

REPORT

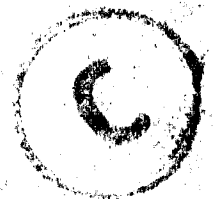
ON THE

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WORKING OF THE MICRO-BIOLOGICAL SECTION OF THE KING INSTITUTE, GUINDY,

FOR THE YEAR, 1914.

(WITH APPENDICES.)



MADRAS
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS

1915.

Not for sale.

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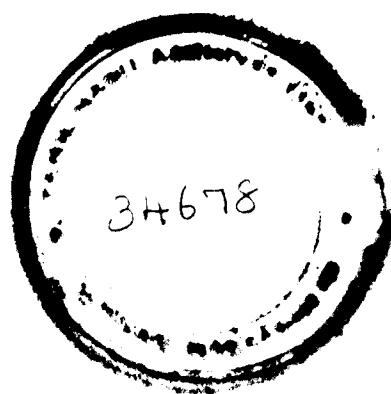


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**REPORT ON THE WORK CARRIED OUT IN THE MICRO-BIOLOGICAL
SECTION OF THE KING INSTITUTE OF PREVENTIVE
MEDICINE, GUINDY, FOR THE YEAR 1914.**

From January 1st till February 21st Major J. W. Cornwall, I.M.S., acted as Director, after which Dr. F. M. Gibson, on return from leave, took over and continued in charge for the remainder of the year.

From January 1st until November 21st Major W. S. Patton, I.M.S., continued to act as Assistant Director, but on the latter date his services were placed at the disposal of the Commander-in-Chief of the Army in India, and he reverted to military duty.

On December 9th, Assistant Surgeon S. Ramakrishnan was appointed as Temporary Assistant to the Director, and was employed partly in the Vaccine and partly in the Micro-Biological Section.

Water analysis.—As in the previous year no quarterly or half-yearly routine analyses were carried out, but a large number of samples were examined in connection with the experimental filters, and proposed water-supplies, etc.

In June 1914, under G.O. No. 1042 W., dated 21st May 1914, a small committee consisting of the Surgeon-General with the Government of Madras, the Sanitary Commissioner for Madras, the Sanitary Engineer to Government and the Director, the King Institute of Preventive Medicine, was appointed to examine into the results already obtained with the experimental filters installed at the King Institute, and to formulate definite problems requiring solution, and the lines of investigation necessary to solve them. These experimental filters were erected with a view to settling as to what was the best type of filter construction for Indian conditions, but the investigations have been interrupted time after time by the discovery of hitherto unsuspected factors which influence the efficiency of a filter, under Indian conditions. Until, while working with a Madras Standard filter, we are able to eliminate these disturbing factors, and to attain such consistently satisfactory results as are obtained in England by sand filtration, it is obviously useless to experiment with varying types of substructure. Who would have supposed, for instance, that a heavy fall of rain would, for the time being, completely disorganise a filter which up to that time had been giving perfectly good results! Yet this was definitely noticed last year in the case of the Clemesha pattern filter, and quite clearly, though not to such an extent, in the Madras Standard pattern filter; this year.

That such should occur just when large quantities of surface pollution are being washed into the rivers and lakes, and in consequence the water is very impure, is a fact of very great significance.

The following table shows the volume of work done in connection with water analysis for the past five years:—

TABLE I.

Nature of examination.	Number of samples.				
	1910.	1911.	1912.	1913.	1914.
Chemical analyses	365	429	416	498	277
Bacteriological examinations	509	529	620	684	617

The large fall in the number of chemical analyses this year is explained by the fact that five-sixths of the samples dealt with were taken in connection with the experimental filters, that is to say, were samples of Adyar river water. As filtration does not appreciably affect the chemical qualities of a water and as the varying chemical features of Adyar river water were very fully known, it was not necessary to examine the samples chemically.

It will be seen that the number of bacteriological examinations has remained pretty constant for the last three years, it being, as a matter of fact, limited by the capacity of the present staff to do more than a certain number in a given time. It has to be remembered that the full detailed examinations hitherto adopted take ten—twelve days to complete, and if, deducting Sundays and holidays, we assume 300 working days per year, it follows that there was an average of twenty or more examinations always on hand. Now that we know something of the bacterial flora of Adyar river water it will no longer be necessary to carry out the examinations in such detail, and the materially shorter time required for each examination will enable us to pass a much larger number through our hands. This is a change that is eminently necessary, since it was not possible from the results of twenty samples per day to control the actual and comparative efficiencies of the different filters in the installation.

Of the 617 samples dealt with 501 were taken from the experimental filters.

Specimens sent for examination.—The number of specimens sent for examination shows a large increase over that for last year. The details of these are given in the following table:—

TABLE II.

Number.	Description of specimens.	Number of positive results.	Number of negative results.	Total.	Remarks.
1	Plague, human ...	39	111	150	Peripheral blood ... 25
2	Plague, animal ...	53	1,249	1,302	Putrefactive organisms ... 12
3	Blood for enteric reaction ...	354	220	574	Putrefactive organisms ... 30
					(i) 214 positive in (1 in 96).
4	Do. paratyphoid A ...	17	182	199	(ii) 149 positive in (1 in 32) but negative in (1 in 96).
5	Do. paratyphoid B ...	32	142	174	Seventeen positive in (1 in 32) but negative in (1 in 96).
6	Do. B. gartner ...	...	1	1	(i) Thirty-one positive in (1 in 32) but negative in (1 in 96).
7	Do. Micrococcus melitensis reaction (Malta fever).	...	6	6	(ii) One positive in (1 in 96).
8	Do. Wassermann reaction.	338	196	534	Includes two indefinite.
9	Do. Malarial parasites.	83	561	644	Four films show increase of large mononuclears suggestive of malaria.
10	Do. Kala-Azar ...	...	10	10	Includes nine indefinite.
11	Do. Filaria ...	...	13	13	
12	Do. Leucocytosis ...	10	100	110	
13	Do. Differential count ...	...	...	21	
14	Sputum and pus smears for tubercle bacilli.	10	42	52	
15	Specimens for lepra bacilli ...	4	7	11	† Wassermann's reaction positive in two cases.
16	Discharge for gonococci ...	31	18	49	Includes six indefinite.
17	Cholera (stools and vomit) ...	22	40	62	
18	Blood for isolation of B. typhosus in taurocholate water medium.	† 1	13	14	† An organism giving most of the reactions of B. typhosus.
19	Isolation of typhoid bacillus from stools and urine.	§ 3	16	19	§ Two organisms which gave most of the tests of enteric bacillus but not all.
20	Diphtheria ...	21	35	56	
21	Stools from ova and amœbæ ...	3	24	27	‡ Amœbæ were found.
22	Urine for chemical and microscopic examinations.	...	...	12	
23	Tumours ...	...	...	4	
24	Specimens for spirochaetes (smears).	...	6	6	
25	Specimens for spirochaetes (fortuses).	6	37	43	
26	Water for cholera-like vibrios ...	15	59	74	
27	Water samples for chemical analyses.	...	...	277	
28	Water samples for bacteriological examination.	...	...	617	501 samples from the Experimental filters at Guindy.
29	Miscellaneous ...	...	...	12	
	Total ...	1,042	3,082	5,067	

Plague—(a) Human.—The number of specimens sent shows a slight decline in comparison with last year and the positive results obtained, a very marked decline. An increase, however, is seen in the number of useless specimens of peripheral blood sent for this examination, the percentage rising from 10·7 nearly

to 16·6. This mistaken practice is a very obstinate one to get rid of. All persons employed on plague duty should be distinctly instructed that plague bacilli, except in certain moribund cases, cannot be detected microscopically in the peripheral blood. During life, films of gland juice (not peripheral blood from over the gland, but material drawn from the interior of the gland) in bubonic plague, and of sputum in suspected pneumonic plague should be sent. From dead bodies of either human beings or lower animals the films should be prepared from a freshly cut surface of the spleen or liver.

Plague—(b) Animal.—Although the number of specimens sent was more than double that of last year, the positive results show a decrease.

Widal's reaction.—There was a slight rise in the number of bloods examined and also a slight rise from 60·3 to 61·5 in the percentage of specimens showing some positive reaction.

Agglutination test for (a) Paratyphoid A.—The number of specimens sent increased from 133 to 199, but the percentage of specimens showing some positive reaction fell from 11 to 8·5. No single specimen gave a definite positive reaction in a dilution of 1 in 96.

(b) Paratyphoid B.—Here again the number of specimens sent showed a marked increase and the percentage of specimens showing some positive result fell from 21 to 18. Only one specimen gave a positive reaction in a dilution of 1 in 96, and in this case only can we say that there was definite infection with the bacillus Paratyphosus. B.

Wassermann's reaction.—There was a considerable decline in the number of bloods sent for this test, but this was due to the fact that specimens from the Poonamallee-hospital which used to be sent to this institute are, by order, now sent to Wellington. There was however a large actual and correspondingly larger percentage increase in the positive results. In the two years these latter were 263 and 338 with positive percentages of 43·5 and 63·3, respectively. This large increase in positive findings is probably partly due to an improved method of carrying out the test. During previous years different methods were compared for reliability. The most generally reliable in all stages of the disease was the original one of Wassermann, but next to it, and a fairly close competitor was Levaditi's modification. It was found that an occasional case was missed or gave conflicting results with either method. So now a combination of the two has been adopted as a routine method. During the last quarter of the year some comparative tests have been made between this combined method and Noguchi's modification, but further work in this direction is required.

Malarial parasites.—The number of bloods sent for this examination was considerably more than doubled, but as the number of positive finds was only slightly larger, the percentage of positive cases is much smaller. Parasites were found in 83 cases as compared with 75 last year, the corresponding percentages being 12·9 and 27·7. Four cases in which parasites could not be detected showed blood changes generally considered to be associated with malaria. Possibly in these cases quinine had been given before the specimen was taken. This procedure which causes the disappearance of the parasites from the peripheral circulation is a fruitful source of failure to detect the parasite. In all cases of fever the routine practice of taking a film of the blood, for future reference, if required, before medicine of any kind has been given is to be strongly recommended.

Leucocytosis.—The number of cases rose from 24 to 110, but here again the percentage of positive results was much smaller, 29 and 9, respectively.

Tubercle.—These specimens show a slight rise in number but a slight fall in the percentage of positive finds.

Leprosy.—The numbers remain about the same. A point of interest here however is that the blood of two out of three negative cases examined gave a positive Wassermann reaction. In many early cases of leprosy it is not possible to demonstrate the bacillus, but if it is found that the Wassermann reaction can be

Water for cholera-like vibrios.—At the instance of the Collector of Chingleput, in which Collectorate cholera was widely disseminated, an attempt was made to examine the well and tank water in every village in which the disease made its appearance. To be of any use at all the result of the examinations would need to be reported within 12 hours of receipt of the sample. As it is quite impossible to declare in such a limited time that an organism isolated from water conforms in all particulars to the true germ of cholera, recourse was had to a simple examination for cholera-like vibrios. It is now generally recognised that the presence of vibrios in a tropical drinking water-supply is one of grave significance, even though it has not been possible to identify any of these vibrios with the actual germ of cholera. If such germs are present in the water, cholera is not very far off. Seventy-four of such samples were examined with the result that 15 or 20 per cent. showed the presence of these suspicious vibrios. In no case was it possible to completely identify these organisms with actual cholera bacilli, but I was informed by the Collector of Chingleput that in some cases the closure of the water-supply, incriminated by our reports, resulted in the cessation of cholera cases in the locality.

In the examination for *Treponema Pallidum* in the tissues of macerated foetuses sent from the Maternity Hospital, the percentage of positive finds fell, but if we regard those negative cases, in which the blood of the mothers gave a positive Wassermann's reaction as being of syphilitic causation, the percentage of cases due to syphilis rises from the 25 per cent. of previous years to 45.5 per cent. which is probably much nearer the truth.

Vaccine Therapy.—There was a slight decline in the number of doses of bacterial vaccines issued. The fall took place entirely in the number of autogenous vaccines made and doses of them issued. This decline was so marked as to mask an actual increase in the number of doses of stock vaccines issued. The number of autogenous vaccines made fell from 230 to 193 and the doses of them issued from 1,396 to 1,151. The varieties of stock vaccines issued fell from 13 to 12, but the doses of them issued rose from 5,691 to 5,830. Under Indian conditions this may be regarded with less regret than would otherwise be the case. The movements of Indian patients are so little susceptible to control that in a considerable number of cases the patient leaves hospital before an autogenous vaccine can be got ready. At best an autogenous vaccine cannot be made and its sterility controlled under four days and it may be longer. As a result of this we see that out of 193 autogenous vaccines made no less than 31 or 16 per cent. are returned as having not been used at all. A farther 49 or 25 per cent. are shown as not known or have had no return at all made about them. It may be assumed that in a considerable number of these latter the vaccine was, as a matter of fact, not used at all. Probably then not less than 25 per cent. of the labour, time and material employed in making these autogenous vaccines is wasted. This is of course a great pity, but it would be a greater pity if this wastage resulted in restricting the number of vaccines made and thus limiting the benefits available for others. Considerable difference of opinion exists as to whether these vaccines can be efficiently prepared by persons who do not see the cases both before and during treatment. Too much stress need not be laid on this since it is obvious that there are many more medical and surgical practitioners who wish to use vaccines than there are men with the special training required to prepare them, just as there are many more hospitals and localities where they are used than there are laboratories with equipment adequate for their preparation.

That every large hospital, of over 500 beds say, might be the better of a trained bacteriologist on its staff, cannot be gainsaid, but he would be so fully employed in elaborating material that he would have little time to observe and control its subsequent use. As regards the effects produced by the vaccines he would have to rely, in the vast majority of cases, on his colleagues. Free sympathetic discussion between the makers and users of the vaccine is probably the way in which sound knowledge of the subject can best be advanced and discussion is more likely to be sympathetic and free when the bacteriologist only visits the wards at the request of his colleagues.

TABLE IV.

Number of doses sent out.						1911.	1912.	1913.	1914.
autogenous vaccines	...	...	...	...	...	...	854	1,396	1,151
stock vaccines	...	...	...	...	...	...	2,150	5,691	5,830
Total						1,600	3,004	7,087	6,981

Two-thirds of the autogenous vaccines were made at the instance of Medical officers and practitioners in Madras City. One hundred and ninety-three autogenous vaccines were supplied as under:—

TABLE V.

(1) For the General Hospital, Madras	...	...	...	...	60
(2) For the Royapettah Hospital, Royapettah	...	...	...	...	4
(3) For the Monegar Choultry Hospital, Madras	...	...	...	...	2
(4) For the Madras Lunatic Asylum, Madras	...	...	...	...	4
(5) For the Government Maternity Hospital, Madras	...	...	...	...	8
(6) For the Station Hospital, Fort St. George	...	...	...	...	9
(7) For private practitioners or medical officers in their private capacity in Madras City	...	...	...	...	41
(8) For hospitals and medical men in the mufassal	...	...	...	...	65
Total					193

In appendix I, Dr. Kesava Pai classifies the various vaccines made and discusses some of the more interesting cases and points about them.

In appendix II, Note I, Civil Assistant Surgeon T. Sitapati Ayyar, L.M. & S., records the further experience gained in connection with still-births in which the foetus is extruded in a macerated condition. The object for which this investigation was started, namely, to see if any large percentage of these cases could be assigned to any definite cause, may be said to have been attained, since it has been shown that a very large proportion of the foetuses and a still larger proportion of the mothers are undoubtedly syphilitic. The work however is being continued since these foetuses form the sole source of one of the essential reagents used in performing the Wassermann Test.

In appendix II, Note II, Civil Assistant Surgeon T. Sitapati Ayyar, L.M. & S., also gives some notes on improved methods for the bacterial examination of water. Some of the results shown are of great interest and will, I think, come as a surprise to many.

Sera from the Lister Institute, London, and the Central Research Institute, Kasauli, were stocked in the cold chamber of the Institute and supplied to medical men on requisition at cost price. A considerable quantity of sera and bacterial vaccines were supplied to the Hospital Ship "Madras."

TABLE VI.

Nature of serum.		Sera issued.	Total quantity supplied.
(1) Anti-streptococcus serum	...	...	347 bottles of 10 cc. each (25 bottles to the Hospital Ship "Madras").
(2) Anti-tetanic serum	...	...	299 bottles of 10 cc. each.
(3) Anti-diphtheritic serum	...	...	139 bottles of 2,000 units each (25 bottles to the Hospital Ship "Madras").
(4) Anti-dysenteric serum	...	...	55 bottles of 20 cc. each (25 bottles to the Hospital Ship "Madras").
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(6) Coley's fluid	...	...	9 vials of 2 cc. each.
Total		...	855

Table VI shows the number and kinds of issues made. Since the outbreak of the war, it has been almost impossible to obtain anti-tetanic serum, all the available supplies having been bespoken by the Military Authorities in Europe. A small quantity of half strength serum was sent out by the Lister Institute, but no further supplies even of this strength, are likely to be available for some time. In these circumstances economy of existing stocks becomes very essential, and it is important to record that excellent prophylactic results have been obtained at the military hospitals in Europe with very much smaller doses than those heretofore used. Doses of 2 cc. containing 300 units have been found to give good results, and, apart from operations on accident cases, even smaller doses might be sufficient in the cases of minimal infection which alone are to be taken into account in ordinary surgical practice.

As in previous years large quantities of anti-rinderpest serum and Hæmorrhagic septicæmia vaccine have been stored and distributed on behalf of the Civil Veterinary Department. Recently also consignments of anti-anthrax serum have been received.

Buildings.—The enlargements to the main building have now been completed, and some of the rooms are in occupation, but effective occupation of the whole is delayed for want of electrical equipment.

Educational.—Thirty candidates attended the vaccination class in 1914 and all obtained qualifying marks at the end of the course. A further course of instruction in the manufacture, care and handling of calf vaccine lymph was given to candidates for the degree of Bachelor of Sanitary Science. Only two candidates appeared for this and both passed creditably in an examination on the work of the course.

Research work.—The following papers were published during the year in the Indian Journal of Medical Research :—

No. 1—A paper on "The Occurrence of *Stygeromyia Maculosa* in Madras together with some observations on its habits"—by Major W. S. Patton, I.M.S.

No. 2—Paper on "The Examination of the Peripheral Blood of 84 patients suffering from Kala Azar at the General Hospital, Madras, during the period from 15th June 1912 to 15th July 1913"—by Major W. S. Patton, I.M.S.

No. 3—Paper on "Some Observations on the salivary secretion of the commoner blood-sucking insects and ticks"—by Major J. W. Cornwall, I.M.S., and Major W. S. Patton, I.M.S.

No. 4—A paper on "An Investigation into the Bacteriology of Dysentery in the Madras Lunatic Asylum"—by Civil Assistant Surgeon M. Kesava Pai, M.D.

A short article on "Recent work in Kala Azar" was also published by Major W. S. Patton, I.M.S., in the Book of Tropical Medicine and Hygiene.

A paper on "Medical Entomology, its scope and some of its economical aspects" by Major W. S. Patton, I.M.S., was read in the Indian Science Congress of 1914.

THE KING INSTITUTE OF PREVENTIVE
MEDICINE, GUINDY,
5th February 1915.

F. M. GIBSON, M.B., B.Sc.,
Director.

Order No. 342 L., dated 3rd March 1915.

Recorded.

(True Extract.)

W. FRANCIS,
Secretary to Government.

APPENDIX I.

NOTES ON VACCINE THERAPY.

By Civil Assistant Surgeon M. Kesava Pai, M.D.

The results of autogenous vaccine treatment in the 193 cases for which they were prepared will first be described under the headings of the different classes of diseases and the reports on the use of stock vaccines will next be briefly summarized.

Furunculosis.—The *staphylococcus aureus* was the organism invariably isolated in the 2 cases that came under observation. Of the nine cases in which the autogenous vaccines were used and the results followed up, eight were cured and one showed marked improvement.

TABLE I.

Furunculosis.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine made.	Result.
1	5	Major T. H. Symons, I.M.S., Madras ...	Furunculosis ...	<i>Staphylococcus aureus</i> .	Improved.
2	19	The District Medical and Sanitary Officer, Madras.	Do. ...	Do.	Not used.
3	48	Lt.-Col. C. Donovan, I.M.S., Madras ...	Do. ...	Do.	Not known.
4	44	Major W. A. Justice, I.M.S., Madras ...	Do. ...	Do.	Not used.
5	46		Do. ...	Do.	Cured.
6	50	The Superintendent, Govt. Maternity Hospital, Madras.	Do. ...	Do.	Not used.
7	57	Officer Commanding Station Hospital, Madras.	Do. ...	Do.	Cured.
8	74	The Resident Medical Officer, General Hospital, Madras.	Do. ...	Do.	Not known.
9	77	Lt.-Col. C. Donovan, I.M.S., Madras ...	Do. ...	Do.	Not used.
10	85	The Resident Medical Officer, General Hospital, Madras.	Do. ...	Do.	Not known.
11	87		Do. ...	Do.	Cured.
12	90	The Resident Medical Officer, General Hospital, Madras.	Do. ...	Do.	Not known.
13	98	The District Medical and Sanitary Officer, Cuddalore.	Diabetic boils ...	Do.	Cured.
14	126	The Medical Officer, Brigade Laboratory, Madras.	Furunculosis ...	Do.	Do.
15	127	The Superintendent, Royapettah Hospital, Royapettah.	Do. ...	Do.	Do.
16	128	Dr. W. E. Gibson, Egmore ...	Do. ...	Do.	Do.
17	129	The Chief Medical Officer, S.I.B., Trichinopoly.	Do. ...	Do.	Not known.
18	134	Dr. W. E. Gibson, Egmore ...	Do. ...	Do.	Cured.
19	149	The District Medical and Sanitary Officer, Cuddalore.	Do. ...	Do.	Not used.
20	169	Major Niblock, I.M.S., Madras ...	Do. ...	Do.	Do.
21	173	Officer Commanding Brigade Laboratory, Madras.	Do. ...	Do.	Not known.
22	177	Major F. F. Elwes, C.I.B., I.M.S., Madras	Do. ...	Do.	Not used.

Eczema, pemphigus, sycosis and pustular skin eruptions.—The vaccine treatment of the cases of streptococcal pemphigus was as usual very successful. The staphylococcal cases of pustular eczema also readily yielded to their autogenous vaccines. The only case (No. 139) which did not yield to this treatment was one of chronic dermatitis without any definite exudation. The cultures were made from a scraping from the eruption and it is almost certain that the organism isolated was the non-pathogenic *staphylococcus epidermidis albus*.

TABLE II.

Eczema, pemphigus, sycosis and pustular skin eruptions.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine made.	Result.
1	18	The Superintendent, Maternity Hospital, Madras.	Pustular eruptions ...	<i>Staphylococcus aureus</i> .	Not used.
2	24	The Fourth Physician, General Hospital, Madras.	Pemphigus ...	<i>Streptococcus</i> ...	Cured.
3	37	The Staff Surgeon, Fort St. George, Madras.	Do. ...	Do. and <i>Staphylococcus aureus</i> .	Do.

TABLE II—cont.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine made.	Result.
4	41	The First Physician, General Hospital, Madras.	Pemphigus ...	Streptococcus	Not known.
5	51	The Resident Medical Officer, General Hospital, Madras	Pustular eczema ...	Staphylococcus aureus.	Cured.
6	63	Dr. E. Rama Wariar, Calicut ...	Chronic eczema ...	Do.	Greatly improved.
7	75	The Resident Medical Officer, General Hospital, Madras.	Eczema ...	Do.	Do.
8	107	Do. do.	Do. ...	Do.	Improved.
9	130	Do. do.	Do. ...	Do.	Not known.
10	122	Do. do.	Syccosis of face ...	Staphylococcus albus.	Do.
11	125	Do. do.	Do. ...	Do. aureus.	Do.
12	130	Officer Commanding Station Hospital, St. Thomas' Mount.	Pustules on arm ...	Streptococcus brevis.	Greatly improved.
13	139	The Surgeon, IV District, Madras ...	Dermatitis ...	Staphylococcus albus.	No effect.
14	140	The Resident Medical Officer, General Hospital, Madras.	Pustular eruption on thigh.	Staphylococcus aureus.	Not known.
15	158	The Officer Commanding Station Hospital, Poonamallee.	Pustular eruption on face.	Do.	Improved.
16	162	Dr. B. K. Nariman, M. & S.M. Railway, Madras.	Vesicular eruption ...	Do.	Cured.
17	168	The Director, King Institute, Guindy...	Pemphigoid eruption on arms.	Do.	Do.
18	192	The Officer Commanding, Brigade Laboratory, Fort St. George.	Pemphigus ...	Streptococci	Under treatment.

Abscesses and carbuncles.—The organism isolated was as a rule the staphylococcus aureus, streptococci having been grown in two cases only. In these latter it is not unlikely that the streptococcus invaded the tissues after the abscesses opened or else they were cases of suppurative cellulitis and not circumscribed abscess. Two cases deserve special mention.

Case 71 was a typical instance of a markedly lowered resistance to staphylococcal invasion so commonly seen in the hot weather. The condition begins as an attack of prickly heat. Many of the papules rapidly run into vesicles and pustules with an angry looking areola around each and very tender to the touch. These are soon followed by crops of boils and superficial abscesses, the chest, armpits, face and scalp being most frequently affected. In the present case the abscesses were so numerous that as many as eighteen had to be incised. Large patches of prickly heat had formed into weeping eczematous areas, covered here and there with thick scabs, which, when removed, left large bleeding surfaces. After the first two doses of 25 and 35 million antigenous staphylococcus vaccine, the skin rapidly cleared up, the abscesses completely healed and the skin assumed a more healthy appearance than for months previously.

Case 124—One of multiple abscesses in a baby of nine months. The left elbow, back and thigh were covered with small abscesses of the size of marbles. They were incised and drained, whilst fresh ones formed in the neck, right arm and external ear, the child developing a temperature of 102° F. daily. After four injections of autogenous staphylococcus vaccine the temperature dropped down to normal and the child made a complete recovery.

TABLE III.
Abscesses and carbuncles.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine made.	Result.
1	3	The First Surgeon, General Hospital, Madras.	Multiple sinuses ...	Staphylococcus aureus.	No effect.
2	9	The Third Surgeon, General Hospital, Madras.	Abscess foot ...	Do.	Cured.
3	15	Do. do.	Abscesses ...	Do.	Do.
4	25	Assistant Surgeon S. P. Sarma, Dindigul.	Carbuncle ...	Do.	Not known.
5	26	The First Surgeon, General Hospital, Madras.	Iliac abscess ...	B. Celi ...	Not given a fair trial.
6	49	The District Medical and Sanitary Officer, Guntur.	Diabetic abscess ...	Staphylococcus aureus.	Not used.
7	60	The District Medical and Sanitary Officer, Trichinopoly.	Abscess ...	Do.	Not known.
8	63	The District Medical and Sanitary Officer, Cuddalore.	Do. ...	Do.	Not used.
9	68	Dr. P. Lakshmanan, Quilon ...	Diabetic carbuncle ...	Do.	Cured.
10	70	Officer Commanding Brigade Laboratory, Madras.	Abscess ...	Do.	Do.
11	71	Do. do.	Multiple abscess ...	Do.	Do.

TABLE III—cont.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
12	92	The Civil Surgeon, Tellicherry ...	Multiple diabetic abscesses.	Staphylococcus aureus.	No effect.
13	93	The Third Surgeon, General Hospital, Madras.	Psoas abscess ...	Do.	Not known.
14	106	The Surgeon, First District, Madras ...	Sinus groin ...	Do.	Cured.
15	110	The Third Surgeon, General Hospital, Madras.	Abscess ...	Do.	Not known.
16	111	Dr. U. Rama Rao, Madras ...	Carbuncle ...	Do.	No effect.
17	117	The District Medical and Sanitary Officer, Cocanada.	Do. ...	Do.	Not used.
18	123	Dr. P. Lakshmanan, Quilon ...	Diabetic carbuncle ...	Do.	Cured.
19	124	Do. ...	Abscess ...	Do.	Do.
20	137	Miss Macphail, Conjeeveram ...	Carbuncle ...	Streptococcus	Cured, but the patient died later from complications.
21	138	The District Medical and Sanitary Officer, Cuddalore.	Abscess ...	Staphylococcus aureus.	Not known.
22	152	Mr. S. Maniswami, Trichinopoly ...	Carbuncle ...	Do.	Not used.
23	157	The District Medical and Sanitary Officer, Vellore.	Do. ...	Do.	Cured.
24	159	The Superintendent, Lunatic Asylum, Madras.	Abscess ...	Do.	Not used.
25	163	Dr. L. A. Ravi Varma, Trivandrum ...	Diabetic abscess ...	Streptococcus	Not known.
26	191	Assistant Surgeon B. Keshava Rao, Chowghat.	Carbuncle ...	Staphylococcus aureus.	Do.

Acne.—Considering that this disease is of such a chronic and persistent nature the results obtained may be considered to be on the whole good. The acne bacillus was cultivated anaerobically by the following method. About 10 to 15 c.c. of ordinary bouillon were boiled in a sterile test tube to drive off the air dissolved in the medium, which was then rapidly cooled by being immersed in cold water and inoculated at once with a few bits of the crushed comedones previously washed in sterile salt solution. Melted sterile vaseline was next poured over the surface of the bouillon to prevent access of air, the whole operation being gone through in a very short time so as to prevent reabsorption of oxygen. In two to five days there was a distinct growth in which acne bacilli could be seen in large number along with the staphylococcus albus in the majority of cases. A subculture was then made in bouillon anaerobically by the same method and after three or four days' incubation a growth was obtained in which staphylococci were few and acne bacilli predominant. This broth culture was heated and carbolised and used as the vaccine. It was combined with a vaccine made from the coexisting staphylococcus albus whenever the latter was found in fairly large numbers in the aerobic cultivation.

An interesting case that was treated during the year was one of acne indurata affecting mostly the neck and the lower part of the face. After suppuration small but prominent and unsightly scars were produced. Whilst in England some time previously the patient had been treated with an autogenous staphylococcus vaccine with marked success. The trouble had however recurred after coming out to India. Cultures made from the pustules gave a growth of staphylococcus albus only, no acne bacilli being detected. A course of combined autogenous staphylococcus albus vaccine and stock acne vaccine was however given and the eruption cleared up rapidly leaving the skin smooth and healthy.

TABLE IV.
Acne.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	47	The Resident Medical Officer, General Hospital, Madras.	Acne ...	Acne bacillus	Improved.
2	55	The Fourth Physician, General Hospital, Madras.	Do. ...	Do.	Cured.
3	56	The Officer Commanding Station Hospital, Poonamallee.	Do. ...	Acne bacillus and staphylococcus albus.	Improved.
4	58		Do. ...	Staphylococcus albus.	Much improved.
5	99	The Officer Commanding Station Hospital, Poonamallee.	Do. ...	Acne bacillus and staphylococcus albus.	Cured.
6	104	Do. do.	Do. ...	Staphylococcus albus.	No effect.
7	105	Dr. P. Lakshmanan, Quilon ...	Do. ...	Do.	Not known.
8	147	The Resident Medical Officer, General Hospital, Madras.	Do. ...	Acne bacillus and staphylococcus albus.	Do.

Ulcers, septic wounds and sinuses.—In a class of cases where anti-septic treatment and surgical measures must necessarily play an important part, it is satisfactory to note that of the 6 cases where the vaccine was used and the results reported, 4 were cured and 1 improved. The only case that was not affected was one of epithelioma of the floor of the mouth which was treated at first with a vaccine presumably on the supposition that it was an ordinary ulcer.

TABLE V.
Septic wounds and sinuses.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	3	The Third Surgeon, General Hospital, Madras.	Septic wounds ...	Staphylococcus aureus.	Not known.
2	6	Do. do.	Epithelioma of floor of mouth.	Streptococcus brevis.	No effect.
3	14	The Staff Surgeon, Fort St. George ...	Septic wound of leg.	Streptococcus ...	Cured. Surgical treatment also adopted.
4	27	The Third Surgeon, General Hospital, Madras.	Suppurating wound of palm.	B. Coli ...	Not used.
5	31	Do. do.	Do.	Streptococcus ...	Cured. Other surgical treatment also adopted.
6	32	Do. do.	Suppurating wound of groin.	Do.	Cured.
7	176	The Medical Officer, Station Hospital, St. Thomas' Mount.	Chronic ulcer ...	Do.	Improved.
8	180	The Medical Officer, Municipal Hospital, Vellore.	Ulcers ...	Do.	Not known.
9	184	The District Medical and Sanitary Officer, Cuddapah.	Septic tiger bite ...	Streptococcus longus.	Cured.
10	190	Do. do.	Suppurating wound after operation.	Streptococcus ...	Not used.
11	131	The Resident Medical Officer, General Hospital, Madras.	Sinus on left shoulder.	Do.	Not known.

Pyorrhoea alveolaris.—The bacteriology of this condition is still wrapped in obscurity. Cultivations from the discharge almost invariably give growths of streptococci and it has been the custom to treat the condition with the corresponding streptococcal vaccines. The result of such treatment cannot on the whole be considered to be satisfactory, so much so that vaccine therapy has been considered by some to be of no avail in this condition. It is possible however that the disease is due to some other organism or organisms working either by themselves or in symbiosis with the streptococci. This view is favoured by the fact that the microscopic examination of films of the discharge in most cases shows large number of spirochaetes and fusiform bacilli, besides streptococci, but attempts, made so far, to cultivate them in different media both under aerobic and anaerobic conditions have failed.

The most interesting part of the work done in connection with the vaccine therapy of *Pyorrhoea alveolaris* was an attempt to employ it in the treatment of the secondary symptoms supposed to be due to the absorption of the toxic products of the streptococci either from the tooth sockets themselves or from the intestines which are supposed to be infected with the organisms ingested with food. The dental condition in these cases was comparatively slight. Under this category come two cases of sprue (112 and 113) whose general health had suffered a good deal from malnutrition and "alimentary toxemia." They were treated with the autogenous vaccines made from their alveolar discharges. Both patients increased in weight and improved not only in general health but in their intestinal condition as well.

Case 97 was one of *Pyorrhoea alveolaris* in a person of 39 years. The condition was accompanied by an ulcerated and fissured tongue. As a result of treatment with autogenous streptococcal vaccine, the tongue looked cleaner, the white patches diminished in number and the cavity of the mouth assumed a more or less healthy appearance. This result is interesting as it seems to indicate that the stomatitis and the suppuration in the teeth sockets were caused by the same organism, the streptococcus.

TABLE VI.
Pyorrhoea Alveolaris.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	48	The District Medical and Sanitary Officer, Madras.	Pyorrhoea alveolaris.	Streptococcus ...	Not known.
2	97	Do. do.	Do.	Do.	Improved.
3	109	The District Medical and Sanitary Officer, Calicut.	Sprue with pyorrhoea.	Do.	No effect.
4	112	The Fourth Physician, General Hospital, Madras.	Do.	Do.	Improved.
5	113	Do. do.	Pyorrhoea alveolaris.	Streptococcus longus.	Do.
6	125	Dr. Wilson, Kodaikanal ...	Do.	Streptococcus brevis.	Marked improvement.
7	148	Do. do.	Do.	Do.	Improved.
8	153	The Superintendent, Medical School, Royapuram.	Do.	Do.	No effect.
9	170	Sub-Assistant Surgeon K. R. Subrahmanyam, Municipal Hospital, Madras.	Do.	Do.	Do.
10	175	Do. do.	Do.	Do.	Temporary improvement.
11	178	The Superintendent, Lunatic Asylum, Madras.	Do.	Do.	Not used.
12	189	Do. do.	Do.	Do.	Under treatment.

Inflammations of the nasopharynx and ear.—Streptococci, M. Catarrhalis and B. Influenzae were the organisms isolated from the discharges. The last organism was isolated from two cases of pharyngeal catarrh and the autogenous vaccine in each case brought about an improvement in the catarrhal condition.

Both the M. Catarrhalis and B. Influenzae were found to be very delicate organisms. Though seen in large numbers in the microscopic preparations of the catarrhal discharge, the growth in the culture tubes was comparatively very scanty and the organisms often died out during the very first sub-cultivation. The M. Catarrhalis grew best on serum agar and the B. Influenzae on blood agar. In spite of frequent and careful subplanting in these media, the organisms died out in a few weeks.

TABLE VII.
Inflammations of the nasopharynx and ear.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	13	Do. do.	Otorrhoea ...	Streptococcus ...	Not used.
2	17	Do. do.	Pharyngitis ...	M. Catarrhalis and B. Influenzae.	Improved.
3	28	Do. do.	Do. ...	Streptococcus ...	Doubtful.
4	96	Dr. H. W. McCauley Hayes, Trichinopoly.	Chronic nasopharyngeal catarrh.	M. Catarrhalis ...	Not known.
5	108	Dr. C. Mangayya Nayudu, Vizianagaram.	Nasopharyngeal catarrh.	Streptococcus and Staphylococcus aureus.	Improved; still under treatment.
6	154	The Resident Medical Officer, General Hospital, Madras.	Follicular tonsillitis.	Streptococcus ...	Not used.
7	156	The Second Surgeon, General Hospital, Madras.	Chronic discharge from right ear.	Do.	Do.
8	160	Major F. Clarence Smith, Madras	Nasal catarrh	B. Septus ? ...	Not known.
9	164	Do. do.	Nasopharyngeal catarrh.	B. Influenzae ...	Improved.
10	185	Major F. Clarence Smith, Madras	Chronic sphenoidal sinus.	Pneumococcus ...	Not known.

Asthma and Chronic Bronchitis.—The experience of previous years regarding the applicability of vaccine treatment in asthma and chronic bronchitis has been sufficiently confirmed by

the results obtained by the vaccine therapy of these obstinate diseases during 1914. Thirty-six cases were examined in all. The bacteriological findings and results of autogenous vaccine therapy can be tabulated as follows:—

Organisms isolated.	Total number of cases.	Cured or greatly improved.	Improved.	No effect.	Vaccine not used or result not known.
Pneumococcus	6	1	1	2	3
Pneumococcus and M. Catarrhalis	2	1	...	...	1
Pneumococcus, M. Paratetrigenus and streptococcus	1	1	...	...	...
Pneumococcus and streptococcus	1	...	...	...	1
Streptococcus	13	7	2	2	2
M. Catarrhalis	2	...	1	...	1
M. Catarrhalis and streptococcus	2	1	...	...	1
M. Paratetrigenus	1	...	1	...	...
M. Paratetrigenus and streptococcus	8	3	1	1	3

As was observed last year the *Pneumococcus* and *streptococci* have been found in the sputum more frequently than the other organisms, the former having been isolated in 10 cases and the latter in 24, either alone or associated with other organisms. The majority of cases reported as cured or greatly improved were streptococcal and this seems to indicate that the streptococci do after all play a truly pathogenic part in these respiratory catarrhs and that the number of these streptococcal cases is perhaps much greater than was originally supposed. On account of the disappointing results obtained at an earlier stage with autogenous streptococcal vaccines in asthma and chronic bronchitis, the bacteriological findings in this class of cases was at first viewed with some suspicion and whenever the streptococcus alone was isolated from a sputum it was feared that the real organism was for some reasons missed. It is clear that this view was rather premature and that streptococci do play as important a part in the pathology of bronchial catarrhs as other organisms.

Of the 24 cases in which the reports of the results of vaccine treatment could be obtained, 13 were either cured or greatly improved; 6 showed some improvement and the remaining 5 derived no benefit. In a paroxysmal and recurring disease like asthma, with intervals of comparative and even absolute quiet, it is perhaps rather presumptuous to assert that a case has been cured, unless the patient has been kept under observation for a long period, during one or two cold seasons say, but there are one or two cases whose history is sufficient to dispel all scepticism. These have now been under observation for two or three years and as their trouble was of such a virulent type, that marked relief for any length of time under medicinal treatment had been unknown for years, their practical freedom during such a prolonged period can only be attributed to the treatment with bacterial vaccines.

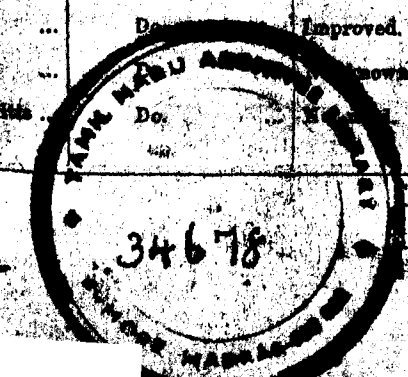
One was a young lady, for a long time a resident of Secunderabad, who was afflicted with a very severe type of bronchial asthma which was now and again complicated with pneumonic attacks with rise of temperature and general prostration. As there was a history of phthisis in the family, it was even feared that she was a consumptive subject. She came to Madras in October 1912 for vaccine treatment which was begun with an autogenous streptococcal vaccine, no pneumococcus having then been isolated. This was probably due to the very delicate *Pneumococcus* having died out in transit to the King Institute from the General Hospital where she was an in-patient. As this vaccine did not work satisfactorily, a stock pneumococcus vaccine was combined with it and the patient got so well that she left for Ootacamund in search of employment. She spent the cold season in the Nilgiris without being very much affected by the rigorous weather. Early in 1914 she left for Calcutta. On her way she visited the Institute to give material for the preparation of a fresh autogenous vaccine, the old one having run short. The cultures thus made under clinical conditions yielded the *Pneumococcus*, a streptococcus and *M. Paratetrigenus*, and a combined vaccine was prepared. Before a fair trial could be given to this new vaccine, the damp climate of Calcutta produced a deleterious effect on her lungs and she had a relapse of some severity which necessitated her going into the Calcutta General Hospital. She soon recovered from the acute attack and has been continuing the course of injections with the new vaccine with such gratifying results that for nearly a year she has been free from cough and hard breathing.

Another case was in that of a Civilian who, for over ten years, was troubled with a continuous bronchial catarrh with such asthmatic exacerbations during damp weather as to make sleep at night almost impossible. The pneumococcus was isolated in pure culture from his sputum. A long course of the autogenous pneumococcus vaccine produced such a marked effect on his catarrh that during the last two years of his service in India he was practically free from the cough and asthma, and the rainy weather of the hills during the summer did not affect him at all. With his previous experience of the uselessness of medicinal treatment he was thoroughly satisfied that it was the vaccine treatment, and nothing else, that had brought about such a markedly beneficial effect on his lungs.

TABLE VIII.

Asthma, Bronchitis and Pneumonia.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	1	The First Physician, General Hospital, Madras.	Asthma	Pneumococcus and M. Catarrhalis.	Marked improvement.
2	4	Major F. Clarence Smith, Madras	Do.	M. Paratetrigenus and streptococcus.	Do.
3	7	The Second Physician, General Hospital, Madras.	Do.	Streptococcus brevis.	Do.
4	11	Assistant Surgeon S. P. Sarma, Dindigul.	Do.	M. Paratetrigenus and streptococcus.	Considerably improved.
5	12	The First Physician, General Hospital, Madras.	Do.	Streptococcus	Slight improvement.
6	23	Major F. Clarence Smith, Madras	Asthma and hay fever	Do.	Marked improvement.
7	23	The Fourth Physician, General Hospital, Madras.	Asthma	Streptococcus and M. Paratetrigenus.	Not used.
8	29		Do.	Pneumococcus, M. Paratetrigenus and streptococcus.	Almost completely cured; still under treatment.
9	33	Major F. Clarence Smith, Madras	Do.	Streptococcus brevis.	No effect.
10	36	The Second Physician, General Hospital, Madras.	Do.	Do.	Marked improvement.
11	39	Major F. Clarence Smith, Madras	Do.	M. Paratetrigenus and streptococcus.	Considerable improvement.
12	40	The Superintendent, Royapettah Hospital, Madras.	Do.	Streptococcus	Not used.
13	43		Pneumonia	Pneumococcus	Do.
14	54	The Second Physician, General Hospital, Madras.	Asthma	Streptococcus	Considerable improvement.
15	59	Dr. T. V. Subba Rao, Triplicane	Do.	Streptococcus and M. Paratetrigenus.	No effect.
16	65	The First Physician, General Hospital, Madras.	Do.	Streptococcus and M. Catarrhalis.	Cured.
17	72	Major F. Clarence Smith, Madras	Do.	Streptococcus and M. Paratetrigenus.	Not known.
18	78	The First Physician, General Hospital, Madras.	Do.	Streptococcus	No effect.
19	81	The First Physician, General Hospital, Madras.	Do.	Pneumococcus	Do.
20	83	The Second Physician, General Hospital, Madras.	Do.	M. Catarrhalis and Streptococcus brevis.	Not used.
21	88	Do.	Do.	Streptococcus brevis.	Marked improvement.
22	88	The First Physician, General Hospital, Madras.	Do.	Do.	Cured.
23	89	Major F. F. Miles, O.L.S., I.M.S., Madras.	Do.	M. Paratetrigenus and streptococcus.	Improved.
24	115	Dr. C. Mangayya Nayudu, Vizianagaram.	Do.	Streptococcus brevis.	Do.
25	116	Lt.-Col. G. G. Giffard, O.L.S., I.M.S., Madras.	Pneumonia and bronchitis	Pneumococcus	Not known.
26	121	The Second Physician, General Hospital, Madras.	Asthma	Streptococcus brevis.	Do.
27	136	The Sub-Assistant Surgeon, Kallakudi.	Chronic bronchitis	Pneumococcus and M. Catarrhalis.	Do.
28	150	Lt.-Col. G. G. Giffard, O.L.S., I.M.S., Madras.	Asthma	M. Paratetrigenus	Improved.
29	151	The Fourth Physician, General Hospital, Madras.	Do.	M. Catarrhalis	Not given fair trial.
30	155	The Medical Officer, Station Hospital, St. Thomas' Mount.	Do.	Do.	Improved.
31	168	Dr. C. Mangayya Nayudu, Vizianagaram.	Chronic bronchitis	Streptococcus longus and pneumococcus.	Not used.
32	168		Do.	Streptococcus and M. Paratetrigenus.	Not known.
33	171	The First Physician, General Hospital, Madras.	Asthma	Pneumococcus	No effect.
34	173	Do.	Do.	Streptococcus	Do.
35	174	The District Medical and Sanitary Officer, Madras.	Abscess of lung	Pneumococcus	Do.
36	182	The Second Physician, General Hospital, Madras.	Asthma	Do.	Improved.
37	183	The Superintendent, Royapettah Hospital, Madras.	Do.	Do.	Not known.
38	187	The Fourth Physician, General Hospital, Madras.	Chronic bronchitis	Do.	Do.



Diseases of bones and joints.—Of the 6 cases treated, 2 were of tubercular caries with secondary streptococcal infection. Both improved under autogenous streptococcus vaccine treatment. Three were cases of chronic rheumatism from the urine of which attempts were made to isolate the staphylococcus described by Crowe. Though no organisms answering to his description could be isolated in any of the 3 cases, vaccines from a staphylococcus isolated from the urine were tried. Two of the cases improved, but how far as a result of the vaccine treatment, is doubtful.

Case 8 was one of acute periostitis of the femur in a boy of 14 years. The whole of the shaft of the femur was involved and the temperature ranged between 101° and 104° F. The swelling was incised and drained and a dose of 5 million autogenous streptococcus given. The temperature fell down to normal after the first injection and the operation wound rapidly healed in three weeks during which five injections up to 30 million were given. This case is interesting as the result, both of the cultivation and of the autogenous vaccine treatment, indicates what an important part streptococci play in bone inflammations.

TABLE IX.

Disease of bones and joints.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	8	The Third Surgeon, General Hospital, Madras.	Periostitis of femur.	Streptococcus	Cured.
2	20	Do. do.	Necrosis of os calcis.	Do.	Improved.
3	91	Dr. F. R. Carreck, Kotagiri	Chronic rheumatism.	Staphylococcus	Do.
4	132	The Third Surgeon, General Hospital, Madras.	Caries of spine	Streptococcus brevis.	Do.
5	148	The First Physician, General Hospital, Madras.	Rheumatoid arthritis.	Staphylococcus albus.	Doubtful.
6	53		Rheumatism	Streptococcus	Improved.

Gonorrhæal infections.—In this class of cases are included not only purely gonococcal infections of the urethra but secondary infections with staphylococci and streptococci which sooner or later supervene in the great majority of instances, as the trouble reaches the sub-acute and chronic stage. It is usual when cultivations are made from the discharge in these latter to find more than one kind of organism in the cultures so that it is not always possible to judge what part each plays in the inflammatory process. It is certain that, though the gonococcus cannot be grown in the later stages of the disease, the organism is usually present in the lacunæ and the patient is infective in the true sense as regards the gonococcus. Herein probably lies the explanation of the want of uniformity in the results obtained by the use of the secondary vaccines and the constantly successful results with the autogenous gonococcus vaccines. Whenever the gonococcus cannot be isolated in such cases, it may therefore be a wise thing to combine the secondary vaccine with a polyvalent stock gonococcus vaccine.

Case 64 is an instance of gonococcal cystitis. The patient, a girl of 15 years, was suffering for three months from the bladder infection. The purulent deposit from the urine contained large numbers of gonococci. The autogenous vaccine was injected in doses of 2 to 10 million organisms. The administration of six doses in eighteen days sufficed to cure the condition which till then had resisted all medicinal and topical treatment.

TABLE X.

Gonococcal infections.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	38	The Officer Commanding Station Hospital, Poonamallee.	Gonorrhæal urethritis.	Staphylococcus albus.	Temporary improvement.
2	64	The Superintendent, Maternity Hospital, Madras.	Gonorrhæal cystitis.	Gonococcus	Cured.
3	67	The Officer Commanding Station Hospital, Poonamallee.	Gonorrhæal urethritis.	Staphylococcus albus.	Not known.
4	79	Do. do.	Do.	Do.	No effect.
5	84	Do. do.	Do.	Gonococcus	Cured.
6	85	Do. do.	Do.	Do.	Do.
7	102	Do. do.	Do.	Staphylococcus	Doubtful.
8	103	Do. do.	Do.	Do.	Marked improvement.
9	114	Do. do.	Do.	Gonococcus	Cured.

TABLE X—cont.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
10	141	Dr. J. St. C. Bartley, Vepery	Gonorrhæal urethritis.	Gonococcus	Not known.
11	143	The Officer Commanding Station Hospital, Poonamallee.	Do.	Streptococcus	Improved.
12	144	Do. do.	Do.	Staphylococcus	No effect.
13	145	Do. do.	Do.	Streptococcus	Improved.
14	186	Do. do.	Do.	Staphylococcus albus.	Slightly improved.
15	198	The District Medical and Sanitary Officer, Godāvāri.	Do.	Do.	Under treatment.

Infections of the urinary tract.—Pyelitis caused by infection either with B. Coli or with cocci is much more common in the female than in the male, all the 8 cases treated being females. The condition usually comes on in an acute form with high temperature, sweatings and signs of septic absorption from the pelvis of the kidney, tenderness over the renal region being a constant feature. The urine is usually loaded with pus cells and organisms, the latter being grown in pure culture from the urine even without centrifugalization. The vaccine as a rule gives very satisfactory results.

Case 133.—One of relapsing fever with spirochaetes in the blood. She developed pyelonephritis as a complication, the urine showing large numbers of red corpuscles, pus cells and colon bacilli. A course of 7 injections with the autogenous coli vaccine was given in five weeks during which the urine steadily cleared up and the renal pain and constitutional symptoms disappeared.

Case 35.—One of coli pyelitis in a woman of 25 years. She had fever for more than three weeks with occasional rigors and sweatings, pain over the right lumbar region and painful micturition. The urine was loaded with pus cells, epithelial cells and bacilli. The temperature ranged between 102° F. and 103° F. After 3 injections (10, 20 and 30 million) given at intervals of 8 days the temperature came down to normal, the urine cleared up and the patient was convalescent within a fortnight of the commencement of vaccine treatment.

Case 6 was one of staphylococcal pyelitis in a female with pyrexia and mild daily rigors and severe pain in the lumbar region accompanying the rigors. The blood showed no malarial parasites and quinine had no effect on the fever. The autogenous staphylococcus albus vaccine prepared from the urine had a most decidedly beneficial effect and at the end of the course of 4 injections (10 to 50 million at intervals of 6 to 8 days) the patient had completely recovered from the symptoms.

TABLE XI.

Infections of the urinary tract.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	84	The Superintendent, Government Maternity Hospital, Madras.	Pyelitis	Staphylococcus	Not used.
2	35	Do. do.	Do.	B. coli	Cured.
3	61	The Officer Commanding Station Hospital, St. Thomas' Mount.	Bacilluria	B. typhoid like organisms.	Improved.
4	78	The Superintendent, Government Maternity Hospital, Madras.	Pyelitis	B. coli	Cured.
5	76	Major E. W. Browne, I.M.S., Ootacamund.	Do.	Staphylococcus albus.	Marked improvement.
6	118	Dr. T. V. Subba Rao, Triplicane	Cystitis	Streptococcus and staphylococcus albus.	Do.
7	119	The Superintendent, Government Maternity Hospital, Madras.	Pyelitis and cystitis.	Streptococcus	Temporary improvement.
8	123	The Third Physician, General Hospital, Madras.	Pyelonephritis	B. coli	Cured.
9	142	Major Kirkpatrick, I.M.S., Madras	Bacilluria	Do.	Not known.
10	181	Miss Alexander, Tondiarpet	Pyelitis	Do.	Do.

Other cases.—A number of other cases including 4 of puerperal sepsis, 1 of meningitis, 1 of pulmonary abscess and 1 of empyema were treated with autogenous vaccines. There is nothing of interest to note in connection with them. Autogenous vaccines were also made for 6 cases of dysentery, 2 of these being patients of the Madras Lunatic Asylum where the bacteriological investigation in connection with endemic asylum dysentery was continued during the year.

Diseases of bones and joints.—Of the 6 cases treated, 2 were of tubercular caries with secondary streptococcal infection. Both improved under autogenous streptococcus vaccine treatment. Three were cases of chronic rheumatism from the urine of which attempts were made to isolate the staphylococcus described by Crowe. Though no organisms answering to his description could be isolated in any of the 3 cases, vaccines from a staphylococcus isolated from the urine were tried. Two of the cases improved, but how far as a result of the vaccine treatment, is doubtful.

Case 8 was one of acute periostitis of the femur in a boy of 14 years. The whole of the shaft of the femur was involved and the temperature ranged between 101° and 104° F. The swelling was incised and drained and a dose of 5 million autogenous streptococcus given. The temperature fell down to normal after the first injection and the operation wound rapidly healed in three weeks during which five injections up to 30 million were given. This case is interesting as the result, both of the cultivation and of the autogenous vaccine treatment, indicates what an important part streptococci play in bone inflammations.

TABLE IX.

Disease of bones and joints.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	8	The Third Surgeon, General Hospital, Madras.	Periostitis of femur.	Streptococcus ...	Cured.
2	20	Do. do.	Necrosis of os calcis.	Do. ...	Improved.
3	91	Dr. F. R. Carreock, Kotagiri ...	Chronic rheumatism.	Staphylococcus ...	Do.
4	133	The Third Surgeon, General Hospital, Madras.	Caries of spine ...	Streptococcus brevis.	Do.
5	148	The First Physician, General Hospital, Madras.	Rheumatoid arthritis.	Staphylococcus albus.	Doubtful.
6	53		Rheumatism ...	Streptococcus ...	Improved.

Gonorrhœal infections.—In this class of cases are included not only purely gonococcal infections of the urethra but secondary infections with staphylococci and streptococci which sooner or later supervene in the great majority of instances, as the trouble reaches the sub-acute and chronic stage. It is usual when cultivations are made from the discharge in these latter to find more than one kind of organism in the cultures so that it is not always possible to judge what part each plays in the inflammatory process. It is certain that, though the gonococcus cannot be grown in the later stages of the disease, the organism is usually present in the lacunæ and the patient is infective in the true sense as regards the gonococcus. Herein probably lies the explanation of the want of uniformity in the results obtained by the use of the secondary vaccines and the constantly successful results with the autogenous gonococcus vaccines. Whenever the gonococcus cannot be isolated in such cases, it may therefore be a wise thing to combine the secondary vaccine with a polyvalent stock gonococcus vaccine.

Case 64 is an instance of gonococcal cystitis. The patient, a girl of 15 years, was suffering for three months from the bladder infection. The purulent deposit from the urine contained large numbers of gonococci. The autogenous vaccine was injected in doses of 2 to 10 million organisms. The administration of six doses in eighteen days sufficed to cure the condition which till then had resisted all medicinal and topical treatment.

TABLE X.

Gonococcal infections.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	38	The Officer Commanding Station Hospital, Poonamallee.	Gonorrhœal urethrit.	Staphylococcus albus.	Temporary improvement.
2	64	The Superintendent, Maternity Hospital, Madras.	Gonorrhœal cystitis.	Gonococcus ...	Cured.
3	67	The Officer Commanding Station Hospital, Poonamallee.	Gonorrhœal urethrit.	Staphylococcus albus.	Not known.
4	79	Do. do.	Do.	Do.	No effect.
5	84	Do. do.	Do.	Gonococcus ...	Cured.
6	95	Do. do.	Do.	Do. ...	Do.
7	102	Do. do.	Do.	Staphylococcus ...	Doubtful.
8	103	Do. do.	Do.	Do. ...	Marked improvement.
9	114	Do. do.	Do.	Gonococcus ...	Cured.

TABLE X—cont.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
10	141	Dr. J. St. C. Bartley, Vepery ...	Gonorrhœal urethrit.	Gonococcus ...	Not known.
11	143	The Officer Commanding Station Hospital, Poonamallee.	Do.	Streptococcus ...	Improved.
12	144	Do. do.	Do.	Staphylococcus ...	No effect.
13	145	Do. do.	Do.	Streptococcus ...	Improved.
14	186	Do. do.	Do.	Staphylococcus albus.	Slightly improved.
15	193	The District Medical and Sanitary Officer, Godāvari.	Do.	Do.	Under treatment.

Infections of the urinary tract.—Pyelitis caused by infection either with B. Coli or with cocci is much more common in the female than in the male, all the 8 cases treated being females. The condition usually comes on in an acute form with high temperature, sweatings and signs of septic absorption from the pelvis of the kidney, tenderness over the renal region being a constant feature. The urine is usually loaded with pus cells and organisms, the latter being grown in pure culture from the urine even without centrifugalization. The vaccine as a rule gives very satisfactory results.

Case 133.—One of relapsing fever with spirochaetes in the blood. She developed pyelonephritis as a complication, the urine showing large numbers of red corpuscles, pus cells and colon bacilli. A course of 7 injections with the autogenous coli vaccine was given in five weeks during which the urine steadily cleared up and the renal pain and constitutional symptoms disappeared.

Case 35.—One of coli pyelitis in a woman of 25 years. She had fever for more than three weeks with occasional rigors and sweatings, pain over the right lumbar region and painful micturition. The urine was loaded with pus cells, epithelial cells and bacilli. The temperature ranged between 102° F. and 103° F. After 3 injections (10, 20 and 30 million) given at intervals of 8 days the temperature came down to normal, the urine cleared up and the patient was convalescent within a fortnight of the commencement of vaccine treatment.

Case 6 was one of staphylococcal pyelitis in a female with pyrexia and mild daily rigors and severe pain in the lumbar region accompanying the rigors. The blood showed no malarial parasites and quinine had no effect on the fever. The autogenous staphylococcus albus vaccine prepared from the urine had a most decidedly beneficial effect and at the end of the course of 4 injections (10 to 50 million at intervals of 6 to 8 days) the patient had completely recovered from the symptoms.

TABLE XI.

Infections of the urinary tract.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	34	The Superintendent, Government Maternity Hospital, Madras.	Pyelitis ...	Staphylococcus ...	Not used.
2	35	Do. do.	Do. ...	B. coli ...	Cured.
3	61	The Officer Commanding Station Hospital, St. Thomas' Mount.	Bacilluria ...	B. typhoid like organisms.	Improved.
4	73	The Superintendent, Government Maternity Hospital, Madras.	Pyelitis ...	B. coli ...	Cured.
5	76	Major E. W. Browne, I.M.S., Ootacamund.	Do. ...	Staphylococcus albus.	Marked improvement.
6	118	Dr. T. V. Subba Rao, Triplicane ...	Cystitis ...	Streptococcus and staphylococcus albus.	Do.
7	119	The Superintendent, Government Maternity Hospital, Madras.	Pyelitis and cystitis.	Streptococcus ...	Temporary improvement.
8	133	The Third Physician, General Hospital, Madras.	Pyelonephritis ...	B. coli ...	Cured.
9	143	Major Kirkpatrick, I.M.S., Madras ...	Bacilluria ...	Do. ...	Not known.
10	181	Miss Alexander, Tondiarpet ...	Pyelitis ...	Do. ...	Do.

Other cases.—A number of other cases including 4 of puerperal sepsis, 1 of meningitis, 1 of pulmonary abscess and 1 of empyema were treated with autogenous vaccines. There is nothing of interest to note in connection with them. Autogenous vaccines were also made for 6 cases of dysentery, 2 of these being patients of the Madras Lunatic Asylum where the bacteriological investigation in connection with endemic asylum dysentery was continued during the year.

TABLE XII.
Other cases.

Serial number.	Case number.	Medical Officer.	Disease.	Vaccine.	Result.
1	21	The Third Surgeon, General Hospital, Madras.	Tubercular adenitis.	Streptococcus longus.	Cured.
2	161	The Fourth Physician, General Hospital, Madras.	Pulmonary tuberculosis.	Streptococcus and pneumococcus.	No effect.
3	10	Major F. Clarence Smith, Madras.	Dysentery.	Streptococcus longus.	Not cured.
4	16	Do.	Do.	B. enteritidis.	Improved but probably not due to vaccine.
5	30	The Second Surgeon, General Hospital, Madras.	Empyema.	Pneumococcus.	Not used.
6	45	Major F. F. Elwes, C.I.E., I.M.S., Madras.	Dysentery.	B. dysenteriae.	Not known.
7	52	The Superintendent, Lunatic Asylum, Madras.	Do.	Do.	Cured.
8	66	The Superintendent, Government Maternity Hospital, Madras.	Puerperal sepsis.	Streptococcus.	Do.
9	69	The Superintendent, Lunatic Asylum, Madras.	Dysentery.	B. dysenteriae.	Not cured.
10	80	The Superintendent, Gosha Hospital, Madras.	Puerperal sepsis.	Streptococcus.	Not known.
11	89	The District Medical and Sanitary Officer, Coimbatore.	Meningitis.	Staphylococcus.	No effect.
12	100	The Fourth Physician, General Hospital, Madras.	Dysentery.	B. dysenteriae.	Not used.
13	101	Do.	Do.	Do.	Do.
14	174	The District Medical and Sanitary Officer, Malabar.	Abscess of lung.	Pneumococcus.	No effect.
15	179	The Medical Officer, Cantonment Hospital, St. Thomas' Mount.	Puerperal sepsis.	Streptococcus.	Not used.
16	188	The Officer Commanding Station Hospital, Poonamallee.	Do.	Do.	Not known.

STOCK VACCINES.

Polyvalent streptococcal vaccine—was used in the General Hospital, Madras, in cases of pulmonary tuberculosis and chronic bronchitis to bring down the temperature in the secondary infection of the former disease or to cure the catarrh of the bronchi supposed to be caused by streptococci. The results obtained in this class of cases were indifferent. Anti-streptococcus vaccine was also used by the District Medical and Sanitary Officer, Guntur, as a preventive of suppuration or sepsis after abdominal operations, accidental injuries, amputations, obstetric operations, etc. He thinks that the after progress of cases thus treated justifies the conclusion that the vaccine had the desired effect.

A polyvalent pneumococcal vaccine—was made from a number of strains isolated from cases of asthma and bronchitis. It was used on a fairly large scale in the wards of the Second Physician of the Madras General Hospital in cases of chronic bronchitis, asthma and tuberculosis of the lungs, in doses of 2½ to 20 million organisms, with gratifying results.

Anti-gonococcal vaccine—The results of the use of this vaccine in epididymitis and arthritis were as usual eminently satisfactory but the urethral cases have continued to give uncertain results. The Station Hospital at Poonamallee used the vaccine on a large scale, 149 cases having been treated there during 1914. The object of employing this treatment, according to the medical officer in charge, was more to prevent complications than to cure the urethritis itself. This it successfully did, the usual doses employed being 5 million, 10 million and upwards. In the Government Ophthalmic Hospital, Madras, cases of gonorrhoeal conjunctivitis, iritis and scleritis are reported to have been greatly benefited. Higher doses than 200 million of this vaccine have been known to produce severe reactions. Consequently in routine work a maximum dose of 100 million is recommended.

Tuberculin—Regarding the efficacy of tuberculin treatment in tuberculosis, especially of the lungs, opinions have been conflicting. Of 5 cases of tuberculosis of the lungs treated by the Medical Officer, Jubilee Hospital, Berhampur, one, an advanced case, died, 3 considerably improved and the fifth was almost cured. One case of bone tuberculosis did not yield at all to this treatment.

The Second Physician of the General Hospital used stock tuberculin in 38 cases of pulmonary tuberculosis but with the exception of one case which was greatly relieved, the results in other cases were quite unsatisfactory.

The observations made by other medical men who were supplied with tuberculin from the Institute show that though it was not of any use in the advanced pulmonary cases, it has been very beneficial in the incipient and early cases even when they were febrile.

Anti-leprosy vaccine—was obtained from the Bombay Bacteriological Laboratory in bulk and issued in divided doses to 4 patients at Kumbakonam. Two of these benefited whilst in the other two no good whatsoever resulted.

APPENDIX II.

LABORATORY NOTES.

By Civil Assistant Surgeon T. Sitapati Ayyar, L.M. & S.

NOTE I.—WASSERMANN TEST.

During the year 534 bloods were examined by the Wassermann test with 63 per cent. of positive results. Of these 370 were examined as in the previous year by the Original and Levaditi's methods. The remaining 164 bloods were subjected to a new method along with the usual methods to find out if any advantage were to be gained thereby.

It has been found that neither the Original nor Levaditi's method were capable of taking in all syphilitic cases. Some bloods (a small percentage of cases) gave a positive reaction with the Original and a negative with Levaditi's method. It happened during the present year that the reagent alcoholic extract of ox livers, used in the Levaditi's modification proved to be more active than the aqueous extract of syphilitic liver in the Original. Therefore another smaller percentage of cases were missed by the Original method while the Levaditi's answered satisfactorily.

A positive reaction obtained by either method was reported as syphilis, and thus many clinically suggestive cases were not missed. But the examination of a blood by both tests, as a routine, involved much labour and time; so the idea suggested itself to mix the two reagents, aqueous syphilitic liver extract and alcoholic ox liver extract, and subject the blood to the mixed reagent. This method was tried simultaneously with the other two methods with highly satisfactory results. The new method not only included all the positive cases of both the methods separately but also gave a positive reaction in a few cases in which no positive result could be obtained by either of the other two methods. The technique adopted is the same as the one adopted in this laboratory for each of the two methods singly, a description of which appeared in the Annual Report for the year 1912, except that the aqueous solution of the alcoholic extract was made first and then the necessary quantity of aqueous syphilitic liver extract alone added to it without the addition of another quantity of saline solution. There is thus only one fixed quantity of saline solution and a definite quantity of each of the alcoholic and aqueous extracts. The quantity of complement to be added should be estimated by previous experiments to find out its minimum hæmolytic dose and the quantity inherently absorbed by the extracts. A mixture of the ox liver extract and syphilitic liver extract forms a powerful reagent which when mixed with a syphilitic serum fixes a large number of the minimum hæmolytic doses of complement.

This modified method throws some light on the theory of the Wassermann test, and it may be stated:—

- (1) That the Wassermann test is a very complicated biological test in which many substances enter whether purely chemical or biological.
- (2) The term "antigen" is used to denote the extracts which seem to consist of several substances and group themselves into two classes, A and B, both of which are essential for the reaction. These are present in different proportions in different reagents. The original syphilitic liver extract contains more of class A than of class B, and when it alone is used in the test, only a small quantity of A sufficient to react with B is used up, the remainder of A remaining unused. The ox liver extract contains more of B than A so that, when that reagent alone is used, a quantity of B is left over unused. Now in a mixture of the two reagents ox liver extract and original syphilitic liver extract, the two classes A and B will be more or less equal and the united body is present in large proportion for use. According to some the two bodies are Lecithin and Cholesterin, or substances akin to them. This compound body when mixed with syphilitic serum gives rise to a sufficient quantity of the complement fixing system.

TABLE I.

N.B.—Explanation of notations used in the table.

+++ Complete hemolysis.

++ Partial but leaning towards complete lysis.

+ Slight lysis of a negligible nature.

- No lysis.

Num- ber.	Date of examination.	Name.	Levaditi's.	Original.	Mixed.	Result.	Remarks.
1	1914. 23rd July ...	D.S. G.H. ...	+++	+	-	Positive strong.	
2	Do. ...	G.N. G.H. ...	+++	+++	+	Do.	Secondary syphilitic rash and ulceration.
3	Do. ...	L. G.H. ...	-	+	-	Do.	
4	Do. ...	M. G.O.H. ...	-	+++	+	Do.	Denies history. Suspicious sores on both shins. Hard shotty glands inguinal and cervical.
5	Do. ...	Mrs. H. G.O.H. ...	+++	+++	+	Do.	
6	Do. ...	K. ...	+++	+++	+	Do.	
7	Do. ...	S. ...	+++	+++	+	Do.	Denies history. Number of ulcers resem- bling rupia treated. Retinal arterio scle- rosis with falling vision lately.
8	1st Aug. ...	G.P. G.O.H. ...	-	+++	-	Do.	Had injection of salvarsan; vision and general health improved.
9	Do. ...	R. Mt. C.H. ...	++	+++	+	Do.	
10	Do. ...	R. G.O.H. ...	+++	+++	+	Do.	Gonorrhoea. Sore and rash two years ago. Chancres and a number of rupia.
11	Do. ...	B. G.H. ...	+++	+++	+	Positive moder- ate.	
12	Do. ...	K. M.H. ...	+++	+++	+	Positive strong.	
13	Do. ...	M.M. M.H. ...	+++	+++	-	Positive moder- ate.	
14	Do. ...	V. o/o Dr. P ...	+++	+++	+	Positive weak.	
15	Do. ...	C. o/o S.E. ...	+++	+++	+++	Positive strong.	Has several whitish patches. Some of them anaesthetic but no lepra bacilli could be seen in any of them. Aged ten years.
16	31st Aug. ...	G. G.H. ...	+++	+++	+	Positive weak.	Ulcers lower part of septum of nose on both sides, duration four months; said to be caused by barber's razor.
17	Do. ...	N. G.H. ...	+++	+++	+	Positive moder- ate.	
18	Do. ...	H. G.H. ...	+++	+++	+	Positive trace.	
19	Do. ...	D. ...	+++	+++	+	Positive trace.	Aged 85. History of sore about five years ago, followed by secondary symptoms about five months after. Has now gumma- like swellings.

TABLE I—cont.

Num- ber.	Date of examination.	Name.	Levaditi's.	Original.	Mixed.	Result.	Remarks.
20	1914. 31st Aug. ...	M. G.H. ...	+++	+++	++	Positive trace.	Facial paralysis left side, with history ten years ago.
21	Do. ...	S. o/o Dr. T.S. ...	+++	+++	++	Positive moder- ate.	Sycoosis leg.
22	Do. ...	K. ...	+++	+++	+	Positive weak.	
23	Do. ...	H. o/o Dr. P ...	+++	+++	++	Positive trace.	
24	Do. ...	R. G.H. ...	+++	+++	-	Positive strong.	
25	Do. ...	M. ...	++	++	+	Positive weak.	No history. Septum of nose perforated and eaten away. Palate arched. Patient has had severe pain in the nose for the last six months.
26	Do. ...	D. G.O.H. ...	+++	+++	+	Positive strong.	
27	Do. ...	C. ...	-	+++	-	Do.	History of primary sore, etc., for the last ten years. Abscesses and ulcers appear to be gummatous.
28	9th Sept. ...	A. ...	-	+	-	Do.	Two years ago gonorrhoea and buboes. No sore nor any eruption on body. No sore throat. Growth surrounding anus looking like condyloma.
29	Do. ...	M. G.O.H. ...	+++	+++	+	Do.	No history. Advanced choroidal atrophy suspicious.
30	Do. ...	M. G.H. ...	+++	+++	+	Do.	Locomotor atax.
31	Do. ...	O.T. G.O.H. ...	+++	+++	+	Do.	Five years ago acquired syphilis in finger; surgical; rash sore throat. Tenderness of shins. Active treatment with mercury and potassium iodide. Last symptoms in 1910 July. Fibrositis left ankle. Wass- ermann negative in November 1911. Present slight wasting of left calf and diminution of nasal field of vision right eye.
32	Do. ...	M. G.O.H. ...	-	-	-	Do.	Clear history of one year. Iris occlusion of pupil.
33	Do. ...	S. o/o Dr. T.S. ...	+++	+++	++	Positive moder- ate.	
34	Do. ...	J. G.H. ...	+++	+++	+	Positive strong.	
35	Do. ...	L. M.H. ...	+++	+++	+	Positive moder- ate.	No history. Confined a still-born fetus. Previous births natural.
36	Do. ...	D. 1st Dt. ...	-	+	-	Positive strong.	No history. Suppurating bone cavity in head of left tibia. Old sores of gumma- on face and other parts of the body.
37	Do. ...	G. L.A. ...	+++	+++	+	Do.	
38	17th Sept. ...	Mrs. D.S. G.H. ...	+++	+++	-	Do.	Pustular rash on both legs, left fore arm and right buttock. On scratching blisters and pigmented areas form. Inguinal glands enlarged, suffering from sore throat during pregnancy. Borne five children who have had the same complaint.

TABLE I—cont.

un- er.	Date of examination.	Name.	Levaditi's.	Original.	Mixed.	Result.	Remarks.
	1914.						
59	13th Oct. ...	S. c/o Dr. P. ...	- + ++	+++ +++ +++ +++	- + ++	Positive moderate.	
60	Do. ...	P. c/o Dr. P. ...	- - -	+++ +++ +++ +++	- - -	Positive strong.	
61	20th Oct. ...	A.O.W. c/o Dr. G.	- - -	+++ +++ +++ +++	- + ++	Positive moderate	
62	Do. ...	M. G.O.H. ...	- - -	- - -	- - -	Positive strong.	Optic neuritis. No history.
63	22nd Oct. ...	M. M.H. ...	- + +++	+ ++ +++ +++	- - ++	Positive moderate.	Macerated foetus seven months, Placenta looks unhealthy; shows white raised areas of fatty gummatous degeneration.
64	Do. ...	P. c/o Dr. J.D.	+ ++ +++	++ +++ +++ +++	+ + ++ +++	Positive weak.	
65	Do. ...	V. G.O.H. ...	- + +++	+++ +++ +++ +++	+ ++ +++ +++	Positive trace.	
66	Do. ...	B. G.O.H. ...	- + +++	+++ +++ +++ +++	+ + ++	Positive weak.	
67	6th Nov. ...	M. G.O.H. ...	+++ +++ +++ +++	+++ +++ +++ +++	+ + +	Positive moderate.	Age 21. Neuro-retinitis. No history, but suspicious.
68	Do. ...	B. c/o Dr. P. ...	+ + +++	+++ +++ +++ +++	+ + ++	Positive moderate.	
69	Do. ...	M. G.H. ...	- - ++	+++ +++ +++	- - -	Positive strong.	Pain in precordial region; tenderness on right side of chest. Diagnosed to be an intrathoracic tumour, probably an aneurism of the aorta. Age 33. No history of syphilis.
70	Do. ...	K. c/o Dr. T.S.	+++ +++ +++ +++	+ ++ ++	- - -	Positive strong.	Previously examined with positive result. Had one injection.
71	Do. ...	A. G.O.H. ...	+++ +++ +++ +++	+++ +++ +++ +++	+ ++ +++	Positive trace (incomplete).	Had only gonorrhoea about four years ago, but no syphilis. Another blood may be sent for confirmation.
72	Do. ...	S. ...	- ++ +++	+++ +++ +++	+ ++ +++	Positive weak.	Vitreous opacities, both eyes. Gonorrhoea. No syphilis.
73	13th Nov. ...	S. c/o Dr. T.S. ...	- - +++	+ +++ +++	+ ++	Positive moderate.	
74	Do. ...	M. G.O.H. ...	- - -	- - +	- - -	Positive strong.	Ulceration of nose and soft palate, five years' history.
75	Do. ...	N. 1st Dt. ...	- - +++	+++ +++ +++	+ ++ +++	Positive weak.	Primary two and a half years ago. Eruptions present on chest, etc.

TABLE II—cont.

Number.	Description.	Combined method. (Original and Levaditi's.)		Noguchi's method (examined at Wellington Laboratory).		History.
		Date of examination.	Result.	Date of examination.	Result.	
		1914.		1914.		
28	V. G.O.H.	11th Dec. ...	Positive weak.	17th Dec. ...	Positive.	No history.
29	K. Do.	Do. ...	Positive moderate	Do. ...	Negative	Interstitial Keratitis. No history.
30	S.B. L.A.	Do. ...	Positive trace.	Do. ...	Do.	
31	P. Do.	Do. ...	Positive weak.	Do. ...	Positive.	
32	S. G.H.	Do. ...	Negative	Do. ...	Do.	
33	R. R.H.	19th Dec.	Positive moderate.	24th Dec. ...	Do.	A case of dyspepsia with a history of sore and rash two years ago
34	K. Do.	Do. ...	Do.	Do. ...	Do.	
35	A. G.O.H.	Do. ...	Positive strong.	Do. ...	Do.	Syphilis three years.
36	R.M. Do.	Do. ...	Positive weak.	Do. ...	Negative	No history. Blood on 16th Nov. 1914. Positive trace: blood sent for confirmation.
37	K. Do.	Do. ...	Positive trace.	Do. ...	Positive	No history.
38	V. ...	Do. ...	Positive strong.	Do. ...	Do.	Neurochoiditis right eye.
39	C. G.H.	Do. ...	Negative	Do. ...	Do.	Syphilis thirty years ago.
40	N. Do.	Do. ...	Do.	Do. ...	Do.	

Table II shows the comparative results obtained with bloods subjected to the combined method at this Laboratory and Noguchi's method at Wellington. Altogether 40 bloods were examined by both these methods. Of these 22 gave a positive result by both methods, 8 more were positive by the combined method and negative by Noguchi's method while a further 4 were positive by Noguchi's and negative by the combined. Some more work on these lines is necessary before any opinion can be arrived at.

NOTE II.—ON THE QUANTITATIVE BACTERIAL CONTENT OF NATURAL WATERS.

The quantitative bacterial content forms a test in the bacteriological examination of water. The usual laboratory method consists in totalling up all the colonies that grow on nutrient agar of standardised reaction incubated at blood-heat, 37°C. Definite quantities of water under examination as 1, .1, or .01 c.c. are added to melted and cooled tubes of nutrient agar, mixing thoroughly while still liquid, pouring out into petri dishes and allowing to solidify. The plates are then incubated at 37°C for 48 hours; from these the total number of colonies in 1 cc. of the original water is calculated. This method, though it appears in theory to afford valuable information, yet from a scientific point of view, is liable to many fallacies and subject to many limitations. The limitations are constant features which do not vitiate the comparative value of the test, since the colonies counted represent only those that grow under aerobic conditions on nutrient agar of definite strength and reaction, and incubated at 37°C for a period of 48 hours, but not the entire bacterial content of the definite quantity of water. But the fallacies, that exist, render the test liable to give a variable result. They are:—

(1) (a) Sometimes it happens that solid agar sterilised in test tubes does not show any visible growth, but on melting and pouring into plates, a number of minute colonies develop. This is probably due to some resistant spores surviving in the depth of the agar and not capable of multiplying under these circumstances, but, when the agar is poured into shallow plates, favourable aerobic conditions supervene and development takes place.

(b) The petri dishes or plates may be imperfectly sterilised and growths may develop from the surface of the glass as soon as nutrient agar is melted and poured into them. Control experiments to test the sterility of the agars and the plates can only give presumptive but not definite proof that all the plates and agar tubes of the same lot are sterile.

(2) The thickness of the agar in the plate affects the growth of certain organisms, and some colonies are missed because growth in the depth of the agar in 48 hours is too sparse to render the colonies visible to the naked eye, whereas the same organism on the surface will grow into fair sized colonies in that time.

TABLE I.

Number.	Date of collection of sample.	Sample of water taken from.	Definite quantities of water taken and mixed with different quantities of agar and poured into plates to get different depths.	
			Thick.	Thin.
1	1914. 23rd Nov. ...	1st tap ...	A spreading colony and thirty-five colonies.	A spreading colony and eight colonies.
2	Do. ...	2nd " ...	Countless	Countless.
3	Do. ...	3rd " ...	A spreading colony and forty-nine colonies.	196
4	Do. ...	4th " ...	120	A large number of tiny colonies in the centre and forty-one discrete colonies.
5	Do. ...	5th " ...	Cannot be counted. A spreading colony and six colonies.	160
6	Do. ...	Outlet discharge pipe.	Cannot be counted. A spreading colony and sixty-two colonies.	152
7	25th Nov. ...	1st tap ...	Cannot be counted. One spreading colony.	1,400
8	Do. ...	2nd " ...	400	1,200
9	Do. ...	3rd " ...	248 (P) Not easily countable	338
10	Do. ...	4th " ...	A spreading colony and fifteen colonies.	600
11	Do. ...	5th " ...	352	204 and a big colony in centre.
12	Do. ...	Outlet discharge pipe.	Cannot be counted. One spreading colony.	232
13	27th Nov. ...	1st tap ...	1,000. A tree-like colony occupying a third of the plate.	A spreading colony and six other colonies.
14	Do. ...	2nd " ...	1,300	1500
15	Do. ...	3rd " ...	220	Two woolly colonies in $\frac{1}{4}$ of the plate and thirteen other colonies.
16	Do. ...	4th " ...	310	520
17	Do. ...	5th " ...	Twenty-one and a group of small colonies in centre.	310
18	Do. ...	Outlet discharge pipe.	Cannot be counted. A spreading colony.	Forty-four and a spreading colony (450).
19	30th Nov. ...	1st tap ...	600	800
20	Do. ...	2nd " ...	Two and a large number of tiny colonies in the centre.	450
21	Do. ...	3rd " ...	210	Ten colonies and a spreading colony.
22	Do. ...	4th " ...	One colony and a big spreading colony.	Thirty-four colonies and a spreading one.
23	Do. ...	5th " ...	Twelve colonies and a spreading colony.	260
24	Do. ...	Outlet discharge pipe.	180	Ten colonies and a big spreading colony.

Table I records experiments which show the difference in the total number of colonies growing in the same quantity of water on agar of different depths.

3. A small quantity of the material examined (water inoculated into melted agar) remains adherent to the test tube and may contain a variable number of organisms. To obviate this source of error it was proposed to incubate the emptied tubes also and to count any colonies which may grow thereon. At 37°C however the agar dries and shrivels up and colonies do not develop. A new method of estimating the number of organisms in a definite quantity of water, which is free from most of these fallacies, has of late been tried in this laboratory. The method consists in preparing:—

(1) Dry sterile agar plates. Solid sterile agar is melted in bulk and distributed into sterile plates using a liberal amount filling the plate to a depth of not less than one-eighth of an inch in thickness. The plates are now incubated at 37°C for 24 to 48 hours. This is really for the purpose of drying off the condensation water, but any plates which show colonies are rejected. When only one small colony is seen on the surface of the agar, it may sometimes be carefully removed with a previously sterilised small wire without further contaminating the plate. The plates are then removed and stored in a box.

(2) Other requirements are sterilised graduated 1 cc. pipettes for measuring and diluting; tubes containing 9 cc. of sterilised distilled water for making one-tenth dilutions and sterilised spreaders of the ordinary bent glass rod pattern. If, from previous experience, the water sample is suspected to contain a comparatively small number of colonies, half a cc. of the sample itself is taken and dropped over the agar surface of a plate and spread over the entire surface evenly by means of the sterile spreader. The same spreader is carried on to a second plate and spread over the agar surface. Generally, two plates will be enough, but if necessary, a third plate may also be used. If the water is of an inferior quality, and suspected of containing a fairly large number of colonies, 1 cc. of the sample is added to 9 cc. sterile distilled water tube thus making a tenth dilution. Similarly a hundredth dilution may be made by taking 1 cc. from the first dilution and adding to 9 cc. of another distilled water tube. Half a cc. from each of these dilutions may be smeared as per previous description. By taking the precaution of thoroughly rinsing the pipette with each dilution, the same pipette may be used throughout. These smeared plates are incubated at 37°C for 48 hours. The total number of colonies that grow from 1 cc. of water is then calculated.

TABLE II.

Date of collection.	Total colonies in 1 cc. of unfiltered water.			Total colonies in 1 cc. of filtered water.		
	Mixture calculated from 0.1 cc. plates.	Mixture calculated from 0.01 cc. plates.	Smear on agar.	Mixture calculated from 0.1 cc. plates.	Mixture calculated from 0.01 cc. plates.	Smear on agar.
1914.						
27th July	...	12,000	8,000	...	800	1,000
28th "	...	1,000	2,800	140	...	220
29th "	...	2,000	3,100	200	...	350
30th "	...	64,500	Countless	500	...	1,480
31st "	880	2,000	3,200	One spreading colony.	...	One spreading colony.
1st Aug.	One spreading colony.	...	Cannot be counted.	Do.	...	One big spreading colony covering whole plate.
8th "	...	2,900	Do.	...	600	Do.
9th "	...	1,300	1,000	420	...	730
10th "	...	800	1,200	160	...	240
11th "	1,580	900	7 groups of organisms and 3 stray colonies each group with a large number of tiny colonies.	Cannot be counted.*	...	Cannot be counted.*
12th "	One spreading colony.	2,000	One central mass of organisms with few discreet ones.	A central mass of woolly organisms.	...	Do.†
13th "	980	1,800	Spreading colony.	500	...	Spreading colony.
14th "	680	Spreading colony.	Do.	Spreading colony.	...	Cannot be counted.‡
15th "	...	1,800	Do.	Spreading colony and 28 discreet colonies.	...	Spreading colony.
16th "	Four tree-like colonies and 78 small colonies.	Spreading colony.	5,000	290	...	Spreading colony made up of tree-like colonies and 7 discreet ones.
17th "	...	Do.	2,200	Spreading colony.	...	660
17th "	...	Do.	5,200	Do.	...	540
18th "	...	1,800	2,000	...	1,000	2,000
18th "	...	Spreading colony.	3,400	780	...	Spreading colonies.
19th "	...	...	...	370	...	Do.
19th "	...	Spreading colony.	Countless	660	...	Cannot be counted.§
20th "	...	1,000	Spreading colony.	A spreading and 15 colonies.	...	One spreading and 16 small colonies.
21st "	...	2,100	2,600	1,660	...	One spreading and about 30 colonies.
22nd "	...	1,600	4,600	880	...	Three spreading and 9 tiny colonies.
25th "	...	...	...	Spreading colonies.	...	A spreading and 8 colonies.
26th "	...	...	...	270	...	A spreading and about 59 colonies.
31st "	...	...	...	260	...	340
2nd Sept.	...	...	...	280	...	440
4th "	...	...	...	410	...	820
9th "	...	3,700	About 22 colonies and a group of organisms composed of a large number of colonies.	A spreading colony.	1,600	2,000
10th "	...	3,100	20 discreet colonies and 4 groups of few colonies each.	350	900	1,660
11th "	...	2,600	Spreading colonies.	220	...	A central group and 24 discreet colonies around.

* One spreading colony.

† One big mass and a large number of discreet colonies.

‡ One spreading colony covering the major portion and

§ Tree-like spreading colonies.

TABLE II—cont.

Date of collection.	Total colonies in 1 cc. of unfiltered water.			Total colonies in 1 cc. of filtered water.		
	Mixture calculated from 0.1 cc. plates.	Mixture calculated from 0.01 cc. plates.	Smear on agar.	Mixture calculated from 0.1 cc. plates.	Mixture calculated from 0.01 cc. plates.	Smear on agar.
1914.						
12th Sept.	1,300	1,700	2,600	180	...	A spreading colony.
13th "	810	800	1,600	115	...	270
14th "	A spreading and a few colonies.	A spreading and a few colonies.	3,200	280	...	300
15th "	Do.	...	6,000	3,050	...	820
16th "	1,160	...	2,400	280	...	400
26th "	Cannot be counted.	4,800	24,800 (F)	260	A spreading and 8 colonies.	1,250
29th "	Do.	2,300	3,300	800	300	1,000
30th "	1,170	1,100	6,300	A spreading and 17 colonies.	A big spreading and one discreet colony.	1,580
2nd Oct.	A spreading and 17 colonies.	200	1,600	A spreading and 41 colonies.	...	Spreading colonies.
7th "	...	...	...	400	400	1,300
7th "	...	...	...	A big tree-like colony and 20 clear colonies.	2,700	3,200
16th "	A spreading colony and 60 colonies.	2,600	4,300	1,170	1,000	1,200
17th "	A spreading colony and 14 colonies.	1,400	2,000	A spreading colony and 28 colonies.	1,100	4,400
18th "	A spreading colony and 78 colonies.	3,800	9,400	3,020	A spreading colony and 23 colonies.	Cannot be counted.*
19th "	Two spreading colonies and 97 colonies.	A spreading colony and 12 colonies.	10,000	A spreading colony and 37 colonies.	2,000	6,000
20th "	...	...	...	23 discreet colonies and one big woolly colony.	700	2,200
21st "	1,040	A spreading colony and 8 colonies.	2,000	A spreading colony and 8 colonies.	...	A spreading colony and 7 colonies.

* A large group of organisms in the centre of the plate.

AVERAGE number of total colonies in 1 cc. of water calculated from the mixture method as compared with the smear method.

	Calculated from plates.	Mixture.	Smear.	Ratio between the two.	Remarks.
0.1 cc.	...	1,080	3,000	1 : 2.83	Unfiltered water.
0.01 cc.	...	2,353	3,494	1 : 1.55	
0.1 cc.	...	500	754	1 : 1.508	
0.01 cc.	...	1,118	2,360	1 : 2.11	Filtered water.
Total	...	4,981	9,808	1 : 1.94	

Table II shows different counts made simultaneously from the same sample by the two methods, the mixture method and the smear method. It is clear from the experiments that the total number of colonies in 1 cc. of a sample of water is greater in the smear method than in the mixture method. About 50 to 95 per cent. of colonies are missed in the mixture method due to the fallacies pointed out. The smear method brings out the quantitative bacterial content of a water far more accurately than the ordinary counting method and the preliminary incubation of the plates for the purpose of drying in condensation gives an efficient control against accidental failures in sterilisation.

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