. The last is the class of cases usually placed before a Sub-Magistrate and such cases are, in my opinion, too heavily punished.

5. My suggestions with regard to passports for Railway travellers are as follows :—

(1) The passport books should be regularly checked with the ticket-collection books (with permission of the Railway authorities) and a periodical report of the result submitted to the Collector;

(2) The plague staff should try to detect cases of persons who have given false names and of persons who have neglected to take out passports, rather than cases of failure to get observed for a few days; and

(3) Sub-Magistrates should be distinctly given to understand the difference between the two classes of cases.

6. Passport gates round the town are, in my opinion, of little value. The work of the passport clerk cannot possibly be checked and the men cannot be trusted, unless we can check their work. It is true that the mere fact that there is a gate to pass sometimes checks an exodus. But it is usually the healthy people who are deterred from passing through the gates. The sick people, who are specially interested in escaping, usually find some means, however risky, of escaping from an infected locality. Instead of having passport gates, I would insist on village munsifs finding out where strangers to their villages come from and on their supplying them with passports. If the work of village munsifs in this connection is properly supervised by plague inspectors, we might do away entirely with our passport gates.

Letter from H. R. Bardswell, Esq., I.C.S., Head Assistant Collector.

1. At present, no uniform procedure is adopted in the issue of passports to persons arriving at one infected area from another. Sometimes passports are issued to such persons and sometimes not. I believe that the issuing of passports in such cases is necessary under the rules, though I do not think that it is very necessary for practical purposes. The main idea is to protect, as far as possible, areas not already infected from becoming so by immigration from an infected area, but an area already infected hardly seems to need protection.

2. Taking the case in which a passport is issued to a person arriving at an infected area, A, from another infected area, B, there is also a difference in the procedure adopted, when such an arrival passes on from the second infected area to a third place which is uninfected. Suppose, for instance, that a man leaves Ránipéttai, an infected area, and goes to Arkonam, another infected area, where he is given a passport on arrival and, after receiving the passport, stays for, say, four days and then leaves for an uninfected locality. The present practice in such a case seems to be that :—

(a) if he leaves Arkonam by rail, the ticket issued at that railway station is punched with a plague punch and either a fresh passport is given then, which runs for ten days from that date, or the original passport is allowed to remain in force, in which case the passportee does not subject himself to observation for the full period of ten days from the date of his leaving the last infected locality and

(b) if he leaves Arkonam, not by rail, but by road, for a non-infected place, he has to pass through a passport gate, at which the passport originally granted is shown, and the passport clerk does not issue a fresh passport, but merely puts his initial on the old passport and so allows the passportee not to avail himself of the benefit of observation for the full period of ten days from his leaving Arkonam. It is very desirable that the observation of the man who leaves an infected area for an uninfected area should be for the full period of ten days from his leaving the infected area. The absence of definite instructions in the rules on this point has, I think, led to this uncertainty of procedure. Steps may be taken to remedy this defect.

3. In some places, as for instance at Kuppam, the practice seems to be for the station-house officer to maintain the register of passportees observed, while the duty of observing the passportees is assigned to the local hospital assistant. The reason seems to be that the medical subordinate cannot conveniently attend to the large amount of scriptory work involved in maintaining the register, in addition to his ordinary professional duties. This dual system causes a good deal of inconvenience to passportees, not to speak of the ignorance on the part of many that they should attend the two places, the police station and the dispensary. The observation and the maintenance of the register should, I think, be combined in one and the same man—local medical subordinate—a clerk being given, to assist him in the scriptory work, where necessary. A hospital assistant will ordinarily have a subordinate capable of helping him in this work.

4. Note 3 to Rule 2 (3), page 5 of the *Plague Regulations*.—Rule 103 gives the Collector the discretion of adding to the list of Assistant Plague Officers persons of known and approved character and responsible position. In some places, as, for instance, Sholinghur, there is neither a Tahsildar nor a Deputy Tahsildar, but there is a Sub-Registrar, who can be said to hold a responsible position under Government and who, I think, can well be authorized to exercise the power of exempting from personal attendance any passportee, under note 3 to rule 2 (3).

5. In rule 4 (page 6 of the *Plague Regulations*), it is said that the passportee "shall, unless exempted for ten days from the date of the issue of the passport, daily present himself with his passport, etc." This would imply that the ten days' observation period should be calculated from

the date of the issue of the passport, while rule 2 (1) and the form of passport printed in Appendix II-A convey instructions that the passport should be observed for ten days, commencing from the day next to that on which the passport is issued. A correction would seem to be necessary in rule 4.

6. *Appendix II-II.*—In the list of officers entitled to permanent exemption from passport rules, the class of plague supervisors and inspectors and such other responsible plague officials on effective duty may be included *ex-officio* and they may be granted exemption certificates on their first appointment and without their having to apply for them.

7. Rule 33 appears to lay great stress on the examination of gosha women being always conducted by females. I think that the rule might be so worded as to make it clearly apply also to females, who, though not absolutely gosha, are of such social position as not ordinarily to go about in public.

Letter from the Deputy Superintendent of the King Institute of Preventive Medicine, regarding the mode of Examination of Candidates for the post of Temporary Sanitary Inspector (19th July 1904).

All candidates for the temporary sanitary inspectors' class are carefully examined by me, previous to admission, as to their moral character and as to the public examinations passed by them, the certificates being scrutinized by me in each case. Any doubtful case would be referred to the Sanitary Commissioner.

I also beg to forward a copy of the syllabus of lectures, delivered by me as Acting Personal Assistant, since November last. The syllabus was drawn up in July 1903 (up to which time, the Sanitary Commissioner instructed the class) by my predecessor Assistant Surgeon Krishnamurti Aiyar and was used by him for the previous classes. The text book used is the "Plague Inspector's Manual". Each candidate is provided with a copy, for which he deposits one rupee, which is returned to him on delivery of the book.

The candidates undergo 15 days' training, during which period oral lectures are delivered by me, and revision of the subject-matter of previous lectures is secured, by frequent questions being put in the class. At the conclusion of the course, the students are given practical demonstration regarding disinfection methods and the care of the sick until the arrival of the medical section of the ambulance. For practical instruction in disinfection, the class is divided into two or three sections, according to the number enrolled, and each section is taught separately and, if possible, all the sections are assembled on some one day and the whole demonstration repeated. At this class, coolies are temporarily employed as disinfectors, to demonstrate practical disinfection: they are given the usual coats, trousers and boots: a hand-cart is obtained, on which are placed all the articles required for a sanitary section of the ambulance staff: the various disinfecting solutions and their manner of preparation is demonstrated, and the candidates are shown how to disinfect a dwelling, as well as all articles found within it.

Prior to the written examination, the candidates are personally inspected by the Sanitary Commissioner as to their general social status and also their physical fitness for employment as plague inspectors. I believe the marks so gained are employed by the Sanitary Commissioner, in giving a final value to the paper of each candidate.

The questions for the examination are set by the Sanitary Commissioner, who also finally examines the answer papers. Copies of questions for previous examinations are attached herewith. As a rule, these have been given to me by telephone, after I had assured the Sanitary Commissioner that all candidates were in their examination places, his object being, I believe, to render it impossible for any paper to be known previous to the actual assembly of the class. It will be observed that the fourth question is always the same, that is, concerning disinfectants. The candidates are aware of this being a standing question and, if not perfect in their replies, they are not allowed to pass, whatever the results may be in the other parts of the paper.

Letter from Messrs. Spencer & Co., quoting the prices of Izal, Fluid and Powder (27th July 1904).

We have received a small consignment of this preparation in fluid, also in powder, for which we quote as follows:—

						RS.	A.	P.
Izal fluid in 5 gallon drums, per gallon	..	..	..	..	..	4	12	0
Do. 1 do. do.	..	..	..	..	..	5	12	0
Do. 1 pint cans, per can	..	..	..	..	..	1	6	0
Izal powder 1 cwt. double bags, per bag	..	..	..	..	..	8	0	0
Do. 1 lb. tin (perforated top), per dozen tins	..	..	..	..	..	4	0	0
Do. 2 lb. tin do. do.	..	..	..	..	..	8	0	0

(Delivered on rail, Madras.)

**Letter from the Chairman of the Chamber of Commerce, on the subject of Plague Administration in Madras (1st August 1904).*

I have the honour to inform you that your letter of the 14th ultimo was circulated among Members of the Chamber and the subject of Plague Administration in Madras was fully discussed at the General Monthly Meeting held on the 26th idem. As regards the general Administration, the Chamber is of opinion that, though the regulations may be inconvenient to individuals, they do not involve any serious dislocation of trade nor such great injury to mercantile interests as would certainly follow upon an outbreak of the epidemic in this city. The Chamber is not in a position to assign with certainty a reason for the remarkable immunity from the disease which Madras has hitherto enjoyed, but it considers that the Plague Regulations and the protection they afford are probably one of the main causes contributing to this happy result. For this reason, it holds that the expenditure that is being incurred on plague preventive measures is justified, so far as Madras and its neighbourhood is concerned.

The Chamber has no suggestions to offer with regard to a modification of the rules, which seem to it to be as comprehensive and satisfactory as possible under the circumstances, but it begs to suggest that other plague inspecting stations should be opened at the police thannah on the Mount Road, opposite to Neill's Statue, and at the thannah on the Poonamallee Road, near Spur Tank. Many of the existing stations are situated in very inconvenient localities, so far as a large number of people are concerned, especially those living in the Club and the chief hotels, Kilpauk and Chetput and, if stations were opened at the places named, the inconvenience that is now felt would be removed.

Letter from the Collector of the Nilgiris, to the Secretary to Government, Local and Municipal Department, regarding the cost and personnel of the Plague Observation Staff (No. 1288, dated 5th August 1904).

The cost and personnel of the plague observation staff has been long under discussion. At present, when a district is threatened, a large number of circles are formed and inspectors appointed, whose sole duty is to bring to notice suspicious cases of illness or death. Usually, they have undergone only a few days' training, but nevertheless their salary is higher than that of a fifth-grade hospital assistant, who has, at great expense and after 3 years' study in the Medical College, obtained a diploma.

There can be no comparison between the relative merits, qualifications and utility of these two classes of servants and, in the case of hospital assistants, Government has an additional guarantee for good behaviour, which is altogether wanting, in the case of circle inspectors.

2. For these reasons, Government, in G.O., No. 1257-P., dated 4th November 1903, ordered that hospital assistants, when available, might, in all cases, be employed, in place of sanitary inspectors on plague work. I would venture to suggest that this order be given wide application.

3. In this country, epidemics of all sorts, such as plague, cholera, small-pox, etc., and malarial fevers and sicknesses of various kinds, are of frequent occurrence, to combat which no permanent itinerating staff has been organised, except that of the vaccination department. Hospitals and dispensaries have conferred an enormous boon, but reach comparatively few and are of little use for purposes of observation and prevention, which is the special object of this reference.

4. Small-pox has received special consideration, with the result that we now have a well-organised itinerating department.

Plague preventive measures are now engaging attention and, instead of dealing with each of the various kinds of epidemics separately, it seems to me advisable to organise one department, whose duty would be to attend to all.

The objects of such an itinerating staff would come under the following heads:—

1. Medical relief in villages.
2. Epidemics—
 - (a) Plague.
 - (b) Cholera.
 - (c) Small-pox.
 - (d) Malarial fevers, enteric, etc.
3. Sanitation.
4. Vital statistics.

5. The personnel would necessarily be hospital assistants, each of whom should be supplied with a small medicine chest, containing all medicines and appliances required for vaccination, plague and other purposes. These men could then, in addition to discharging the duties of plague circle inspectors on observation and preventive duties, provide general medical relief in

villages, thus obtaining the confidence of the people and, at the same time, discharge the duties of vaccinators and, in actual out-breaks of plague, cholera or small-pox, carry out the necessary measures of disinfection, segregation, evacuation, etc. In their tours, they would supervise general sanitation and vital statistics.

Their duties would be both preventive and remedial. Under preventive, we would have—

- (a) for Plague—Observation.
- (b) for Cholera—Water-supply and general sanitation.
- (c) for Small-pox—Vaccination.

Under remedial, we would have ordinary medical relief, together with the usual measures of disinfection, etc.

6. At present, very large sums are spent on vaccinators and circle inspectors, whose functions are very limited and who are useless for other purposes. This multiplication of offices, or rather separation of duties, leads to enormous expense and delay. A circle inspector can only report a suspicious illness, but cannot diagnose or treat it, but he nevertheless draws more than some hospital assistants. The salary of a first-class vaccinator is Rs. 18 and this would go some way to paying a hospital assistant, who could discharge both duties. In ordinary times, a permanent staff on the lines suggested would be far more economical and beneficial and, when necessity occurred, temporary men could be recruited.

7. As to the relative utility of the three classes of servants, there can be no question, but the main difficulty is that the supply of hospital assistants is not equal to the demand. The number would, however, certainly increase, as appointments were offered and an organisation, such as is here contemplated, must be the work of time.

8. One main reason for the formation of observation circles is that the village officers will not maintain their birth and death registers properly. Nor will they report sudden and suspicious deaths. Itinerating hospital assistants would be a useful check and this might be supplemented by increased penalties.

Notes by F. D. Bird, Esq., and A. Fotheringham, Esq., (Coimbatore), regarding the recruitment of the Plague Staff (6th August 1904).

F. D. BIRD, Esq.

I do not think that the question of examinations should receive any consideration in the matter. What is wanted for plague work is a sound body with plenty of energy in it, rather than scholastic attainments. I would suggest outside recruitment on the following lines. A definite promise of employment for two years, to be extended thereafter for a year at a time—the promise of permanent absorption in the subordinate grades of any public department in any part of the Presidency, after the cessation of plague duty, conditional on good conduct as a plague officer and subject to a period of probation in the new appointment: past plague service to count for pension, if eventually confirmed. In this connection, I would specially suggest that the President of the Anglo-Indian and Eurasian Association at Madras should be asked to induce suitable young men of that community to come forward for training in plague work. In their case, no question of caste prejudice can arise; they would be as ready to go into the house of a Pariah as into that of a Brahmin and the possibility of misunderstanding, started and spread by interested parties, when, as at present, orders are issued by a man of lower caste to those of a higher or *vice versa*, would be obviated. There are other reasons which lead me to think that a good man of that stamp would be of value for plague work. I would not restrict recruitment to persons who are not in Government service already, but I would insist on certain conditions being fulfilled, before a revenue or other subordinate was transferred to the plague department, to guard against an unsuitable man taking up the work merely to get an increase of pay. I think the (revenue) appointments of such men should be permanently filled up and they themselves should be placed on a second list, to be absorbed eventually in the same department, after a period of not less than two years, if their services are required so long for plague work and subject to good work as plague officers. They should not lose the benefit of any promotion they would have received had they not volunteered for plague work. All the plague staff should be available for transfer to any part of the Presidency, as necessity arises. Lists of men available for transfer should be sent to Collectors of newly-infected districts.

A. FOTHERINGHAM, Esq., I.C.S.

I do not like the suggestion. No one wants to spend his life on plague work and the permanent men will not care to have their places permanently filled up, unless an open door is kept for them to return to the regular line, without having run any risk of losing promotion.

I much prefer the counter-suggestion of considering plague duty a special means of recruitment for the regular pensionable service, by means of which a man can escape from the irksome rules regarding qualifications for service.

Opinions of certain Collectors, etc., on Captain Niblock's suggestion to make the taking of Thumb-Impressions a part of the Passport-System.

R. RÁMACHANDRA RAO, Esq., COLLECTOR OF KURNOOL.

I do not think it practicable to adopt the system referred to therein. Not that I think the passportes would object to their thumb-mark being obtained, but that cases of fraud are very rare; not a single case has come to my notice; the labour of verifying, if the thumb-mark on the passport is that of its presenter, is great, and legible marks cannot be taken by the majority of our passport-issuing officers.

E. SCOTT, Esq., I.C.S., COLLECTOR OF ANANTAPUR.

I consider it would be quite impracticable and of little use to have the taking of thumb-impressions made a part of the passport-system.

C. M. MULLALY, Esq., I.C.S., COLLECTOR OF THE NILGIRIS.

The introduction of thumb-impressions, as a part of passport-system, is inadvisable. I agree with the Revenue Divisional Officer, the District Medical and Sanitary Officer, the Civil Surgeon, Ootacamund, and the Chairman, Coonoor, copies of whose reports I enclose.

CAPTAIN P. C. GABBETT, I.M.S., DISTRICT MEDICAL AND SANITARY OFFICER, THE NILGIRIS.

I do not think there would be any gain from obtaining thumb-impressions on passports. It would add to the delay already incurred in issuing passports and it requires considerable care and experience to identify even good thumb-impressions.

Thousands of passports are being issued daily—often by very minor officials, all of whom would require apparatus and experience.

In the case of permanent certificates, it should always be obtained, when possible.

F. HANNYNGTON, Esq., I.C.S., REVENUE DIVISIONAL OFFICER, THE NILGIRIS.

Such a course would lead to lengthy delays at passport-issuing stations. Cases of fraudulent possession of passes are so rare that I do not consider that the course suggested is called for, though it may have been found to work well at a plague camp.

G. H. COLEMAN, Esq., CHAIRMAN, MUNICIPAL COUNCIL, COONOR.

The suggestion is feasible in granting camp detention certificates or even contact passports, where ample time exists for obtaining such impressions, but to introduce it, when granting passports to travellers at railway stations, etc., where the greatest expedition has to be used, would seriously hamper the passport staff and cause much delay. The few cases of fraudulent possession of passports, which may have occurred in this Municipality, do not appear to justify the adoption of this suggestion.

MAJOR F. J. CRAWFORD, I.M.S., CIVIL SURGEON, OOTACAMUND.

In my opinion, the plan of placing thumb-marks on passports is not generally practicable. It would cause great delay at the important stations and still more in checking the impressions so as to identify the passports. Unless every case were thus checked, the system would be useless and it is only necessary to be present any shandy day to estimate the inconvenience a wholesale comparing of thumb-impressions would be to the crowds of waiting people. The plan might be practicable in a small area, such as a town protecting itself by issuing passports to all people entering it. It might be expedient, if, in certain towns, there were strong reasons to think that personation were resorted to, to the danger of a particular community.

The idea occurred to me several times last year, but I gave it up as practically impossible. Those officials who would ordinarily have the duty of comparing finger prints would be quite incapable of doing it properly, without calling in the more skilled and with all the delay incidental to such a proceeding.

It would mean the introduction of an extra "rule of thumb," in a system where rules of thumb are much too common.

What is to prevent a man giving his thumb-impression and a false name and address and destroying his copy of his passport?

N.B.—I don't refer to railways.

D. W. G. COWIE, Esq., I.C.S., COLLECTOR OF BELLARY.

I have the honour to forward herewith a copy of letter No. 1572-P., dated 25th July 1904, from the District Medical and Sanitary Officer and to state that I agree with him.

COLONEL R. PEMBERTON, I.M.S., DISTRICT MEDICAL AND SANITARY OFFICER, BELLARY.

I consider it undesirable and impracticable to introduce the taking of thumb-marks on passports, as a means of identification of persons from infected areas. The rules regarding passport holders are, in my opinion, at present sufficiently stringent and, considering that the number of cases of fraud are so few, I do not think it is justifiable to subject the people to the above measure.

Everyone having a thumb-impression on his passport must be identified, if there is to be a complete check; otherwise, it is of no utility: besides, it will increase considerably the work of the plague staff.

R. C. C. CARR, Esq., I.C.S., COLLECTOR OF NORTH ARCOT.

The proposal therein made seems to be impracticable. Even as it is, there are complaints that people are put to inconvenience, by being detained both where they are given passports and where they are observed. The proposal to take thumb-impressions will, I think, only enhance this inconvenience.

2. Again, to verify the identity of thumb-impressions, in cases of doubt, a trained class of men must be employed. A host of officials would have to be trained for the purpose; every village headman, every station-house officer and every medical subordinate entrusted with the duty of examining passport holders.

3. Women of high caste would object to their finger impressions being taken by a passport-issuing officer.

M. J. MURPHY, Esq., I.C.S., COLLECTOR OF COIMBATORE.

The system would tend to complicate and render even more irksome than it is at present the matter of taking out passports, and I do not think the advantages to be gained outweigh the extra trouble and elaborateness involved.

R. B. CLEGG, Esq., I.C.S., COLLECTOR OF SALEM.

To make an universal rule that thumb-impressions should be taken on all passports would mean supplying the apparatus and ink to all passport-issuing officers and local authorities in the Presidency. This would be impracticable and prohibitive as regards cost. As there is undoubtedly a good deal of false personation prevalent in the larger towns, I think it would be an excellent thing to supply the various railway stationmasters and the passport-issuing officers and local authorities of the towns in a district with sets of apparatus for taking and checking thumb-impressions and to require such officers to take the thumb-impressions of the passportee on the passports they issue.

B. MACLEOD, Esq., I.C.S., COLLECTOR OF CUDDAPAH.

I am in favour of the proposed introduction of taking thumb-impressions, as a part of the passport-system, if proper arrangements could be made for the impressions being taken, with as little inconvenience as possible to the passengers. The passport-system is not as popular as it ought to be and anything which would enhance its unpopularity should be scrupulously avoided. Evasions of the passport rules now occur almost daily, chiefly owing to difficulty in identifying the defaulters, which is due to the meagre account given of themselves by the defaulters to the passport-issuing officers. The thumb-impression system would act as a safeguard against such frauds and in the question of prosecution of defaulters.

Opinions of certain Collectors, etc., on Mr. Dutt's suggestions, regarding the work of Passport-Issuing Clerks at Railway Stations.

R. C. C. CARR, Esq., I.C.S., COLLECTOR OF NORTH ARCOT.

Mr. Dutt's suggestion seems worthy of consideration, but, by adopting it, we only find out the number of evasions and do not avoid the recurrence of such evasions. They must, of course, be prevented, by securing the co-operation of the railway officials, who should not pass out arrivals from infected areas or with punched tickets, until a passport is taken by them, as required by Rule 20 of the Madras Plague Regulations. There is further the fear of evasion by giving out false addresses. This can only be checked by careful enquiry on the part of the passport-issuing officer and by awarding deterrent punishments in cases detected.

C. G. SPENCER, Esq., I.C.S., COLLECTOR OF TRICHINOPOLY.

It is reported by the District Medical and Sanitary Officer that the difficulties alluded to by Mr. Dutt are not experienced in this district and that his suggestion, which quite meets the case, has already been adopted here.

D. W. G. COWIE, Esq., I.C.S., COLLECTOR OF BELLARY.

The suggestion of Mr. Dutt appears to me, if carried out, to involve extra labour without any corresponding advantage. I enclose a copy of a letter from my District Medical and Sanitary Officer on the subject.

COLONEL R. PEMBERTON, I.M.S., DISTRICT MEDICAL AND SANITARY OFFICER, BELLARY.

There is no necessity to open a passport book, showing the number of passengers arriving from infected localities. It will increase the work of the medical subordinates on duty at the railway stations and I cannot see the use of it. A large number of people do arrive from infected localities with punched tickets without passports; in the majority of cases, these are arrivals from places outside the Presidency. And, when the tickets are collected in the presence of the medical subordinates, all those with punched tickets are given passports.

Mr. Dutt states that, on the 20th June 1904, at Gudiyattam, only 147 passports were issued, whereas 336 tickets were delivered at that station on that date from infected localities. All that I can say is that the work of the passport officer and ticket clerk are not sufficiently supervised. In Bellary railway stations, no one can get a ticket without producing a passport; consequently, the number of tickets and passports issued each day must tally.

Fresh passports are given to all passengers arriving from infected areas.

R. B. CLEGG, Esq., I.C.S., COLLECTOR OF SALEM.

I do not advocate increase of the work of the passport clerks at the railway stations, by requiring them to maintain registers of persons arriving from infected parts.

I consider the check suggested by Mr. Dutt might be exercised, from time to time, by inspecting officers.

E. SCOTT, Esq., I.C.S., COLLECTOR OF ANANTAPUR.

I have the honour to forward herewith copies of remarks of Mr. E. P. Walsh, the Head Assistant Collector, and of M.R. Ry. M. V. Nārāyanaswāmi Pillai Avargal, the Head-Quarters Deputy Collector, with whom I agree. The 189 persons, for whom no passports were issued at Gudiyattam station, as stated by Mr. Dutt, might have had passports already. In one sentence, Mr. Dutt says 'They must have gone without passports' and, in the next, he says that 'they may have had passports.' In fact, I do not understand how any person could travel without a passport, unless the rules were disregarded. If any register is maintained at a station, it should be a register showing the number of persons from infected areas, who arrived without passports.

M.R. RY. M. V. NĀRĀYANASWĀMI PILLAI AVARGAL, DEPUTY COLLECTOR OF ANANTAPUR.

Mr. Dutt requires that the passport-issuing clerk at railway stations should maintain registers, to show the various reasons for which he does not issue passports to incoming railway passengers. This is intended to show whether any persons coming from infected areas were allowed to depart, without either producing passports issued in those areas or obtaining them at the railway stations. My experience is that the number of such cases, if any, cannot be large and a register written up is not likely to improve matters. I will give concrete instances. Passengers from infected areas, alighting at the Anantapur railway station, may go to several places in the interior of the taluk or other taluks; for example, Kal-andrug taluk. If the passport-issuing clerk notes against every person to whom he has not issued passports that passports were produced, the checking officer will have to make references to the Tahsildars concerned, giving lists in all cases, to find whether passports were really received for them. The fraudulent omissions not being large, the references may prove to be of no avail. The proposal appears to me to involve labour disproportionate to the advantage, if any, to be gained. The best way of ensuring that passports are issued in all cases, where they ought to be, seems to me to be to check the work at the issuing railway stations. The issuing clerk or station-master ought to be able to show, on any day, that the number of passports given out corresponds with the number of tickets issued. Even here, ingenuity may invent methods of deceiving, such as, for instance, the writing up of passports to show to checking officers, but not sending intimations to places of destination. This method of checking may, however, largely minimise the number of evasions, though not altogether prevent them. I should think that it is not possible to organise a system, under which evasion would be impracticable. If the passport clerks do not cheat, the parties themselves do, as experience amply shows. I have come across a number of instances, in which parties give false names and addresses. Detection has been found to be impossible in any case yet. I recommend therefore that the Tahsildars and Divisional Officers and, if possible, Sub-Magistrates should visit railway stations after the issue of tickets and check the passport books with the number of tickets issued. This, I think, will be more effective than the maintenance of the registers proposed.

E. P. WALSH, Esq., I.C.S., ACTING HEAD ASSISTANT COLLECTOR OF ANANTAPUR.

The Tahsildars of Hindupur, Penukenda and Dharmavaram report that there has not been serious difficulty, from the cause mentioned by Mr. Dutt. The important point of course is that, at the infected stations, no ticket should be issued without a passport. If this rule is strictly observed, there can be no mistake at the station where the tickets are collected and the few cases that do escape can be easily detected. If the issuing station-masters are really careful, the proposed check will not be needed. I see no objection, however, to the clerk being ordered to maintain a register, in which he should enter the collected tickets handed him each day by the station-master and returned by him to the station-master after entry. This could then be checked with his passport register.

M. J. MURPHY, Esq., I.C.S., ACTING COLLECTOR OF COIMBATORE.

If, as I understand it, the proposed idea merely involves a reference to the ticket-collector's book by the passport-issuing officers for purposes of check, it is an excellent and most valuable suggestion, but, if it involves any additional scriptory work or the maintenance by any one of another register, then I would not approve of it.

A. FOTHERINGHAM, Esq., I.C.S.

Mr. Dutt's proposal seems *prima facie* likely to have good results, but I am not in a position to give any decided opinion on the matter, as I have no evidence of plague in this taluk being introduced by evasion of railway passports.

*Captain Gabbett's Notice to the Residents of Coonoor regarding Rats, etc.
(7th September 1903.)*

Plague is at present confined to Alvarpett and a group of houses near the railway station known as Ashley works.

Residents should ascertain in what part of Coonoor their servants are living. If any are living in the infected localities, it is recommended that arrangements should be made for them and their families to live in the compound. If the families do not accompany the servants, it will be impossible to prevent constant intercourse with the infected localities. It is also necessary that householders should make daily personal examination of their servants' godowns, to ascertain that there are no cases of fever hidden in them. This plan will avoid the sudden removal of a servant to the contact camp, through one of his family having developed plague elsewhere. It will also thin out the population of an infected neighbourhood and place many of them under daily supervision. The danger of house servants being in daily contact with plague will thus be avoided.

Leave to servants to attend funerals should only be granted after enquiry, since such a gathering is known to be frequently a means of spreading infection. It should be remembered that unsuspected cases of plague are far more likely to occur in the families of servants than among the servants themselves, whose absence is at once known; hence the necessity for personal daily observation of godowns.

A careful use of rat-poison is also recommended, as a possible means of preventing the infection of a house.

PROPOSED "TOM-TOM" ANNOUNCEMENT AND CIRCULAR (ENGLISH AND VERNACULAR).

Rats carry plague. No rats, no plague. All rats in every house in Coonoor should be killed. Not one should be left alive. They should be driven out by smoke, sticks, dogs and cats. Also every house should have a rat-trap and the rats should be killed by traps or by poison.

There should not be one single rat or mouse left alive in Coonoor.

*Circular of the Collector of Tanjore, issuing instructions for the frequent inspection of
Consignments of Grain arriving from Plague-infected Areas
(No. 550, dated 2nd July 1904).*

1. The following instructions are issued for the frequent inspection of consignments of grain arriving from plague-infected areas and of landing places, railway goods-sheds and grain bazaars, etc., under rule 51 of the Madras Plague Regulations.

2. The Railway station-masters, Sea-Customs Superintendents and Port Officers at the marginally-noted places are requested to give immediate intimation of the arrival of grain from plague-infected areas to the respective marginally-noted officers.
3. It will be the duty of the medical officers mentioned in paragraph 2 *supra* to make inspection, immediately on receipt of intimation, and it will be the duty of the Municipal Chairmen to arrange for immediate inspection by a medical officer or sanitary inspector. In places where there are no medical officers (or sanitary inspectors), the Divisional Officers should make such arrangements as they think proper.
4. All civil apothecaries and hospital assistants in non-municipal towns or villages will also make it their duty to inspect landing places, railway goods-sheds and grain bazaars, at least once a month. If they find any rats therein, they will arrange to kill and burn them. They will also send reports to the undersigned, on the 15th of each month, showing the result of inspections.
5. Village munsifs should be directed to report at once any unusual mortality among rats to the Tahsildars and Municipal Chairmen concerned.

*Circular of the Collector of Anantapur regarding the control and management of the
Special Plague Police (No. 705, dated 5th August 1904).*

The following rules are issued, for the information and guidance of all concerned, with regard to the control and management of the temporary plague police force:—

(1) The temporary plague constables are entirely under the control of the District Superintendent of Police, who alone can suspend, fine, dismiss or transfer them.

(2) When temporary plague constables are required at any place owing to the outbreak of plague, the Divisional Officer will at once apply direct, by telegram, if possible, to the Superintendent of Police for the number required. A copy of any such requisition should, at the same time, be sent to the District Magistrate. It will rest with the District Superintendent of Police to send the number asked for or not, as he considers desirable, but, should he not send them, he should inform the District Magistrate at once, stating his reasons for such refusal.

(3) In urgent cases, application may be made to the local Police Inspector, who will supply the required number of men from the permanent police force, as a measure of emergency and pending the result of the application for the services of the temporary police. This practice should, however, be adopted only when real urgency exists and in no case will the permanent police be retained on this duty for more than a week, a period which should suffice for their relief by an equivalent number of temporary men. Such applications to Police Inspectors will be supplementary to applications sent to the Superintendent at the same time and, in the application to the Superintendent under rule 2, it should be stated that an urgent application for permanent constables has been made to the Inspector under rule 3.

(4) No transfer of temporary constables will be made, without the authority of the District Superintendent of Police or of some police officer empowered by the District Superintendent of Police to transfer. A Divisional Officer may ask the District Superintendent of Police to transfer and it will rest entirely with the police department to see that the request is attended to.

(5) No temporary plague constable shall be employed on work other than that for which he was specially appointed by the District Superintendent of Police, without the sanction of the District Superintendent of Police.

(6) It will rest with the local Police Inspector to see that the temporary plague constables, while on duty, do not neglect their work.

(7) If any revenue officer or sanitary inspector has any complaint to make against any temporary plague constable, he should address the District Superintendent of Police through the proper channel.

(8) When any temporary plague constables, who were obtained on a requisition to the Superintendent of Police, are no longer required, the Divisional Officer should report the fact to the Superintendent of Police without delay and it will rest with the Superintendent of Police to see that their services are dispensed with or that they are sent on other duty.

*Rules for Disinfection by heat by Lieutenant-Colonel P. H. Benson, I.M.S., Senior
Surgeon and Sanitary Commissioner, Mysore.*

Disinfection of a house can be conveniently done with heat.

The articles required are—

- (1) A supply of bratties or dried cow-dung, sufficient for the whole house.
- (2) A few ounces of kerosine-oil.

These two can occasionally be had in the houses themselves.

(3) A sufficient number of thermometers. In the absence of graduated mercury thermometers, paraffin ones made for the purpose may be used. These can be had, on application to the Health Officer, Bangalore. The object aimed at is to raise the temperature of all the rooms in the house to a point above that at which germs die. In Jammu City, where all the houses were successfully desiccated, the floor temperature was raised to 130° F. (55° C.) and maintained at that degree for 30 minutes. This meant a temperature of 186° F. (82° C.) on the walls. Subsequently, the required temperature of the floor was raised to 158° F. (70° C.). This means a temperature of 203° F. (95° C.) on the walls. It is found that this latter temperature can be easily reached, without damage to the house or property, by burning bratties. The bratties are arranged in every room of the house in circular heaps of from 1½ to 2 feet in diameter and about 1 or 1½ feet in height; one or more such heaps have to be made, according to the size of the room. Roughly, there should be one heap to every 40 square feet of floor area. In tiled rooms, more heaps will be required to raise the temperature to the required point than in mud-roofed houses. Bratties without straw in them give greater heat than those with it. The height of the heaps should vary according to the height of the roof or ceiling. In thatched houses, the heaps should be as low as possible. The maximum height need not, in any house, be more than 2 feet. The number of bratties that go to each heap will vary according to their size and the size of the rooms. From 70 to 150 bratties are required per heap as a rule.

When the floor is of a material that would be damaged by the fire, the bratties should be arranged in desiccators or on sheet-iron trays placed on stands a few inches above the ground.

When all the heaps have been made, the furniture in the rooms should be so arranged as to be exposed to the heat, but not damaged by the fire. Inflammable materials, if any, such as kerosine-oil or gunpowder, should be removed altogether. Clothes may be spread out and hung on the walls. Boxes of clothes may be left as they are, with the lids open.

Thermometers are kept in convenient corners away from the fire. Those registering below 100° C. (or 212° F.) should not be used, as they are likely to burst, when the temperature goes high.

A few bratties may then be soaked in kerosine-oil and inserted into the sides of all the heaps at the lower part and set fire to, and the heaps allowed to burn. The doors and windows are kept closed, so that the heat may not escape and get diffused. If thick black smoke is given out, some air must be let in, to help the combustion. The smoke generated, however, is not altogether a disadvantage, for it necessitates subsequent cleaning and lime-washing of the house, which is an useful adjunct to the disinfection.

If the bratties are properly arranged and lit, it will be observed that the temperature will go up to the required point in something less than half an hour. Very often, the temperature on the floor can be raised to 203° F. or 95° C. When the maximum temperature required is reached, the fire is not put out. It is allowed to go down of itself, so that it takes about half an hour or more for the heat to go down to normal. This is sufficient to kill most microbes. It also kills fleas, bugs and other vermin, which, in some houses, are a constant source of annoyance to the unfortunate inmates. Spiders, cockroaches and other little creatures, if any, also die; rats either run away or die in their holes. Apart from killing germs and small insects, the application of heat in this way has another very important use, i.e., it dries up or destroys the organic matter with which the floors and walls of houses are often saturated and which probably is the medium in which germs live. This tends to prevent or delay subsequent infection.

Disinfection of houses by heat is a convenient and cheap method. And, as the houses may be occupied at once, people prefer it to disinfection with perchloride of mercury lotion, which leaves the house wet and swampy. When once the method is shown, the people can do it themselves, as often as it may be required.

*Instructions for Disinfection of Houses, issued in Bangalore Cantonment
(23rd August 1899).*

1. The disinfecting party should be inspected, before commencing work; special working clothes, sufficient for two gangs of coolies, must be kept at each disinfecting station and supplied to every gang, before it begins work. Immediately after work, they must be taken off and disinfected. Every one should wear boots and putties to protect his feet and legs, and care should be

taken to see that none go to work who have any cuts, scratches or abrasions about their hands or any exposed parts of their bodies. They should be warned to change their clothes and to bathe after work and also to carefully avoid inhaling dust during the process of disinfection.

2. Before opening the door of a vacated house or room which is to be disinfected, sprinkle the ground or floor about the entrance thoroughly with perchloride of mercury solution, so as to keep down the dust. Then open the door and, before entering, spray the whole of the floor in the same way with the pumps and also, if possible the walls and roof, so as to prevent any dust that might carry infection from being stirred up and floating about in the air. The perchloride of mercury solution should always be used in a wooden tub and not in a metal vessel.

3. On entering, open all doors and windows, to allow free ventilation. If there is any deficiency of light and air, remove part or the whole of the roof, to admit sunlight as freely as possible, and, if necessary, also knock some holes in the walls. Unless there is an abundance of light let in through the windows, at least 6 feet by 4 feet of the roof should be removed.

4. Sweep up all dust and rubbish and burn it in the court-yard or outside the house, together with all bedding and clothes that have been used by a plague patient; all old rags, sack- ing, mats and other articles of trifling value should also be burnt. Put all pots, grindstones and other articles that will not be injured by fire on to the burning heap, so as to be highly heated.

5. A list of all articles destroyed, with an estimate of their value, should be recorded, for the purpose of deciding on any claims for compensation. If members of the household are present and if they are destitute, the compensation should be paid on the spot. For this purpose, one member of the household should, if possible, be present to see the work done, and any respectable neighbours, who are about, may be consulted as to value of articles.

6. Clothes, bedding, etc., should, if possible, be sent in gunny bags sealed with lead seal clamps to the detention camp, to be disinfected by steam. If there are too many houses to be disinfected for this to be carried out, they must be completely immersed in boiling water for not less than 10 minutes at the nearest disinfection station. Leather and other articles, which would be damaged by exposure to steam, must be immersed in perchloride of mercury solution or thoroughly scrubbed with a 5 per cent. solution of carbolic acid and soft soap.

Metal vessels, cooking utensils, curry stones and grindstones must be highly heated on a fire or immersed in a solution of permanganate of potash, which must be well rubbed over them; other articles, which are too valuable to be destroyed, but cannot be soaked, such as pictures, books and papers, must be laid out in the sun as long as possible.

7. Sprinkle all articles of furniture with perchloride of mercury solution: then take them outside and there thoroughly swab or drench them all over with the same or dip them in a tub of it, giving particular attention to holes and crevices and such parts as the cane seats of chairs or cots. Then leave them exposed to the sun as long as possible.

8. The room being empty, thoroughly spray every part of it with the perchloride of mercury solution, with the pump, beginning with the roof and working down all round and giving particular attention to all corners and crevices.

9. If the floor is of earth, it is to be thoroughly saturated with perchloride of mercury solution and, if dressed with cowdung, the solution for it must be used of double strength, i.e., 2 bottles of concentrated solution to 6 gallons of water. For a dressed floor, 8 gallons should be used for every 100 square feet. If the walls are covered with a greasy coat of dirt, they must, after being thoroughly soused with perchloride of mercury solution, be well scrubbed with a hot 5 per cent. solution of carbolic acid and soft soap.

10. Clean up thoroughly the whole of the surroundings of the house, sweep up all rubbish from the yard or cook-house or latrine and burn it. Flush all drains and latrines with carbolic or phenyl solution and sprinkle carbolic powder freely about.

11. On the day after the house has been disinfected, the whole of the interior, including roofs, floors and doors must be lime-washed. The lime must be kept unslaked, until it is actually required for use, and must be laid on very thick, whilst hot. It should be mixed in galvanized tubs or buckets and not in wooden ones. If plague cases increase to such an extent that the disinfecting gangs are fully worked, the lime-washing may be carried out on the completion of the disinfection, but it should always be postponed until the following day, if possible.

12. A register is to be kept, showing the number of men employed and the length of time taken to limewash each house, so that the cost may be recovered from the owner hereafter.

13. All rooms, whether occupied by the same or different families, under the same roof as an infected room, should be disinfected, the occupants being turned out temporarily. The houses on either side of an infected house should also be temporarily evacuated and disinfected. Allow one man of each house to watch the disinfection of the kit, if he wishes to, and allow the people to return, as soon as the lime-washing is completed. In these houses (i.e., houses that are not actually known to be infected, but which are under the same roof as an infected house), only a small portion of the roof need be removed, if the ventilation is very defective.

14. When the disinfection of a house is completed, the doors should be locked and sealed by the special plague officer and the following marks painted on it:—

Infected house that has been disinfected
+ and date

and is unfit for human habitation

+ U. H. H. and date.

Vacated house or occupied house (under same roof with infected house) that has been disinfected

+ and date.

15. No person is allowed to enter and re-occupy a house that has been disinfected, until it is re-opened for the purpose by the District Medical Officer.

16. The hands of the coolies should be protected from the effects of the carbolic solution and lime by the plentiful application of oil.

17. When the work at each house is completed, all coolies must be made to wash their hands thoroughly in perchloride of mercury solution.

18. No food or drink must ever be taken whilst in an infected house and hookah-smoking in such a place should be prevented.

NOTE ON DISINFECTANTS TO BE USED.

A. Perchloride of Mercury or Corrosive Solution.

This will be prepared in the form of a concentrated solution, viz., 1 part of perchloride of mercury solution, 2 parts of hydrochloric acid and a little aniline blue to a strength of 1 in 27; one bottle of this solution should be added to 6 gallons of water for ordinary disinfecting purposes or two bottles to 6 gallons of water for floors dressed with cowdung.

The solution must not be stored in a porous vessel or brought in contact with metal. All wooden tubs should be plainly marked, to show where the 6 gallons comes to. The solution is very poisonous and must be used with care.

B. Permanganate of Potassium.

This will be supplied in solid form, in powder or in crystals. It should be powdered, before use; otherwise, it is very slow in dissolving. If there is a well on the premises to be disinfected, it should be disinfected with permanganate of potassium, from one to two ounces being used for an ordinary small well. A solution of about half an ounce to a large bucket of water should be used for such articles as brass vessels or cooking pots, for which perchloride of mercury must not be used. When this solution loses its blue colour and turns brown, it is useless.

C. Carbolic Acid.

One bottle should be added to 3 gallons of water, to form a 5 per cent. solution. It should be heated in an earthen chatti or galvanised iron bucket for use on greasy walls or furniture.

D. All chemicals should be obtained from the Medical Store Depot and, on receipt of a fresh supply of perchloride of mercury or carbolic acid, they should be tested as follows:—

Perchloride of mercury should be of a white or glassy colour; heated on an iron spoon over a flame, it should disappear, without leaving more than a trace of residue. It is soluble in 16 parts of cold water—60° F. The impurity most likely to be present is calomel, which is insoluble in water.

Take a little of the perchloride to be examined, powder it, place it in a test-tube and add pure water. Shake and pour off the clear fluid into a second test-tube. The clear fluid should contain the perchloride of mercury. Add some of a 9 per cent. caustic soda solution to it: a yellow precipitate indicates perchloride of mercury. If any salt is left in the bottom of the original test-tube, a little of the caustic soda solution should be poured on it. Blackening indicates the presence of calomel. The examination of the carbolic acid is less satisfactory. A long test-tube should be taken and sufficient of the carbolic acid poured into it to fill it for 1½ inches. Twice the quantity of the 9 per cent. solution of caustic soda should then be added, to fill the test-tube up to 4½ inches. The tube should then be corked, well shaken and the contents allowed ample time to settle. If tar oils are present, they will separate in a dark layer and, if this layer measures more than ½ inch in the test-tube, the carbolic acid contains too much tar oil to be efficient.

Directions for the Use of the Common-Sense Rat-Exterminator.

Rats.

In laying down large quantities of bait, the most expeditious manner would be to make a small pile of fine sugar and another of flour, on a board or table. Cut fresh bread into thick slices (about an inch), spread the exterminator on the bread lightly, then place it on the

pile of sugar, with the side which has been spread with the exterminator down, rub it into the sugar lightly, so as to get the sugar well into the mixture, then apply the flour in the same way, but see that the flour well covers the exterminator. Then cut into squares of about one inch. Each square might be smoothed over with the blade of a knife, in case the flour has come away in the cutting.

Place as many pieces as you think there are rats (at night), as near their holes as possible, and take up all pieces that are left next morning and destroy them, as, after the bread gets stale, it ceases to attract.

Lay fresh bait each night, gauging the number of pieces by the number taken the previous night, and continue, until none are taken, when it will be safe to infer that they have had their dose and, in a few days, their pelts will be all that is left of them.

Be sure and lay plenty of bait the first night.

Mice.

The same directions apply for mice, only that biscuits (plain sweetened) may be used, and these can be left for two or three nights, as they retain their attractive qualities for this period.

Extracts from a Memorandum of His Excellency, Governor Sir H. A. Blake, Hong Kong, dated 3rd August 1903.

I believe, I am right in saying that, at the Confidential Meeting of the Board held on June 30th, a resolution was passed to the effect that the Government should be asked to sanction, for the rest of the year, the modification of the scheme for dealing with rats suggested for next year's procedure. For information of the Government, it may be well to explain that the reasons for this change are as follows:—

(1) A large sum of money is now paid as a bonus for rats collected in the streets.

(2) A ridiculously small number of rats are caught in houses.

(3) There is no way at present of making sure that the addresses given of rats caught are correct, as foremen and coolies are not to be trusted. In support of this, I may mention that Inspector Allen found, some little time since, a group of rat-catchers sorting out rats in a back lane and putting on address tickets promiscuously.

(4) There is a suspicion that the coolies have given wrong addresses, out of revenge, in order that the house might be disinfected. It has not been possible to prove this, but it is clear that this might be done.

(5) The bonus of five cents for each rat is probably an incentive for the importation of rats. It is highly probable that a brisk trade in rats has been going on. It would no doubt pay to bring rats into the city from outlying villages and from boats and even from Macao and Canton. Inspector Reidie has reported that he heard of a meeting of rat-catchers at Possession Point, where rats arrived in parcels and were distributed. He was too late to catch them. But these rumours have the colour of truth.

The proposal to adopt next year's scheme in the matter at once will involve (1) the immediate appointment of six extra Portuguese foremen at \$50, one for each plague inspector; (2) the raising into line with this the salary of the present permanent plague foremen and (3) the appointment of 14 coolies for collecting rats, at a fixed salary of \$12 per month; (4) the abolition of the bonus.

2. We found it difficult to trace the means of infection. The immunity of people living, sometimes for several days, in the same room went far to disprove the theory of contact. With the exception of Chu Kom and Wong Sam from No. 4 Sheung Fung Lane, none of the people of that house who were attacked worked together or partook of the same food. Fourteen days after Sheung Fung Lane had been cleansed out, I directed that as many fleas, bugs, etc., as could be found should be sent to the Government Bacteriologist for examination. A number of bugs and a spider were found and, on the 10th June, Dr. Hunter reported that in both bugs and spider were found plague bacilli. At the same time, he reported, as the result of examination of a number of bugs, flies and fleas from No. 4, Sheung Fung Lane, where several cases of plague had arisen, that no bacilli were found. Again, after the death of the two boys who lived on the first floor of 109 Second Street, bugs were procured from the first floor and from the ground floor. Dr. Hunter reported that, in the two bugs from the first floor, no bacilli were found, but a number of bugs from the ground floor were found infected with several plague bacilli. During a visit to the Plague Hospital at Kennedy Town, I observed a large number of flies in one ward, numbers of which had settled on the patients. I directed that a number should be sent for examination. On the 9th July, Dr. Hunter reported that the majority of the flies were plague-infected. He reported, at the same time, that several cockroaches, caught in a stall in the Central Market,

contained *B. pestis*. On the 1st June, it was reported that fowls from the Western Market were found to have died of plague and, as the poorer classes of Chinese eat the entrails of fowls with their rice in a semi-cooked state, a notice was issued that such food, if not thoroughly cooked, was dangerous. On examining specimens of various foods exposed for sale, Dr. Hunter has since found the *B. pestis* in inferior rice. I have suggested to Dr. Thomson to find, by experiment, if mosquitoes, which fed on plague patients, contained bacilli, and several have been examined by Dr. Hunter with negative results. The examination is, however, being continued.

20. We have, from Professor Simpson's report, evidence that pigs, calves, sheep, monkeys, geese, ducks, turkeys, hens, pigeons and rats are susceptible to plague, which may be contracted by food or by inoculation direct or by means of suctorial insects. To this list, the examination mentioned above adds bugs, spiders, flies and cockroaches. I may add that quails kept in the market for sale were also found to be infected. In paragraph 22, page 100, Professor Simpson points out that domestic animals suffer from chronic plague and surmises that this is probably one of the bridges by which the intervals of the attacks in man are connected. I have, for a considerable time, been of opinion that man is himself subject to chronic plague, which may either pass away after a considerable time or continue dormant over the winter months, regaining activity with the annual movement of Spring, when the curve of the epidemic is almost constant. This opinion was strengthened by the fact that, in August, 1899, the body of a Chinese lift-man at Queen's buildings, who was accidentally killed, when attempting to enter the lift, while in motion, was found to contain plague bacilli. A similar result followed the examination of a man, who, on the 4th March, 1901, was killed at Tai Koo sugar works, by a bag of sugar falling on his head from a height of 20 feet, while, on the 2nd April, 1903, in the body of the chief steward of a ship lying in dock, found floating with a large wound on the head, were also found plague bacilli. Early in June, several men from H.M.S. *Ocean* were sent to the Naval Hospital, suffering from pneumonia; on examination of their blood, seven were found to be suffering from mild cases of plague. In like manner, two officers of the Sherwood Foresters, who developed feverish symptoms, were, on having their blood examined, found to be similarly affected. In the 'Boletim Oficial' of Macao, containing the report of the plague epidemic, 1895, Dr. Gomes da Silva, the Medical Officer who published the report in 1895, stated that, during the height of the epidemic, he had discovered plague bacilli in his own excreta.

21. In June, I directed Inspector Gidley to obtain as many specimens of blood as possible, on slides procured from the Government Bacteriologist. He obtained 110 specimens from men, women and children, taken at random. These slides were sent to Dr. Hunter for examination, who reported that, in five slides, he found plague bacilli and, in seven slides, 'bacilli were present in considerable numbers, some of which showed bipolar staining. They were not sufficiently distinctive, however, to be regarded as *B. pestis*.' These slides were obtained, between the 23rd June and 10th July. Since they were obtained, there were but three cases of plague in the district, from none of which was a specimen of blood taken.

22. I am not unmindful of the fact that these reports were the result of microscopic examination only. But the examination was the same as that on which a great many of the cases treated in Kennedy Town Hospital were sent to that institution, where their cases ran the usual course of plague invasion.

23. Now, putting aside the seven doubtful slides, it will be seen that, of these people examined at random, 4.54 per cent. were found to be infected with plague, though to all appearance perfectly healthy. If we exclude all the well-to-do and take the working cooly population alone, they probably number 180,000 and, assuming the same average amount of infection, there are, among that class alone, 8,172 persons at present infected in Hong Kong. If even a quarter of that average be accepted for the 105,000 inhabitants of the superior class, the number of infected will be increased to 9,364. In Appendix G, will be found the number of rats examined in each month of the present year, with the proportion of infected rats. I am afraid that the incidents mentioned in paragraph 5 weaken deduction as regards Hong Kong. But, from whatever source the rats were procured, the proportion of infection in June was 9 per cent. or 4.46 per cent. more than the percentage of the slides examined or, if the doubtful cases mentioned by Dr. Hunter be included, 1 per cent. less, while in January the proportion falls to 8 per cent. This being so, with the complete circle of vermin, insects, food, rats, domestic animals and man all infected in possibly similar, possibly different proportion, it appears to me unsound to concentrate attention upon the rat as the principal means of bridging over the dormant season.

24. I do not know whether the conduct of a culture of the bacillus *pestis* has ever been observed for an annual cycle. I am informed that the usual culture in a culture tube dies in a short period, either by having exhausted the nutriment from the culture medium or by having poisoned it by its own toxin. If the blood of those in whom plague bacilli now exist, without producing the usual effects of plague, could be periodically examined all through the coming year, much light might be thrown upon the dormant period, and the highly important question of the infectivity of these people might be solved. But, failing this, I have suggested the possibility of preparing a culture, in so large a quantity of culture medium as will permit of the spread of the bacillus to the utmost extent, during the period shown to be that of annual activity, and still leave the medium in sufficient quantity to support any renewal of propagation. In this way, I suppose that the annual movement of the bacillus might be observed.

25. The problem before us is, then, not simply the prevention of introduction of plague from without, a precaution taken singly that, considering the wide infection of the city, must be futile, but the elimination of the media of infection in our midst and the building up of the power of resistance to plague invasion, by improvement in the general health of the population that may result from improved sanitary conditions. The first can only be accomplished by constant, unremitting attention to cleanliness of person, furniture and premises and, to be effectual, it is of cardinal importance that the co-operation of the people be secured. With proper facilities afforded, I am of opinion that, while in Hong-Kong, as elsewhere, the residuum might be difficult to deal with at first, the difficulties are not insurmountable and practical co-operation might be secured, by enlisting the sympathies and services of the large class of respectable Chinese in a determined effort to combat the recurring epidemic, the evils of which they fully realize."

ENCLOSURE.

Return showing the number of Rats killed each month this year and the proportion of Plague Rats found among them.

Month.	Total rats.	Total infected rats.	Remarks.
January	14,427	115	0.8
February	14,718	272	1.8
March	16,513	593	3.6
April	15,004	482	3.2
May	15,228	865	5.6
June	9,882	879	9.0

Extract from the chapter on Disinfection, taken from 'The Theory and Practice of Hygiene,' by J. Lane Nottter, M.A., M.D., &c.

PREFACE.

In presenting the following extracts from the chapter on Disinfection (pages 680 to 696), in "The Theory and Practice of Hygiene," Messrs. Nottter and Firth's Standard Work (J. & A. Churchill, London), we beg to say that we have, for want of space, confined ourselves to those portions dealing with the relative value of the only substances demonstrated by the authors to be true disinfectants.

It will be observed on perusal that, as a result of their investigations, the authors find:—

1. Izal is a true disinfectant, as opposed to mere antiseptics or deodorants.
2. Izal, being free from poisonous properties, possesses qualities which practically no other efficient disinfectant affords.
3. Izal is a reliable disinfectant, when diluted five times as much as pure carbolic acid.
4. No other non-poisonous body has been proved to be an efficacious disinfectant in the exhaustive way that izal has.

We beg to commend these facts to your attention, feeling sure they will be considered of sufficient interest by all concerned in the preservation of life and health to be brought prominently under notice.

NEWTON, CHAMBERS & Co., LTD.

THORNCIFFE, SHEFFIELD, ENGLAND.

CHAPTER XIII—DISINFECTION.

CHEMICAL DISINFECTANTS.—If we limit our conception of a disinfectant to that of a substance which is capable, by its own inherent poisonous action upon a pathogenic organism, to destroy the life and power of development of that micro-organism, the number of practical chemical disinfectants is small. Practically, we must set aside all disinfectants that are expensive, as well as all those which are not readily soluble in water or are otherwise difficult to apply and manipulate. To these conditions we may further add that a good disinfectant must be rapid, as well as certain, in its action. In no case ought more than twenty-four hours to be allowed for the complete destruction of all germs and, in many cases, only a very brief exposure can be obtained.

Chemical disinfectants may be solid, liquid, or gaseous, but, from the nature of the case, it is evident that solids must be brought into the form of a solution, to enable them to penetrate throughout any substance to be disinfected. Disinfectants, therefore, are practically useful only as solutions or as gases. The most reliable disinfectants appear to be the following:—

Mercuric Chloride, or corrosive sublimate, is a well-known and highly poisonous salt. A cold saturated aqueous solution contains about 10 per cent., but two parts of boiling water dissolve one part of the sublimate. It is also readily soluble in alcohol or ether. Of a strength of 1 in 1,000 in water, mercuric chloride destroys the bacilli of glanders, anthrax, enteric fever, diphtheria, the spirilla of cholera and the micrococci of erysipelas in ten seconds. Spores are not so readily destroyed, requiring an exposure of 10 minutes at least; a 1 in 5,000 solution produces the same effect in a few hours. As a disinfectant, mercuric chloride has three great disadvantages: (1) it corrodes metals, (2) it forms with albumin an inert insoluble compound, (3) it is poisonous.

By Schill and Fischer's experiments, it appears doubtful whether perchloride of mercury can destroy the spores of tubercle bacilli in phthisical sputa, even in the proportion of 1 in 500 solution. This inefficient disinfectant action is probably due to the fact that the salt enters into chemical combination with the proteids of the sputum or even forms a coating around the bacilli, which protects the contained spores from its further action. This peculiarity of the sublimate somewhat detracts from its general utility as a disinfecting agent in albuminous materials, but may be prevented, by acidulating the solution.

Lingard's experiments show that a solution of sublimate, 1 in 960, destroys the human tubercular virus in from four to eight hours. Experiments made at Netley on this point indicate that, with a 1 in 1,000 solution, at least 12 hours' exposure should be allowed for the absolutely complete destruction of all tubercular virus in sputa by mercuric chloride and, even then, the re-agent must be well mixed with the infected matter. Not less strength than 1 per cent. was necessary, to destroy the spores of anthrax and *B. subtilis*. One part of sublimate in 5,000 of gelatin is antiseptic or sufficient to inhibit the growth of most micro-organisms.

Carbolic acid (phenol), when absolute and pure, is in the form of white crystals, which melt at 42°·2 C. or 108° F. The solubility of these crystals in water is about that of 1 in 11; a saturated solution in water will contain about 8·6 per cent. of phenol. It is more soluble in weak alkaline solutions than in water, while, when pure, it is soluble in all proportions in ether, alcohol, benzene, chloroform and carbon disulphide.

The ordinary red or dark brown fluid sold as carbolic acid is a mixture of ortho-, meta-, and para-cresol. It is less soluble than phenol; a saturated aqueous solution will contain only about 3·5 per cent.; it is soluble in weak alkaline liquids, but is precipitated with excess of alkali. The chief impurities of commercial carbolic acid are tar oils. Their presence and approximate quantity can be estimated, by shaking a measured volume of the acid with twice its volume of pure soda solution of 9 per cent. strength. The cresylic and carbolic acids are dissolved by the alkaline liquid, while the oils separate, the heavy oils sinking to the bottom and the light oils rising to the top; their respective volumes can then be read off. These tar oils are apparently without any disinfectant properties.

Numerous "carbolic acid powders" are in the market these are, for the most part, mixtures of cresylate and carbolate of lime and have no appreciable disinfecting properties.

A considerable number of "carbolic acid soaps," containing more or less free carbolic acid, are also in the market. Soap alone we know to have distinct antiseptic qualities, but it is doubtful whether any of these carbolic acid soaps are of the slightest use for disinfecting purposes or are in any way superior to ordinary soap.

Izal, which is a comparatively new disinfectant, extracted from an unknown oil obtained from certain coke ovens, is a creamy looking emulsion, having an earthy smell, coupled with a faint odour, suggestive of phenol. It is readily mixed with water, forming a milky emulsion. Its disinfecting properties have been extensively investigated by us and found satisfactory. A 20 per cent. emulsion destroyed the highly resisting spores of *B. subtilis* and *B. mesentericus* in thirty-five minutes. A 10 per cent. emulsion killed virulent spores of anthrax bacilli in twenty minutes. Non-spore-bearing specimens of the above bacilli were destroyed after five minutes.

exposure to 0·5 per cent. or 1 in 200 emulsion. A 0·3 per cent. emulsion destroyed the streptococcus of pus, and exposure for half-an-hour to a 1 per cent. emulsion was sufficient to destroy the enteric fever bacillus and the spirilla of cholera.

Our observations dispose us to regard izal as a disinfectant of considerable practical value; for concrete cases of disinfection of morbid materials from the various infectious disorders, an exposure for fifteen minutes in the strength of 1 per cent. will be sufficient. Moreover, izal, being free from poisonous properties, when introduced by injection to the tissues or when administered by the stomach, possesses qualities which practically no other efficient disinfectant affords. The inhibitory or antiseptic value of izal is equally defined, as neither spores, micrococci or non-sporeing bacilli and spirilla can germinate in medicated media, if the amount of disinfectant added is 0·1 per cent.

[The three substances above mentioned are followed by a list of gaseous disinfectants, comprising *chlorine*, *euchlorine*, *sulphurous acid*, *nitrous acid* and *formaldehyde*, with a detailed account of the properties of each. The book then proceeds—]

Lime has a powerful germicidal effect, which has been shown to be due to its alkalinity; a 0·1 per cent. solution of quicklime sterilises excreta after five hours' exposure. Of the many other commonly regarded disinfectants, we may mention the sulphates of copper, iron and zinc, also chloride of zinc and potassic permanganate. All these need to be of 5 per cent. strength and, even then, either take several days to kill anthrax spores or fail to do so. Of the many other chemical and patented substances that have been brought forward at various times as disinfectants, none have been proved to be efficacious in the exhaustive way that mercuric chloride, carbolic acid and izal have been tested. The greater number are really only antiseptics or deodorants, of considerable value as such, but not to be considered as true disinfectants.

From what has been said, it will be seen that so-called disinfectants and disinfection processes have not all the same value, the most powerful and reliable being fire, boiling, steam, exposure to dry air at or above 220° F. for from six to eight hours, corrosive sublimate (1 in 1,000), carbolic acid of not less strength than 5 per cent. and izal, 1 per cent. Among those capable of destroying sensitive but not the more resistant micro-organisms are chloride of lime, nitrous and sulphurous acids, 3 or 4 per cent. solutions of carbolic acid, brief exposures to heat and weak solutions of corrosive sublimate and izal. Finally, among those that have been shown by experiment to be unable to destroy even the more sensitive bacteria, under the conditions occurring in practice, are solutions of chloride of zinc, ferrous sulphate, 1 or 2 per cent. solutions of carbolic acid and other disinfectants in excessive dilution, boracic acid, hot air or fumigation applied to bulky objects or for inadequate periods of time.

In circumstances where no means exist for disinfecting bulky articles of clothing and bedding by exposure to moist heat or dry air at or above 220° F., they should, if possible, be destroyed by burning; failing that, they should be boiled or, at least, be allowed to soak for twenty-four hours in some disinfecting liquid, such as one of the following:—(a) izal, five parts to 100 of water, (b) chloride of lime, two ounces to one gallon of water, (c) chloride of lime, 70 grains mixed with 6 grains of herring brine to one gallon of water, (d) carbolic acid, five parts to 100 of water, (e) bichloride of mercury, half ounce, hydrochloric acid, one ounce, aniline blue, five grains to three gallons of water. After soaking in any one of these solutions, the clothing should be then boiled and thoroughly washed with soap and water.

DISINFECTION OF EXCRETA AND DISCHARGES.—The urine and bowel discharges, so frequent in enteric fever, cholera, dysentery and diarrhoea, should be received into a vessel containing either carbolic acid solution (1 in 20) or mercuric chloride solution (1 in 1,000 as given above) or izal (1 in 20), with a further application of an equal quantity of the disinfectant directly afterwards. The whole should be well mixed, left for a quarter of an hour for the disinfectant to act and then either burnt, buried or discharged down the closet. If the latter is done, it should be well flushed afterwards with water.

The fumigation of rooms has deservedly fallen into disrepute and, unless supplemented by careful washing and scrubbing, is practically valueless. If fumigation is performed, it must be clearly understood that it is quite a subsidiary proceeding and that it can only be done effectually, when the room is unoccupied, as the air must be rendered quite unfit for respiration.

List of Plague Inspectors punished in the Hosur Division.

No.	Name.	Designation.	Reasons for punishment.	Collector's order and date.
1	2	3	4	5
1	Viraragavachari.	Sanitary Inspector in charge of Denkanikottai B Circle.	Neglect in his duties ...	Resigned, fearing that his services would be dispensed with—vide Collector's Order No. 461 P., dated 17th March 1902.
2	K. R. Srinivasaiyar.	Sanitary Inspector in charge of Thalli.	Inefficiency ...	Dispensed with, in the Special Plague Officer's No. 674 P., dated 5th August 1902.
3	Rahiman Sheriff.	Sanitary Inspector in charge of Berikai.	Incompetency ...	Dispensed with, in Collector's Order No. 1785 P., dated 20th December 1902.
4	Mukundan Nayudu.	Temporary Sanitary Inspector, Kaveripattanam.	Falsification of diaries.	Dispensed with, in Collector's No. 1229 P., dated 5th August 1903.
5	K. Madavan Nair.	Temporary Sanitary Inspector, Royakota.	Do.	Reduced to an assistant sanitary inspector's place; No. 1598 P., dated 31st October 1903.
6	Ghulam Hussain.	Assistant Sanitary Inspector, Bagalur A.	Getting an appointment as a temporary sanitary inspector by misrepresentation.	Dispensed with, in Collector's No. 939 P., dated 23rd May 1904.
7	V. Krishna Rao.	Assistant Sanitary Inspector, Bagalur A, Disinfection duty.	Do.	Dispensed with, in Collector's No. 805 P., dated 18th June 1904, and name removed, in Sanitary Commissioner's No. 2496 S., dated 29th June 1904.
8	N. L. Ramasubaiyar.	Certificated Sanitary Inspector, Disinfection duty.	Neglect of duty and hushing up plague cases at Nallur, when he was in charge of Bagalur A Circle.	Services dispensed with, in Collector's Certificate No. 755 P., dated 26th May 1904, and suspended for six months, in Sanitary Commissioner's No. 2138 S., dated 3rd June 1904.
9	M. Seshachari ...	Sanitary Inspector in charge of Mattigiri, South Circle.	Falsification of a diary...	Dispensed with, in Collector's No. 983 P., dated 14th July 1904.

List of Plague Inspectors punished in the Kurnool district during 1903-1904.

No.	Name.	Designation.	Punishment.	Reasons.	Remarks.
1	2	3	4	5	6
1	G. V. Natheasa Aiyar.	Temporary Sanitary Inspector, Laddagiri Circle.	Dismissed ...	Failing to detect plague cases (in Konganapad) (D. Dis. No. 155 P. of 1904).	
2	J. Solomon ...	Temporary Sanitary Inspector, Peravali Circle.	Removed from the list of temporary sanitary inspectors.	Failing to detect plague cases and disobedience (D. Dis. No. 28, dated 17th January 1904).	
3	Manikka Mudaliyar.	Temporary Sanitary Inspector, Laddagiri Circle.	Do.	Posillanimity and unseemly behaviour (D. Dis. No. 213 P. of 1904).	
4	U. Babu Rao Keri.	Certificated Sanitary Inspector.	Services dispensed with.	Pretended illness, when he was transferred from charge of a circle to disinfection duty (D. Dis. No. 213 P. of 1904).	
5	K. S. Narayana Rao.	Temporary Sanitary Inspector, Peravali Circle.	Do.	Negligence, untrustworthy character and writing false diaries (D. Dis. No. 213 P. of 1904).	
6	V. K. Ramaiyar.	Temporary Sanitary Inspector on disinfection duty at Hampi.	Dismissed ...	Extorting money from villagers (D. Dis. No. 299 P., dated 26th June 1904).	Sentenced to undergo rigorous imprisonment for two months.
7	C. T. Ranganatha Rao.	Temporary Sanitary Inspector, Kodumur Circle.	Removed ...	Unsatisfactory conduct, while employed in South Canara (D. Dis. No. 213 P. of 1904).	
8	G. R. Swaminatha Pillai.	Temporary Assistant Sanitary Inspector, Maddikera.	Services dispensed with.	Unwillingness to work (D. Dis. No. 213 P. of 1904).	
9	T. T. Subrahmaniya Aiyar.	Do.	Do.	Incompetency (D. Dis. No. 221 P. of 1904).	
10	P. Vedanta Chari.	Temporary Assistant Sanitary Inspector of Kurnool Municipality.	Dismissed by Municipal Council, Kurnool.	Securing appointment under false pretences (D. Dis. No. 95 P., dated 17th February 1904).	
11	N. Ramaswami Aiyangar.	Temporary Sanitary Inspector.	Removed from the list of temporary sanitary inspectors.	Keeping false accounts and overcharging Government (R.C. No. 356 A.P. of 1904).	
12	M. Tiravengadam Pillai.	Do.	Dismissed ...	Unsatisfactory work and overcharging Government (R.C. No. 356 A.P. of 1904); also suspected to be corrupt.	

List of Plague Inspectors and Assistant Plague Inspectors punished (by dismissal or dispensing with services) in the Bellary district.

Name.	Designation.	Reasons for punishment.	Collector's order and date.
1. N. Sarvottama Rao (Temporary Sanitary Inspector).	Plague Inspector, Kampli.	Falsely certifying that he had maintained a pony.	D. Dis. No. P. 1343, 24th Oct. 1903.
2. A. Srinivasa Rao (Temporary Sanitary Inspector).	District Inspector, Hospet.	Bad conduct ...	No. 1386, 31st Oct. 1903.
3. C. V. Nagendra Rao (Temporary Assistant Sanitary Inspector).	Assistant Plague Inspector, Yelabench.	Failure to detect plague cases ...	No. 1684, 16th Dec. 1903.
4. A. Raju Nayudu (Temporary Sanitary Inspector).	Plague Inspector, Sindigeri.	Obtaining horse allowance by false pretences.	No. 1736, 21st Dec. 1903.
5. D. Venkatakrishnayya (Temporary Sanitary Inspector).	Plague Inspector ...	Failure to inspect villages ...	No. 170, 28th Jan. 1904.
6. T. N. Krishnaswami Aiyar (Temporary Sanitary Inspector).	Plague Inspector, Narayanakeri.	Scandalous neglect of duty ...	No. 199, 31st Jan. 1904.
7. Sitarām Sing (Temporary Assistant Sanitary Inspector).	Circle Inspector, Bellary Municipality.	Neglect of duty and inefficiency ...	No. 247, 9th Feb. 1904.
8. V. B. Ranga Aiyangar (Temporary Sanitary Inspector).	Do.	Failing to carry out the orders of the Special Plague Officer.	No. 328, 21st Feb. 1904.
9. S. Alagara Singarayya (Temporary Sanitary Inspector).	Plague Inspector, Pedda Hotur.	Inefficiency ...	No. 335, 22nd Feb. 1904.
10. P. Rama Rao (Temporary Assistant Sanitary Inspector).	Assistant Plague Inspector, Narayamburn.	Do. ...	No. 353, 25th Feb. 1904.
11. A. Tambu Swami Pillai (Certificated Sanitary Inspector).	Plague Inspector, Kosgi.	Laziness, inefficiency and writing false diaries.	No. 374, 27th Feb. 1904.
12. T. Partasarathi Mudaliyar (Certificated Sanitary Inspector).	Plague Inspector, Kaatalam.	Deliberately absenting himself without leave.	No. 373, 27th Feb. 1904.
13. B. Subba Rao (Temporary Sanitary Inspector).	Plague Inspector, Sindigeri.	Slackness and inefficiency ...	No. 405, 5th Mar. 1904.
14. P. Venkatarama Pillai (Temporary Assistant Sanitary Inspector).	Assistant Plague Inspector, Kollegalu.	Absence without leave ...	No. 488, 11th Mar. 1904.
15. M. C. Jayaram Mudali (Temporary Sanitary Inspector).	District Inspector, Hadagalli.	Gross misconduct, in pretending to employ his relations as disinfecting coolies, and extorting money.	No. 549, 26th Mar. 1904.
16. C. G. Nery (Temporary Sanitary Inspector).	District Inspector, Bellary Municipality.	Giving a false certificate to a house, which had not been disinfected.	No. 674, 19th April 1904.
17. K. Kenakadri (Certificated Sanitary Inspector).	District Inspector, Hospet taluk.	Gross insubordination and disobedience.	No. 764, 9th May 1904.

Statement showing the educational qualifications of Certificated Sanitary Inspectors.

Educational qualifications, i.e., examinations passed.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	Total.
B.A. Examination ...	...	1	1	1	3	2	...	1	...	9
F.A. do. ...	...	4	3	2	5	3	1	3	2	23
Matriculation Examination ...	10	25	28	46	34	35	54	26	43	301
U.C.S. do. ...	1	...	...	1	...	...	...	...	2	4
Upper Secondary do. ...	2	...	...	2	1	2	...	...	1	8
Lower Secondary or Middle School Examination.	12	6	5	13	1	3	4	...	4	48
L.M. & S. Examination ...	...	...	2	...	...	...	...	...	...	2
Hospital Assistants' Examination ...	...	7	4	4	2	1	2	2	1	23
Agricultural College Graduates' Examination.	1	...	...	...	1	...	...	...	...	2
Surveying, Levelling, etc. do. ...	1	2	2	1	1	...	1	...	...	8
Unpassed men * ...	15	12	8	18	3	13	15	14	12	110
Total number that passed the Hygiene Intermediate Examination.	42	57	53	88	51	59	77	46	65	538
Number that died ...	3	4	3	4	1	2	2	...	...	19

* Under this head are included (1) the candidates whose educational qualifications are not known, (2) candidates who passed the Hygiene Intermediate Examination by private study and (3) those who passed no examinations, except Hygiene, Intermediate and other Government Technical Examinations.

Statement showing the educational qualifications of Temporary Sanitary Inspectors.

Educational qualifications, i.e., examinations passed.	1898.	1899.	1902.	1903.	1904 up to May inclusive.	Total.
B.A. Examination	3	1	2	3	...	9
F.A. do.	5	2	5	8	1	21
Matriculation Examination	30	24	49	112	22	237
U.C.S. do.	5	1	2	1	...	9
Upper Secondary do.	...	1	1	1	1	4
Lower Secondary or Middle School Examination.	20	9	110	159	72	370
Hospital Assistants' Examination	2	2	1	...	...	5
Surveying, Levelling, etc. do.	2	2	3	1	...	8
Total number of candidates admitted into the class.	297	74	505	1,154	285	2,315
Total number that passed the examination.	114	61	232	370	161	938
Total number of men posted on plague duty.	78	32	127	340	122	699
Number that died	...	...	4	...	2	6

Statement showing the rates of pay suggested for the Plague Staff, &c.
(vide Part IX, paragraphs 39, 41 and 45).

Officer.	Pay.	Personal allowance (depends on status of officer).	Special allowance (depends on nature of duties).
	RS.	RS.	RS.
(I) (a) First-grade Special Inspector (permanent post).	40	{ Ten rupees (plague allowance, if a Hospital Assistant).	...
(b) Certificated Sanitary Inspector (temporary post).	40	Nil.	...
(c) Second-grade Special Inspector (permanent posts and temporary posts: absorbs the existing grade of Temporary Sanitary Inspectors).	35	Nil.	...
(d) Assistant Inspector	25	Nil.	...
(e) Municipal or Union sanitary subordinate, on deputation in his own town.	Permanent pay.	{ Five rupees (deputation allowance).	...
(II) (1) Any member of class (I), stationed on the hills (except (e)), gets:—	...	...	{ One-third of his pay (hill allowance).
(2) Any member of class (I), doing duty in rural tracts (except on the West Coast) or doing duty as a Divisional Inspector in a town, gets:—	...	...	{ Fifteen rupees (pony allowance: pony or bicycle must be kept).
(3) Any member of class (I), doing duty in rural tracts on the West Coast, gets:—	...	...	{ Five rupees (special allowance: no bicycle or pony need be kept).

Note.—Special allowances (1) and (2) can be drawn by the same person, but not (1) and (3) or (2) and (3): personal and special allowances can be drawn by the same person, except that no person in class (I) (e) can draw allowance (II) (1). The plague allowance of the hospital assistant is drawn without reference to the existence or non-existence of plague in his jurisdiction.

Statistics relating to Inoculation.

District.	Place.	Year in which inoculation was performed.	Number of persons inoculated.	Remarks.
Anantapur	Hindupur taluk ...	1897-98	100	
Bellary	...	1899	1,217	
		1900	41	
		1902	5,906	
		1903	5,850	
Chingleput	...	None since 1899.		
Coimbatore	...	1903-04	1,129	
Cuddapah	Madanapalle	1898-99	368	
		1904	66	
Malabar	...	1898	380	
Madras City	...	1899	5,685	
Mysore	Bangalore Cantonment.	Subsequent years.	Not known.	
	Kolar Goldfields ...	1899-1904	20,000	
Nilgiris	Wellington	1898-99	11,619	
	Ootacamund	1904	21	
	Chittoor	1903	256	
North Arcot	Ranipettai	1899	150	
	Vellore	...	200	
Salem	Remount Depot, Hosur.	...	2,049	
	Do. do.	1898	2,078	
	Do. do.	1899	730	
	Do. do.	1900	157	
	Do. do.	1901	389	
	Do. do.	1902	367	
	Do. do.	1903	300	
	Do. do.	1904	32	
South Canara	...	1902-1903	1,374	
Whole Presidency	...	1899	16,217	
		1900	1,406	
		Intermediate figures not known.		
		1903	6,492	

Statement showing the receipt and disposal of passports in certain districts, between September 1903 and April 1904.

District.	1	2	3	4	5	6	7	8	9	10	11
		Registered.	Examined.	Exempted.	Unaccounted for: the bulk of these were sent to other districts or places of examination.	Submitted to the Collector's Office for default.	Lost in transmission.	Percentage of persons examined to passports received.	Percentage of persons examined or not examined for legitimate reasons.	Probable percentage of loss of passports due to carelessness or possible misconduct.	Percentage of un-doubted crossings, in whole or part, on the part of passport holders.
					(a) Sent to other districts.	(b) Unaccounted for.					
<i>Anantapur.</i>											
Municipal areas	...	5,802	2,197	...	3,474	...	...	36	94.6	...	5.3
Non-municipal areas	...	67,647	54,686	...	10,040	...	522	81	96	...	3.6
<i>Arcon (North).</i>											
Municipal areas	...	45,157	23,816	917	10,300	9,516	...	52.7	77.6	21.1	1.3
Non-municipal areas	...	257,653	195,736	129	6,354	54,401	...	76	78.5	21.1	0.4
<i>Arcon (South).</i>											
Municipal areas	...	4,932	1,946	...	2,900	27	...	39.5	98.2	0.5	1.2
Non-municipal areas	...	22,669	15,787	...	6,287	275	...	69.6	97.4	1.2	1.41
<i>Bellary.</i>											
Municipal areas	...	26,732	13,336	50	13,113	...	187	49.8	99.1	0.7	0.2
Non-municipal areas	...	153,925	101,902	329	44,044	...	7,808	66.2	95	4.7	0.2
<i>Canara (South).</i>											
Municipal areas	...	5,892	1,987	17	146	3,353	...	33.7	36.5	63.5	...
Non-municipal areas	...	364,364	212,243	12	4,934	146,138	118	58.3	59.6	40.4	...
<i>Chingleput.</i>											
Municipal areas	...	7,258	3,205	...	3,978	...	...	44.2	98.9	...	1.0
Non-municipal areas	...	30,650	21,866	69	8,618	...	...	71.5	99.5	...	0.4
<i>Coimbatore.</i>											
Municipal areas	...	25,481	20,600	284	3,243	...	...	81.0	94.8	...	5.4
Non-municipal areas	...	121,491	83,827 + 2,088*	17	24,209	802	...	77.0	98.8	0.7	0.5
<i>Cuddapah.</i>											
Municipal areas	...	1,940	1,075	9	773	...	...	55.4	95.7	...	4.3
Non-municipal areas	...	16,641	12,496	26	3,367	...	...	75.1	95.5	...	4.5

<i>Kurnool.</i>											
Municipal areas	...	4,244	2,084	32	1,941	120	...	49.1	95.6	2.8	1.6
Non-municipal areas	...	8,209	6,521	...	1,311	232	21	79.4	95	3.08	1.5
<i>Madura.</i>											
Municipal areas	...	8,336	7,336	12	530	13	...	88	94.5	0.1	5.3
Non-municipal areas	...	9,866	7,259	1,912	421	35	...	73.6	97.2	0.3	2.4
<i>Malabar.</i>											
Municipal areas	...	26,823	22,484	48	2,364	1,745	...	83.8	92.8	6.6	0.7
Non-municipal areas	...	33,755	20,137	...	3,672	11,945	...	56.3	86.6	33.4	0.002
<i>Nellore.</i>											
Municipal areas	...	1,034	661	...	200	...	...	64	88.2	...	16.7
Non-municipal areas	...	2,633	2,183	...	10	...	...	82.5	83.3	...	...
<i>Nijiriv, The.</i>											
Municipal areas	...	30,674	21,254	702	5,350	254	...	69.3	89	0.8	10.2
Non-municipal areas	...	22,200	19,845	33	2,077	36	...	89.7	95.9	0.2	0.9
<i>Salem.</i>											
Municipal areas	...	74,342	60,610	25	5,237	7,808	336	81.5	88.6	11.1	0.3
Non-municipal areas	...	150,549	108,045	24	22,580	18,154	1,696	71.7	86.7	13.1	0.05
<i>Tanjore.</i>											
Municipal areas	...	3,395	2,261	3	912	...	...	66.6	93.5	...	6.5
Non-municipal areas	...	2,957	1,858	...	642	...	...	62.8	84.5	...	15.5
<i>Madras Municipality</i>	...	114,542	46,174	22,543	39,162	6,663	...	40.3	94	5.8	0.2

* Recovered from passport-holders, consequent on their return to infected areas within ten days.

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Statement showing the areas that would have been infected, had the patients not been stopped at Jalarpet.

North Arcot.	Salem.	Madras.	Malabar.	Coimbatore.	Chingleput.	Trichinopoly.	Tanjore.	Madura.	Pondicherry.	The Nilgiris	Gólavari.
Kárpádi ... 33	Jalarpet ... 17	Madras. 13	Mankarai ... 4	Erode ... 3	Tiruvallúr ... 1	Trichinopoly. 4	Tanjore ... 1	Rámésararam. 1	Pondicherry. 1		
Sholinghur ... 15	Tirupattúr ... 17		Palghat ... 2	Karur ... 1	Ávadi ... 1						
Vellore ... 12	Vaniyambádi ... 5		Arakurussí ... 1	Coimbatore ... 1	Conjeeveram. ... 1						
Wadaja Road. ... 12	Salem ... 3		Olavakkót ... 1								
Virinchipuram ... 10	Elagiri ... 3		Ottajálam ... 1								
Arkonam ... 10	Patchúr ... 2										
Madipatti ... 6	Edinampatti. ... 1										
Tiruvalam ... 5	Kallávi ... 1										
Káripéttai ... 4	Sámelpatti ... 1										
Azínjikuppam ... 4	Sangapéttai ... 1										
Gudiyáttam ... 3	Dharmapuri. ... 1										
Arcot ... 2	Vakkannampatti ... 1										
Kuppan ... 2	Ámbaloor ... 1										
Chittoor ... 2	Chinna Kan- ... 1										
Chevoor ... 1	mampéttai. ... 1										
Sumbodo ... 1	Jalarpet (Indi- ... 23										
Arni ... 1	genons) ... 1										
Surankuppam. ... 1											
Tirupati ... 1											
Ámbúr ... 1											
126		78	13	9	5	4	1	1	1		Total. 241

1902-1903.

1903-1904.

Kárpádi ... 20	Tirupattúr ... 7	Madras. 5	Mankarai ... 9	Erode ... 3	Conjeeveram... 1	Trichinopoly ... 1	Coonoor 1	Rajah- mundry 1
Wadaja Road. ... 4	Jalarpet ... 10		Olavakkót ... 4	Dhárápuram ... 1	Poonamallee ... 1	Fort ... 1		
Sholinghur ... 3	Vaniyambádi ... 3		Pattámbi ... 1	Karur ... 2				
Arni ... 1	Mallápuram ... 2		Shoranúr ... 1					
Chittoor ... 2	Tiruvannamalai 1		Calicut ... 1					
Wandiwash ... 2			Palghat ... 2					
Vellore ... 2								
Tirupati ... 1								
Thiruvalem ... 3	Indigenous. ... 23							
Atkonam ... 1								
Virinchipuram ... 3	Edinampatti ... 2							
Madipatti ... 2	Ponnúri ... 1							
Gudiyáttam ... 4								
Ráripéttai ... 1								
49	26	5	21	6	2	1	1	Total. 112

Statement showing areas that would have been infected, had they not been stopped at Jalarpet—from 19th October 1899 to 31st January 1903.

North Arcot.	Salem.	Malabar.	Coimbatore.	Chingleput.	Madras.	South Arcot.	Trichino- poly.	Tinnevely.	Tanjore.	Travun- core.	South Canara.	Pondi- cherry.	As far as Jalarpet.	Indige- nous.
Kárpádi ... 83	Tirupattúr. 32	Mankarai ... 32	Erode ... 5	Ávadi ... 3	Madras. 12	Tirukkóy- lúr. 1	Trichino- poly. 6	Sáttur. 1	Pápaná- sam. 1	Quilon. 1	Manga- lore. 1	Pondi- cherry. 1	13	Jalarpet. 8 Kodiyúr. 4 Kávéri- péttai. 3 Edayam- patti. 1
Sholinghur ... 16	Vaniyambádi. 19	Pattámbi ... 11	Coimbatore. 2	Tiruvallúr. 2		Udantúr. 1								
W. Road ... 14	Patchúr ... 9	Ottappálam. 2	Kannúr... 1	Bongi. 2										
Arkonam ... 11	Jalarpet ... 7	Parali ... 2	Podandúr. 1											
Virinchipuram. 10	Salem ... 5	Olavakkót ... 2	Palloppatti. 1											
Gudiyáttam. 9	Kádiampatti. 2	Kurukoseri. 1												
Tiruvallam ... 7	McDonald's ... 2	Velambara... 1												
Vellore ... 6	Choultry. 2	Palár ... 1												
Ámbúr ... 4	Patturupet. 2	Agalúr ... 1												
Madipatti ... 4	Reddyúr ... 1	Tadukoseri. 1												
Vellore ... 3	Kávéripéttai ... 1	Penanjeri ... 1												
Ráripéttai ... 2	Kosalanji ... 1	Vaigancheri. 1												
Kannananga- lam ... 21	Kótiándapatti. 1	Shoranúr ... 1												
Arcot ... 2	Mallápuram. 1	Kallávi ... 1												
Vannimédu. 1	Morappur ... 1	Arakurussí... 1												
Velyampokker. 1	Kampanan ... 1	Palghat ... 1												
Vadunkota. 1	Bárgúr ... 1													
Krishnapuri. 1	Vadachéri ... 1													
Ramadáy ... 1	Anandapet. 1													
Alattúr ... 1	Elagiri ... 1													
Kuppan ... 1	Káttéri ... 1													
Tirupati ... 1	Perampet ... 1													
Sembodur ... 1	Chakkara- kuppam ... 1													
Udayendram. 1														
In these cases no proper addresses were available.														

Record of Experiments with Samney's Desiccator at the Civil and Military Station, Bangalore.

Month and Date.	Name of Street.	Number of rooms desiccated.	Dimensions and type of roof.	Time of starting desiccation.	Normal temperature of room.	Time.	Temperature at first reading.	Time.	Temperature at second reading.	Time.	Temperature at third reading.	Time.	Temperature at fourth reading.	Description of fuel used.	Quantity of fuel used.	Number of desiccators.	Remarks.
1903.																	
Feb. 4	13 B, No. 18 Street.	3	25' x 25' x 7½'. Flat roof.	4 p.m.	68°F.	4-30 p.m.	82°F.	5 p.m.	76°F.	5-15 p.m.	72°F.	.....	...	Brat-ties.	24 lbs.	1	
" 5	60, Chandy Chouk Road.	1	20½' x 9½' x 11½'. Tiled roof.	8-20 a.m.	74°F.	8-50 a.m.	96°F.	9 a.m.	96°F.	9-15 a.m.	94°F.	9-30 a.m.	90°F.	Do.	28	1	
" 6	Do.	...	Do.	9 a.m.	76°F.	9-30 a.m.	94°F.	10 a.m.	108°F.	10-15 a.m.	114°F.	10-30 a.m.	112°F.	Char-coal.	60	1	
" 9	8 B, No. 22 Street.	2	8' x 15' x 7½'. Flat roof.	9 a.m.	76°F.	9-30 a.m.	112°F.	9-45 a.m.	112°F.	11-15 a.m.	112°F.	11-30 a.m.	110°F.	Brat-ties.	28	1	Successful.
" 17	60, Chandy Chouk Road.	1	23½' x 9½' x 11½'. Tiled roof.	8-30 a.m.	76°F.	9 a.m.	118°F.	9-15 a.m.	132°F.	9-30 a.m.	128°F.	.....	...	Do.	60	2	
" 20	9 E, No. 3 Street.	2	15' x 8' x 10'. Tiled roof.	8-30 a.m.	.....	9 a.m.	210°F.	9-30 a.m.	208°F.	9-45 a.m.	134°F.	10 a.m.	164°F.	Fire-wood.	105	2	Do.
" 21	8, New Street.	1	15½' x 10½' x 12'. Tiled roof.	8-35 a.m.	74°F.	9-5 a.m.	94°F.	9-20 a.m.	100°F.	9-40 a.m.	114°F.	10 a.m.	108°F.	Do.	59	1	
" 21	Do.	1	15½' x 8' x 12'. Tiled roof.	8-35 a.m.	74°F.	9-5 a.m.	128°F.	9-20 a.m.	140°F.	9-40 a.m.	135°F.	10-30 a.m.	108°F.	Do.	76	1	Do.
" 23	1, Venketappa Lane.	2	12½' x 10½' x 11½'. Tiled roof.	8-45 a.m.	76°F.	9-15 a.m.	172°F.	9-40 a.m.	110°F.	9-40 a.m.	134°F.	.....	...	Do.	155	2	Do.
" 25	2½, Old Poor House Road.	1	17½' x 7½' x 10½'. Tiled roof.	8-40 a.m.	76°F.	9-10 a.m.	128°F.	9-45 a.m.	118°F.	10 a.m.	166°F.	10-30 a.m.	174°F.	Char-coal.	90	2	Do.
Mar. 1	8, New Street.	1	15½' x 10½' x 12'. Tiled roof.	8-15 a.m.	Floor 80°F.	8-45 a.m.	88°F.	9-45 a.m.	108°F.	9-45 a.m.	116°F.	10-15 a.m.	110°F.	Do.	39	1	
" 2	Sweepers' Segregation Camp.	3	24' x 8' x 10½'. Tiled roof.	9-45 a.m.	Floor 72°F.	10-15 a.m.	78°F.	10-30 a.m.	84°F.	11 a.m.	96°F.	11-30 a.m.	100°F.	Coal.	200	2	
" 4	70, Cavalry Road, Northern.	1	8½' x 1½' x 7½'. Flat roof.	8-45 a.m.	76°F.	12 noon.	112°F.	Door left opened at 9-15 a.m.	108°F.	9-25 a.m.	108°F.	9-30 a.m.	120°F.	Brat-ties.	32	1	
" 4	70, Cavalry Road, Southern.	...	Do.	8-45 a.m.	76°F.	9-15 a.m.	136°F.	Door left opened at 9-30 a.m.	130°F.	9-45 a.m.	130°F.	.....	...	Do.	32	1	

Report of a Plague Case at Álangáyam, Salem District.

Village—Álangáyam Parachéri. Number in Taluk map—32. Population—3,800.
Parachéri alone—about 450.

- Name, age and caste of the patient? Muttan, 15, pariah, male.
- (a) Date of commencement of illness. 18th September 1903.
(b) Date of death. 19th September 1903.
- (a) Were there any plague cases or deaths by fever in the house or family within the last 30 days; if so, when? Nil.
(b) Did the patient remove any plague corpse? No, but removed a dead rat.
(c) Was the patient in close contact with any plague cases; if so, was he segregated and placed under observation for 10 days? Nil.
(d) Did he use grain obtained from any infected house or shop? Nil.
(e) Did he visit any plague-infected locality; if so, when? Nil.
(f) If answer to questions (a) to (e) be found in the negative, to what source can the infection be traced? 1st Indigenous cases.
- If he arrived from any infected locality,
 - Was he passported; if not, why not?
 - How did he manage to evade passport?
 - Was his arrival noticed by village munsif and, if not, what is his explanation?
 Nil.
- Date and hour at which :—
 - Circle inspector heard of the case. 19th September 1903 at 4 p.m.
 - Went to the village. 19th September 1903 at 4-45 p.m.
 - Note date and hour at which first intimation of attack was sent to—
 - Plague supervisor. 20th September 1903 by post.
 - Álangáyam assistant. 19th September 1903 at 4-45 p.m.
 - Special Plague Officer. 19th September 1903 by post.
 - Explanation of delay between :—
 - Date of attack and date of despatch of first intimation to superior officers.
 - Date of first intimation and date of despatch of detailed report.
 No delay.
- Was the case reported by the village munsif? The explanation of the village munsif is herewith attached.
 - If not, what is his explanation?
 - Did he keep the fever register properly and on what date was the case entered in it?

- (b) (i) Who is the house-owner or chief male member of the family? The deceased was the head of the family.
- (ii) Did he give information as required by Plague Regulation 2 and, if not, what explanation is forthcoming as to why he should not be prosecuted? *Nil.*
- (c) Name and designation of the person who first reported the case and the date on which he did so. By M. Jivanandam Pillai, hospital assistant, Alangáyam, on 19th September 1903.
7. (a) When did the circle inspector last visit the village:— 16th September 1903.
- (b) How many deaths were there in the village:—
- (i) Since the circle inspector's last visit? One.
- (ii) Since the commencement of the preceding month? One.
- (iii) How many of the deaths were due to fever? *Nil.*
8. Was the patient examined:—
- (a) By any medical officer and by whom and when? Yes, diagnosed after death. By hospital assistant, Alangáyam, on 19th September 1903.
- (b) What symptoms of plague were noticed? Bubó in the right femoral and high fever with prostration.
- (c) Brief history, as given by medical officer or as ascertained by medical officer. On enquiry from his contacts, when he was alive.
9. (a) Was the patient isolated? *Nil.*
- (b) What accommodation was provided for him? *Nil.*
- (c) Is he treated; if so, by whom? *Nil.*
- (d) What objections, if any, exist for his being removed to plague hospital or being treated by ambulance? *Nil.*
- (e) Is it necessary to provide him with rations; if so, how was he provided for, pending orders? What rations were ordered? *Nil.*
10. Note names of contacts:—
- (a) The relationship to the patient and age. 1. Ganji, mother of the deceased.
2. Muthi, sister.
3. Child.
- (b) Which of the contacts are in actual attendance on the patient? *Nil.*
- (c) Was complete list of contacts given to village munsif for observation; if so, when? Yes, on 19th September 1903.
- (d) Where are the contacts segregated? Note the distance between the huts occupied by the patient and contacts. In a field-hut, about 1 mile distant from the village.
- (e) What arrangements were made to prevent them from freely mixing up with other people? A toty is posted to watch them.
11. (a) Was the infected house evacuated; if so, when? Yes, on 19th September 1903.
- (b) (i) Was the house, clothing and other property disinfected; if so, how? The village will soon be disinfected.
- (ii) Were openings made in the roofing for free-inflation of air and sunlight? Yes.

- (c) What *sámáns* were found in it and how were they disinfected? A few chatties that were broken out after being burnt.
- (d) Were all rags and rubbish burnt? Clothing and other property and a few clothes were boiled well and dried in the sun.
- (e) Was the corpse buried or burnt? Buried.
- (f) How deep was the body buried? 6 feet deep.
- (g) How far was the burial ground from human dwellings and water source? One mile from either source.
- (h) If the patient is alive, what arrangements were made for collection and disposal of faecal, etc., matter? *Nil.*
- (i) Who were the corpse-bearers and were the person and clothing well disinfected? Contacts 1 and 2, who were well, disinfected with their clothings.

Number of plague cases in the village up to the date, including previous year.				
Year.	Imported.		Indigenous.	
	Seizures.	Deaths.	Seizures.	Deaths.
1898-1899 ...	...	...	...	...
1899-1900 ...	...	...	...	...
1900-1901 ...	...	...	...	...
1901-1902 ...	...	...	...	...
1902-1903 ...	15	15	29	26
1903-1904 ...	...	...	3	2

12. General remarks.

The deceased and two others, who were also attacked of plague, removed dead rats from the field-huts to Alangáyam during last week. The infected house and the adjoining houses were evacuated. *Sámán* they carried with them were disinfected. They were advised to boil their clothes. Little grain they had with them was exposed to the sun.

(Signed) C. JAYARÁM NAYUDU,
Circle Inspector,
Vellakuttai Circle.

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PLAGUE REPORT.

From

THE CIRCLE INSPECTOR.

Date of despatch.

21st September 1903. Handed over to the plague supervisor in person at Alangáyam.

Date of receipt by supervisor.

21st September 1903.

Remarks by supervisor as to—

(i) Whether he inspected the case and supervised the operations. Proceeded to the village on 21st September 1903 soon after the receipt of the information, and had the contacts inspected in the field huts where they were segregated. They were all doing well in a shed about a mile away from the village. The hospital assistant and the circle inspector are daily visiting them.

(ii) If not, why not?

The deceased was a servant of one Jamalud-din Sahib of Alangáyam and was working in the fields of Jamalud-din. About a week ago the deceased and two other servants (who were also attacked with plague) opened a room in the field but where grain was stored long ago. They found in the grain some dead rats which these men removed. The grain was probably removed secretly from Alangáyam when Alangáyam was infected about a few months ago. This field-hut is about a mile from Alangáyam. With the consent of the owner I have directed the circle inspector to burn the grain and to disinfect the hut. It is also now evacuated.

(iii) Any other remarks.

Nil.

Date of despatch to Plague Officer.

Supervisor.

Date of receipt by Plague Officer.

Remarks as to when he visited the village, where the ambulance is stationed, etc.

(Signed) C. SAURINÁDAM PILLAI,

*Plague Supervisor,
Vaniyambádi group.*

CAMP ALANGÁYAM, 21st September 1904.

Submitted. I was busy at Krishnagiri.

(Signed) S. VÁSUDÉVA RAU,

Special Plague Officer.

27th September 1904.

