[L. & M.
5,000—19-11-96.]

Local & Munl. (1897) Department.

MISCELLANEOUS.

G.O., No. 1184 M

DATED 12th May 1897

[Despatch Abstract.]

Bubonic Plague. Recording, with remark, letter from the Collector of North Arcot, deprecating the removal of the hospital or isolation camp at Arkonam to another site, and requesting Communicating Copy of the letter to the Sanitary Commissioner.

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

Local & Munl. (189) Department.

CURRENT No. [illegible] 3/[illegible]

SECRETARY TO GOVERNMENT * LOCAL & MUNICIPAL DEPARTMENT * 6. MAY. 1897

[illegible]

Ansect copy of Dr. [illegible] to my D.O. of 25-4-97 [illegible] 7-5-7 Please see D.O. [illegible]

From The Collector of North Arcot

SECRETARY TO GOVERNMENT * LOCAL & MUNICIPAL DEPARTMENT * 6. MAY. 1897

Refer Cur. Eng. No. 931 of 97

Mis. **Order** HM / No. 1184 M. mis. dt. 12-5-97 [illegible] 11/5/97

Recorded

2. A copy of the Collector's letter read above will be forwarded to the Sanitary Commissioner, in continuation of G.O. No. 974 M. of 26th April 1897 with the remark that in all the circs. the Govt. does not consider it necessary to move the site of the camp. [illegible] 10.5.7

Dated 4th May 1897
Received 6 " "
Registered " " "
Enclosures
Spare copies

SUBJECT.

Deprecating the removal of the hospital or isolation Camp at Arkonam to another site and requesting to direct the Sanitary Commissioner to select the site himself if it is decided to move the Camp.

HM/ The whole qn. of plague contagion is so unsettled that it does not seem worth the cost or trouble to move the sheds now, especially as the pestilence is so rapidly decreasing. If there is any sign of recrudescence the point may perhaps be reconsidered. Please see Dr. [illegible] D.O. [illegible] 10/5/97

To The Collr. of North Arcot
" Sany. Commr.

Desp. 13/5/97

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

Despatched 5.5.97
Dated

NORTH ARCOT, COLLECTOR'S OFFICE,
Camp Palmaner 4th May 1897.

Refon Cir Enq No. 931 of 1897.

From

S. H. Wynne Esquire,
Collector & District Magistrate,
North Arcot.

To

The Secretary to Government,
Local and Municipal Department
Fort Saint George,

Sir,

In reply to Go. 974 M dated 26th April 1897, I have the honour to state that I deprecate in the strongest manner the removal of the hospital or isolation camp to another site. The site for the present Combined Camp is already at a Considerable distance from the Railway Station, owing to the large size of the Railway Compound. Another Camp would necessarily be still further to the west. To the west of the present Camp is the Meidan now used by the presidents of Artillerans as a golf-ground and all the ground in this direction is intersected by roads, Cart tracks, and paths. The general public must be protected from "aerial infection" as well as the few persons who may happen to be in the observation sheds and the only manner in which a new Camp could be made to secure this would be to take up a large area and enclose it with a strong fence or stockade. If a distance of 100 Yards from the observation sheds is Considered to create a danger to the latter so great as to necessitate a removal from this otherwise "excellent site" (Vide Sanitary Commissioner's Notes) then I presume

a distance of 200 Yards is the least that should be given. That being so the Compound of the New Camp must be a quarter of a mile square and the Stockade round it will be a mile long. The Stockade must be strong and efficacious and would take a very long time to construct, probably months. There will be the further grave inconvenience of the distance from the resident Medical officer's quarters and the consequent diminished control. A Cook house for Europeans and new latrines, and a new Store house will be necessary, and these must be pucka buildings. The expense will be enormous. From every point of view there is the gravest inconvenience and as against it there is possible aerial infection, about which admittedly nothing is known, and this as a danger to observation sheds which will, in all probability, be empty.

2. If it is decided to move the hospital Camp, I request that the Sanitary Commissioner be directed to select the site himself; otherwise when the buildings are finished there is little doubt there will be further objections.

I have the honour to be
Sir,
Your most obedient Servant

V. R. Ramaraja

For Collector.

Mk
D by Jn

L.&M.
1,000 11-11-96.

Local & Munl. (189) Department.

D.O.
~~CURRENT~~ No. 55.

From The Sanitary Commissioner

No.

Dated 5-5-97
Received 7-5-97
Registered " "
Enclosures 2.
Spare copies

SUBJECT.

Re: Surgeon-Major Waters' opinion on the origin &c of the plague.

No 55

Office of Sanitary Commissioner
Madras, 5th May 1897.

SECRETARIAT GOVERNMENT DEPARTMENT
7 MAY 1897
SOUTH ARMY

Dear Mr Forbes.

With reference to your D.O. No 3[illegible] of 25.4.97 Re Surgeon Major Wales's communication, I have taken the liberty of making certain remarks in the margin of the extract from the "Pioneer" - which please see

Surgeon Major Wales is about the last authority in India that any Member of the Medical Profession would think of relying upon. He has endeavoured to run the "grain" theory of plague prevalence in the face of most convincing proof of its unbelievableness and is accordingly held in derision by all except a section of the public who would accept such an absolutely loose statements as he would put forward to support it. On this point, please see parts marked in a proof sent herewith.

My position in regard to distance of observation sheds from isolation sheds is as follows:- I consider that when Government issues an Order restricting personal liberty of the subject on the ground of public safety, that it behoves it to see that this is conducted under conditions that shall not contain entail risk to health or life or more inconvenience than is essential. Any forgetting of these principles leads

to the notorious evil results of bad systems of quarantine, which end in bringing about a spread of the very diseases they are intended to check. Hence, I hold that, in the interest of prevention of disease spread, and in fairness to those subjected to the conditions of plague camps, ~~that~~ there should be no greater element of chance than is unavoidable. Now, the Medical Profession at the present time as a body - whatever single members such as Surgeon Major Waters may say are in the position of not knowing anything *precise* about the distance to which infection is conveyable. For my own part, except in respect to possible conveyance by contaminated flies, I think chances are against aerial infection being possible over anything but a very small distance - if at all. But, on the other hand, we have evidence of the older observers who maintain that the air is the medium of conveyance. ~~But~~ In this ~~matter~~ connection I may say that not till within the last few years would any one imagine that infection by small-pox was not well guarded against by allowing, say, 40 feet between a public road and an Isolation Hospital; yet, a mile is now regarded as not fully giving protection, and the Local Government Board of England requires one-half mile from houses as the minimum distance to be observed, as the result of evidence accumulated with care. Hence, in a state of opinion wherein no decided answer can be given, I think caution is necessary, and would therefore say that the possibility of aerial infection should not be forgotten, and a ~~reasonable~~ distance founded on this doubt should be given where circumstances will reasonably permit it. But laying aside entirely this doubtful point, the essential condition of taking into account what would occur in practice must not be ignored. No one who has the slightest idea of the difficulty of maintaining segregation of menials in such a camp would dream of placing an observation shed in which a healthy European lady or gentleman is to be placed within 100 yards of sheds containing a case of a disease which, in default of better knowledge to the contrary, we still believe is capable of being conveyed by clothing and by earth infection. Would it be possible under such circumstances to keep the menial staff of the segregation and of the observation shed from mingling freely with the menial staff of the isolation shed, or from (specifically) contaminating its surroundings by faecal deposits*. Would it then be right to subject a person undergoing observation to a risk of the

* The faecal or other con- tains the microbes of plague in the case of affected patients

sort—presuming it only to be a risk? I consider the proper course is to take ~~a reasonable view of the situation, and~~ take no extreme view one way or the other. Remembering then what may be required as to proximity in a town already infected is a subject not now under discussion, and that what I say applies only to the unfortunate necessity of leaving at a plague observation station the healthy and the affected under one chief administration, I think that the minimum distance at which observation sheds should be situated with respect to isolation sheds should be three hundred yards, and that absolutely different staffs should be employed in the respective observation and isolation camps. Of course it may well be said to me that the menial determined to cover 100 yards would likewise be quite capable of going three times that distance! This is true; but, as a fact, a distance beyond talking with comfort and seeing with exactitude must go much towards reducing the temptation, and, in any case, the only alternative is cordons of police, iron barbed wire, and other obstructions (all of which can readily be overcome including the policeman) if carefully negotiated.

In the case of Arconam, excellent ground can be obtained in the neighbourhood without difficulty, and I therefore consider 100 yards unreasonably near. But short, there is no reason at all why an observation camp should be in greater proximity to an isolation camp than is dictated by convenience of transfer of patients from the former to the latter, whilst there are dozens of good reasons why they should be as distant and as far apart as possible.

Yours faithfully,

W. Wong

APRIL 14, 1897.

THE ORIGIN OF THE PLAGUE

FURTHER CONTRIBUTION FROM DR. WATERS.

At the last monthly meeting of the Anthropological Society of Bombay Surgeon-Lieutenant-Colonel Waters in the course of a long and highly interesting address made the following remarks upon a subject on which he is now entitled to be regarded as a specialist—the probable origin of the plague:—

I have reason to assume that you are already acquainted with my public utterances on this subject, and so I shall but cursorily touch on what I have previously said in this regard. I am too much honoured by the allegation that I am the father, as well as the exponent, of what is called the grain theory of the origin and spread of plague; for, indeed, I am nothing of the sort. It is true, however, that when I conceived the idea from actual observation of the state of things observable in Bombay, and more specially in the Mandvie district, at the commencement of this epidemic, I was not aware that Dr. Watson, now Surgeon-Colonel Watson—then serving in the Sanitary Department of the North-West Provinces,—had twenty years ago, *i. e.*, in 1876, given written expression to his belief that the disease was an outcome of the protracted and faulty storage of grain. Dr. Watson had given this opinion from observation of the state of things on the Himalayan slopes, in the district of Kumaon, where plague may be said to be endemic.

An observation made by Dr. Bittar, a highly trained bacteriologist, who has been for some time studying the plague here in Bombay, to the effect that to kill the germ you have only to dry it, comes with remarkable force in confirmation of our experience in the House of Correction, where we found the disease died out as soon as the place became free from damp. I have one more point to mention in the same regard. When the epidemic was its worst in the Byculla quarter, some cases broke out in the Byculla Schools, and one boy died of the disease. I had all plants removed from the neighbourhood of the walls and all surface-watering stopped, with the result that the disease did not do much more than make its appearance. The precaution, I have just mentioned cannot but by this time be widely known in Bombay, and it seems more than a pity that its neglect has been the cause of some very recent sad occurrences on Malabar Hill. I have no doubt at all that the disease can be arrested in that quarter even more easily than it was stopped in the House of Correction. The excessive use of water for garden purposes on Malabar and Cumballa Hills respectively, should at once be curtailed to a minimum, and all plants should be removed, as far as possible, from the neighbourhood of houses and servants' quarters. Let only this be done and I am very confident that plague mortality would cease there. In like manner it is obviously indicated that road-watering should be suspended, or at least very much diminished.

Now, as to the part alleged to be played by rats in the dissemination of plague, the facts are to me clearly indicative that this assumption is based on superficial observation. The death of rats in a plague epidemic is an incident in its history, and not a causative or even contributary element in the widening area of infection. Where the plague germs exist rats die before human beings are ordinarily seized with the disease, simply because they come first into close contact with the poison. Dampness, as I have indicated, is the chief determining factor in each local occurrence of an outbreak, and the rats die first, because they are first affected as being nearer the damp surface than human beings. Afterwards human beings become affected, either by direct inoculation from lying on the damp ground, or later by inhalation of germs rising up during evaporation of the moisture.

This brings us to the important question as to whether plague is or is not communicable from person to person by ordinary means of contact. And, as I wish to be as short as possible in the remainder of my remarks, I would simply inform you in regard to this point that for every week-day of the months September, October, November, December, January and February, not less on an average than ten people were received into the Common Prison, drawn from the surrounding districts where plague has been rampant without ever having introduced the disease into the jails. Surely this fact must stand by itself against all speculation as to the probability of the disease being disseminated by personal contact from place to place.

• He does not stop to describe conditions under which admission and death occurred? Yet without this the vast inference made is of no value whatsoever. W.B.King. (1)

(2) He grants that efforts at segregation were used but declines to define the measures.

(3) "Discharge from the sick list" gives not the slightest idea of period as to existence or otherwise of the swellings — and then, be it noted, we get over difficulties by "merely suggesting the subjection of such articles to moderate heat." No idea is given of what extent this "moderate" heat was, and, if we did not dread infection, why thus trifle with disinfection!! W.B.King.

(4) The "grain theory" was proved in the seventies to be valueless, and has been further shown this year by Mr Hankin not capable of support on bacteriological evidence. Yet it is on the endeavour to prove the correctness of this theory that Surg. Major Waters has chosen to appeal not to the profession but to the laity upon evidence that will not stand scrutiny. W.B.King

Further one case of plague did arrive within the prison walls. This convict was admitted one afternoon, and died during the night before I had seen him. He had swollen glands, and I had no difficulty in pronouncing the death to be due to plague. And one man was attacked with plague shortly after admission into the civil jail, within the same enclosure, and was transferred to Arthur Road Hospital, where he subsequently died. Neither case was followed by another attack. Having regard to this state of things in the jails, it is surely hard to believe that the disease nevertheless was conveyed from Bombay to Poona and elsewhere by travellers. And in the House of Correction, where we had a sharp out-break of the disease, and only very incomplete means of segregation of the sick, is it at all likely had we contagiousness to deal with that we could have arrested the plague so soon? I may say that, so soon as the convalescents were able to move about freely, requiring no assistance, I discharged them from the sick-list, allowing them to mingle freely with the other inmates of the jail, merely suggesting that these men should not be troubled with work of any kind till such time as they gained strength, and from this their healthy neighbours did not suffer, whilst the convalescents improved more rapidly by the comparative cheerfulness of the suroundings. Moreover, I saw no reason for recommending the destruction of the clothing and other articles used by the sick of plague merely suggesting the subjection of such articles to moderate heat. All this surely tells with unanswerable force against the view that plague is a disease of any contagiousness to speak of. It is a very noticeable and very remarkable fact that, but for plague, Bombay has been for some months strangely free from sickness. This would not have been the case had we insanitary conditions to deal with. We should then have to fight the host of ills arising from pythogenic causes. As a matter, moreover, of actual observation, Bombay has not for many years been so clean as it has been for the last four months.

Plague is then, I unhesitatingly repeat, not a disease caused by insanitary conditions in the ordinary pythogenic sense. For its cause, we must look to another source, and as you all know, I deem this to be the letting loose on the market in these times of scarcity and high prices, quantities of grain that have long been subject to storage in ground-pits, where it has acquired pestilential potentiality. I shall not repeat the grounds on which I based this conclusion. Suffice it here for me to say, that these grain fungi escape into the air, and there, to a very large extent, they are destroyed by the sun. You will have often observed that the mortality increases in cold and in cloudy weather, and diminishes in warm sunshiny weather. Near the source, whence they emanate, these germs are strong enough to poison people in the upper stories of high houses but at greater distance are weakened by the sun, and then only become potent for ill, in damp places where the moisture restores them to virulent possibilities. This, I maintain, explains the incidence of plague in its various scenes of outbreak. Plague broke out in Karachi almost as soon as it made its appearance in Bombay, because the local conditions of the two places were identical. Why has it only recently made its appearance in Poona and elsewhere in the Deccan and other parts of this Presidency? It would seem that at first, and for some time, the grain fungi lacked the strength to withstand the dry air and sun of the mofussil, but as the condition of scarcity wore on deeper and more dangerous depths of pitted grain were unearthed, giving forth germs of augmented power for evil—stronger germs—and so we have the disease spreading, but not by contagion. Otherwise, why should frequent personal intercourse between Bombay and up-country fail to convey the disease thither for at least four months of the prevalence of the epidemic, and only comparatively recently prove effective in that respect. I now think I have given ample reason for refusing to subscribe to the view that the pestilence now amongst us spreads by dissemination, by means of travellers from one point to another.

From what I have said it will have been perceived that to my mind plague though horrible in its depredations is yet a disease which can be easily grappled with and overcome. Even leaving actual dealing with the grain on one side, we see that by the sedulous use of lime-wash, and more especially the exercise of the very greatest care to avoid dampness in and around dwellings, the disease can be held in defiance. It was mainly with the object of placing these simple facts in relief that I have made plague so largely the subject of this address.

EXTRACTS FROM REPORTS ON PLAGUE BY MR. NETTEN RADCLIFFE, SURGEON-MAJOR COLVILL, MR. C. PLANCK, DR. E. D. DICKSON, M.P., AND OF THE MEDICAL OFFICERS OF THE LOCAL GOVERNMENT BOARD.

(1) FAVOURABLE LOCALITIES AND CONDITIONS FOR SPREAD.

"During the years 1871, 1872 and 1873, I remarked that the epidemic began about the commencement of the rice-planting, that is to say, May or June. Onwards from this time its ravages were severe wherever it passed. During the summer, which in Yünnan is the rainy season, although the epidemic still held its course, yet it was of a milder character, but it is from the time the rain ceases to the end of the year that the disease is most active and deadly. A peculiar fact with regard to the track of the epidemic I have observed in several places both in the north and south of the province. Instead of visiting every village in its direct line of progress, it would pass some completely by, visiting places near them, and on both sides, to return to those forgotten spots, several months afterwards, when the epidemic would appear to have passed far away. Another fact not less curious is that, after having appeared in almost every one of the villages scattered about the plains, it ascends frequently the mountains, where among the aborigines, Ijên, who inhabit the high lands, it claims many victims. One is inclined to believe that the disease is imported by the men and women who descend into the valley to barter, to work at certain seasons of the harvest, as it is chiefly the mountains adjoining the plains that are visited by the disease."

* * * * * *

Good asserts, and Sir G. Blane supports him, that in Europe and Africa the plague is destroyed or suspended between 60 and 80 degrees. Copland gives lower figures, viz., from 35 to 75 degrees. But Mahamurree has appeared within a considerable range of temperature. I have seen it with the thermometer in my tent, varying from 83 to 95 degrees, rising in a grass hut to 105 degrees. But the atmosphere was more or less damp. It is very probable that, with a perfectly dry air and the thermometer at 75 degrees or above it, the poison would be inert. Extremes of temperature, combined with moisture, are, as is well known, not unfavourable to the development of disease. But dry cold is bracing, and the healthiest season of the year in India is the hottest, when the dry hot winds are blowing their hardest. Kumaon and Gurhwal, as already stated, are in plague latitudes, as also are the plains of Upper India; but the native inhabitants or the latter escape Mahamurree, it is alleged, in consequence of the great heat. Their personal cleanliness and a better sanitary condition (though in many places there is room for improvement in this respect) doubtless conduce greatly to their immunity.

* * * * * *

Pali Plague.—The Himalayahs are not the only place in India where plague has appeared. It has raged with great virulence, though more temporarily, in the west of India in the Bombay Presidency. Its first advent there was, it is believed, in May 1815 in Guzerat and Kuttywar Cutch, after three years of severe famine. It reappeared the following January, February and March, in the same locality, whence it migrated to Scinde. It seems to have remained in these parts till 1819, when it disappeared; and we hear no more of the disease till July 1836, when it broke out with violence at a town called Pali in Marwar, whence the name by which it has subsequently been known—*Pali Plague.*

* * * * * *

This appearance of plague in the province of Bengazi had been preceded by four years of drought and consequent failure of crops. Each successive year the miseries arising from dearth had increased. The greater part of the flocks and

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* * * * *

This appearance of plague in the province of Bengazi had been preceded by four years of drought and consequent failure of crops. Each successive year the miseries arising from dearth had increased. The greater part of the flocks and

herds were destroyed from want of food, and the mortality among horned cattle was augmented by a fatal epizootic which attacked them. Plague appeared when the sufferings of the population from famine were greatest.

* * * * *

Among certain of the villages amidst the Hindieh marshes in 1867, after an excessive flood of the Euphrates and inundation of the marshes, plague, which was believed to have disappeared from Mesopotamia for 33 years, reappeared.

* * * * *

Plague in this outbreak in Persian Kurdistan appears to have first shown itself at the end of autumn 1870 or the beginning of the winter of 1870–71, on an elevated table-land lying south-east of Lake Urumiah, between the head waters of the rivers Jagatu and Tatawa, both of which streams flow into the lake named. The district had last before suffered from plague in the epidemic of 1829–35. The villages attacked not only within the locality of first appearance, but also in neighbouring localities to which the disease extended, including the town of Bana (Berozeh), are, according to Dr. Telafons, built at altitudes above the Black Sea of which the lowest (Uchtepé) is 4,540 feet, and the highest (Arbanos, where the disease seems first to have become active), 5,870. Bana has an altitude of 5,470 feet; and Akjivan, where the nature of the disease was first recognised, 5,240 feet.

The villages earliest attacked were situated in the district of Mikri. The disease is believed to have originated in a hamlet named Djoumouchan (Gamishan), which is situated at an altitude of 6,600 feet, and which at the time of the appearance of plague contained six families.

* * * * *

The existence of plague was first observed in April 1874, but Dr. Arnand is of opinion that cases had occurred several months before. The outbreak had been preceded by three years' privation arising from failure of crops in the successive years, consequent upon persisting drought. In the winter months of 1873–74 the famine had become so severe that persons might be seen hunting for undigested grain in the dung-voided camels. The cold season of 1873–74 and spring of 1874 had been unusually wet and had converted some of the favourite camping grounds of the nomadic tribes, as in the valley of Merdj, into swamps, adding to the misery of the starving population for the time being, but rendering secure the summer crops.

* * * * *

"Most of these villages are situated on an elevated table-land called 'Toumo-
"'una,' rising about 2,000 metres above the sea and 1,500 above the 'Tehama,' and
"extending as far as the 'Namaz' range, from which it is separated by the valley
"of 'Waba.'

* * * * *

"Here a marked contrast is seen between the barren, wretched plain of
"Tehama and the fertile, pleasing aspect of the Toumouna plateau. The villages
"just named are built of stone; the houses have several stories, are well-aired and
"properly distributed, and the soil is rich and produces the best quality of Yemen
"coffee, often giving two crops in the same year. Indian corn, dhurra, barley and
"indigo are cultivated; vegetation thrives and fruit trees abound. Running water
"is scarce, but in lieu of it the inhabitants are supplied with wells and cisterns."

* * * * *

To this interesting account Dr. Dickson adds a remark made by Dr. Parznichi, in a report to the Central Health Department, dated from Djerzan in Arabia, on the 18th December 1874, that "the localities lately attacked by the outbreak of "plague had been previously visited by famine."

* * * * *

I have already, beside mentioning the town, described four classes of villages or groups of huts. One class where irrigation takes place with skin buckets on account of the high bank, and the huts are on dry ground and therefore receive all the antiseptic influence of earth. In the second class the villagers only spend the season of cultivation on the ground and return to the towns for the rest of the year. In the third class the villagers are driven, on account of the rise of the water from their rice-fields, and forced to move their habitations twice a year, while the ground they occupy during the greater part of the year is thoroughly cleansed by the rising river. Those three classes of villages are all free from plague, and the disease is confined to the fourth class only. In this class the villages or groups of huts are permanent; they are on ground which is a foot or two lower than the surface of the water in spring, and the ground is so saturated with water that the refuse of the village is neither absorbed nor can it be evaporated, for it acquires fresh moisture from the ground, and this refuse acquires the form of a bluish black oily fluid, which surrounds the huts and covers the paths, and stains the walls two feet from the ground; and, in fact, the village is in such a state of filth that it requires to be seen to be believed. It was this class of village which was exclusively attacked in the Hindeah in 1867.

I can see no reason why it should have attacked this district last spring, and this in preference to any other year; for during the past two years every kind of grain has been in profusion, dates in abundance, and fish on the Euphrates are caught simply for the sake of the oil. It may be remarked that, during last spring, there was an excess of rain as in 1867, but that could not affect villages moist as these are. Still, it is a significant fact that the only two great inundations of the rivers since 1831 occurred in 1867 and last spring, and that during the great plague of 1831 there was an inundation of the Tigris, which washed half Bagdad away. In 1867, however, the disease died away in one spring, while this year the area has much increased since last year.

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The malady would appear to have shown itself with more or less activity in various parts of the tract of country lying between the Shat-el-Atchin and the Shat-el-Hai, and along that part of the course of the Euphrates where it had been chiefly active the previous year (1875). Thus its presence was noted again at Shinafieh, on the Sea of Nedjef at Jerboyah, Diwanieh, Samara and other places on the Euphrates as low down as Suk-e-Sheyukh, and along the course of the Shat-el-Hai to its junction with the Tigris at Kut-el-Amarah. Moreover, in the district lying to the north of the tract of country above described, and which had been the scene of the outbreak of 1873–74, plague was noted at Meshedali, Kufa, Kifl, Tanabi (Tuarich) on the borders of the Hindieh marshes (the last-named place being the chief town of the Hindieh district), and at Kerbella. The disease also appeared at Hillah and at Bagdad, and in the villages of the district lying between the two towns.

The stress of the outbreak of 1875–76 would appear to have fallen upon the tract of country which extends immediately to the north of the district that had suffered in 1873–74.

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(2) Method of Spread.

Poison in the Soil.—I strongly incline to the belief that the poison of Mahamurree exists in great force in the soil, which becomes at every visitation more and more impregnated with it, owing to the filthy habits of the people. They contribute to its accumulation in every possible way. * * * The death of rats and snakes favours the view of the poison emanating from the soil, but whether this be associated with electrical or volcanic changes in the rocks, or earthquakes, or the development of sulphuretted hydrogen, we do not as yet know. Dr. Planck, the Sanitary Commissioner of the North-West Provinces, who was deputed to investigate, in conjunction with Dr. Pearson, the outbreak of Mahamurree in 1876, believes that the rats die of suffocation. He comments upon

in the ground. As soon as this premonitary warning is recognised, the people , . . . purify their houses, abstain from pork, and in some cases fly from the threatened district.

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Mode of a Rat's Death.—The manner of a rat's death was remarkable; the animal would emerge from its hole on to the floor, stagger, perform an involuntary gyration or two, bring up blood and die. More commonly the rats were found in the morning lying dead near the sleepers. On more than one occasion a rag has been found between the clenched teeth of the rat. I am not aware that any of the professional observers ever *saw* a rat die and as thus stated; but, as the same statement was universally made by the natives, there is no reason to discredit it. And we saw rats dead.

Examination of the Grain.—An idea having prevailed in some quarters that diseased grain (that in common use is the *Eleusine coracana* known locally as *Mandooa*) might be a factor in the generation of Mahamurree, we carefully examined it as stowed away in the baskets, from top to bottom, but it was good throughout without any trace of fungus or any disease whatever. The pultaceous mass of food (consisting of grain) found in the rat's stomach seemed particularly wholesome. And on their return home from the jungles, the survivors, if they find any grain left by the bears—who generally, however, make a pretty good clearance—entertain no scruples about using it again. Indeed, they sometimes take it into the jungle with them. Doubtless it is diseased sometimes, and the people, who cannot afford to throw it away, do eat it in that state, but I very much doubt its ever lighting up Mahamurree, and if we admit it as a cause of the disease, it should be in universal operation.

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I may mention here that Dr. Pearson, in his long experience, saw no connection between Mahamurree and the disorders of cattle. The cattle suffered occasionally from foot-and-mouth disease, but not especially in Mahamurree years. During the outbreaks of this disease, and before they, as a rule, remained healthy as did the sheep and the goats. Dr. Watson (who succeeded Dr. Pearson) attributes their immunity from the plague to the fact of their eating only grass and no grain. He gives, in support of the grain theory, the case of rats in the neighbourhood of a water-mill, beginning to die only when some grain had been taken from a village to be ground. With the exception of rats, and much more rarely, snakes, the death of animals in connection with Mahamurree was not a marked feature. If one animal, eating another plague-infected, should die, how much more the bears who, it is alleged, consume the bodies of the villagers that have died of Mahamurree? Certain it is that bears are often carnivorously disposed; and that they were observed in greater numbers than usual in outbreaks of this plague. I myself saw, one moonlight night, what appeared to be a small family of bears pass the bamboo scaffolding on which I was seated—they were too far for a shot—and the plague-stricken corpses rapidly disappeared. No dead bears were ever seen.

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From Pali the disease radiated within a circuit of 30 miles, extending in October as far as Jondhpoor. Under the energetic supervision of Major Dixon, then Superintendent of Ajmere, the capital of Rajpootana, quarantine was established, and the plague did not reach any other states in the province, the intervening hilly country of Mhairwarah helping to exclude them. One town, however, viz., Dewar, was affected owing to infringement of the quarantine regulations. Interested traders persuaded the inhabitants to conduct porters carrying the bales of merchandise into Dewar, where the disease immediately afterwards broke out; passing over in March (1837) to Deogurh in Meywar, in which district 32 villages in all were attacked. With the setting in of the hot season in that same year the plague declined, and has not since been heard of as such in that part of India.

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Commenced amongst the Chippahs.—We find that the Pali plague invariably appeared amongst one class of people, viz., the Chippahs, or Cloth Printers of Pali; that it then attacked others, who fled and formed fresh foci of contagion. The Chippahs principally had dealings with the Bunnyahs, or intermediate small traders, who thus became the carriers of the poison. Why should the cotton-printers be the first to suffer? Because, it is urged, they imported the merchandise from Surat on the coast; because they unpacked it; and because it consisted of goods brought in part from plague countries, whence it would, therefore, contain the fomites of contagion. Surat has commercial intercourse with Egypt, the Red Sea and the Persian Gulf. In Kuttywar, as at Pali, these importers of cotton goods also worked in cotton—they made cotton cloths. From whatever source the poison came, the avocation of the Chippahs invited its advent amongst themselves, raw cotton affording a favourable nidus for its abode, just as the woollen dress of the Gurhwallee more readily gave a lodging to the poison of Mahamurree than did the cotton garment of the Kumaonee. Cotton raw and cotton made up are of course two very different things. The theory of packed goods transporting the poison, and disseminating it when those goods reached their destination and were unpacked, has been recently maintained by Professor Hirsch, the celebrated authority on infectious disorders, who, in a discourse delivered last year before the Medical Association of Berlin, expressed his belief that the poison of the plague, which broke out at the end of 1878 in Vetlianka in Astrakhan, resided in the packed goods that were being conveyed from Mesopotamia to Armenia; and that, when these goods, having become the spoil of the Cossacks, were taken by the latter to their homes and there opened out, this poison became diffused.

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Communication between Kumaon and Gurhwal and the West of India.—On referring to the map of India, we find that a distance of between 700 and 800 miles separates the birth place of the plague in the West of India from Kumaon and Gurhwal, the plains of Northern India intervening, and I am not aware of any regular direct communication between the two. The Bhotiyahs—the carriers of the hills before referred to—annually descend into the plains during the cold season, and visit some of the principal towns there as Allahabad, Agra, Delhi, &c., going, now that they have in a great measure overcome their dread of small-pox as far as Calcutta. But I believe that they have never yet penetrated into the presidencies of Madras and Bombay. Railway facilities may, in the future, enable them to do so, but without these facilities, it would be next to impossible, their time being so limited.

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Dr. Arnaud was able to follow the movements of the disease in some detail, noting its dissemination through the inter-communication of the occupants of various encampments, and showing a period of latency after exposure to infection in three cases of five days, in one case of six days, and generally a limit of eight days.

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Last spring a man arrived from Afiche at Um Nejeris, and died in a hut of plague; and two to three days after his arrival, the first case of plague occurred. Four people in that hut died, all who fell ill, leaving two only untouched. In all, 20 people in a population of 500 died, and some 20 recovered. The heats having set in, the disease became dormant till last autumn, when it again appeared at Um Nejeris, and four persons died, but the greater number recovered. Plague again became dormant till the beginning of January of this year, when it was reported to exist on the Shat-il-Hai. In the beginning of February it was carried to the district of Abdare by some Montefik Arabs from the Hai, and about 150 in the district died out of a population of 4,000 souls. . . . . .

The village of Fowar had a population of about 250 souls, and up to the time of my visit 43 were known to have died though there were probably more deaths. On the 16th of April a man arrived from Fowar, and spent the night in a garden house on the outskirts of the town of Diwaniyah on the left bank of the Euphrates.

them freely, without remaining long in the same room with them, hardly ever caught the disease. When plague entered a house it seldom spared its inmates, and often carried them all off within a week's time. In noting these facts, Doctor Cabiadis was careful to take into account the various tenets of the different religious sects of the people of Bagdad; for while the Mohammedans discarding all sanitary precautions lived with and handled plague patients, the Jews and Christians, on the contrary, firmly believing in its contagious properties, very seldom *touched them;* yet all of them equally caught the disease if they *lived in the same house* with the plague patient, but were safe if they *quitted the house* the moment a case of plague occurred in it. Doctor Cabiadis quotes another remarkable fact in support of his theory. With *one exception* none of the physicians, surgeons, or assistants who daily attended on plague patients *caught that malady*, and he himself handled nearly 2,000 plague-smitten persons without suffering any inconvenience from it. To this it might be objected that the immunity enjoyed by them was owing to their *contact with the sick being a momentary one.* But, Doctor Cabiadis remarks, that if this be true with respect to the *physician*, it cannot be so with regard to the surgeon and assistant whose duties obliged them to prolong their stay near the patients for the purpose of opening abscesses, washing and dressing sores, &c. The exception alluded to above was that of *an assistant who actually died of the plague.* But in an epidemic outbreak affecting a whole population one de. amongst an entire corporation would rather indicate the law that governed the general mortality at the time than the exceptional liability of that body for coming into contact with the diseased.

Dr. Cabiadis does not think that the *infectious matter* of the plague is contained in the *pus secreted from the buboes and sores.* Plague, he observes, is transmitted even in its *incipient stage* and before any of the swellings or boils have suppurated. The problem, therefore, remains to be solved, whether the *specific materies morbi* of plague is exhaled from the patients' respiratory organs, from his cutaneous surface, or from some other emunctory.

These considerations lead me to the important practical question of *fomites.* I was very anxious to obtain from Dr. Cabiadis the fullest information on this point, so as to clear up, if possible, this intricate subject. Dr. Cabiadis says that he considered the *atmosphere* which surrounds a person affected with plague as *the true medium of transmission.* Apart from this, he has also met numerous instances in which he believes the *clothes and bedding* of plague patients communicated the malady to sound persons living beyond the sphere of the epidemic outbreak. Such articles were made of wool, cotton, flax or hemp. He ignores whether these materials in a *raw state* would have given the disease as well, since he has not met with any fact to enlighten him upon the subject.

(3) Modified Forms of Plague.

Two or three months previous to the manifestation of plague in Mesopotamia *glandular swellings free from fever* prevailed in that country. They showed themselves in the groin, arm pit, or neck, and were not accompanied by other symptoms. They began to appear amongst the inhabitants about the end of autumn, and continued through the winter; but towards the end of it plague broke out and reached its acme of intensity in the spring, and died out suddenly during the summer season when the *great heat* declared itself, and the thermometer rose to 45 or 50 degrees of centigrade scale (113° or 122° F.). During the prevalence of the plague the thermometer ranged between 5 and 30 degrees; and when it rose to 30 degrees (86° F.) the disease had reached its maximum of intensity. As the temperature increased from 30 to 45 degrees (86° to 113° F.) the epidemic began to diminish, and as soon as the thermometer got up to 45 degrees (113° F.) it ceased abruptly. On the cessation of the plague, *apyretic glandular swellings* reappeared again, precisely similar to those which had preceded the outbreak, and they continued to manifest themselves for about two months longer. These glandular swellings were frequently met with, and were distinct from the chronic adenitic swellings met with in subjects of a scrofulous tendency, and evidently unconnected with any special diathesis.

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Dr. Cabiadis gives the following translation of a telegram from Drs. Döppner and Zwingmann, dated from Enotayevsk on the 15th (27th) December 1878: "In the beginning of November, cases of ague were observed (at Vetlianka), marked by two or three paroxysms of shivering, and succeeded by a hot stage, and by swellings of the inguinal and axillary glands, often ending in suppuration. On the 27th November (9th December), this outbreak assumed a new form; *the glandular swellings did not appear*, but the patients became affected with shiverings, pain in the forehead and temples, vomiting, intense heat, aches in the limbs, giddiness, headache, altered features, injected eyes, nausea, anorexia, furred and dry tongue; in some cases pericardial distress, discharges of blood, insomnia, delirium and great weakness. These symptoms reached their acme on the third day." . . . "Relapses occurred occasionally in convalescence, and always ended in death. On the 9th December, the character of the outbreak assumed another type."

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Note on larval, abortive, or ambulant plague.—The question here chiefly rests upon the signification to be attached to the non-fatal bubonic malady observed in the city of Astrakhan in 1877-79, and at the beginning of the outbreak at Vetlianka in 1878. This *larval, abortive,* or *ambulant* form of plague has received especial attention during the later outbreaks of the disease in Mesopotamia and Benghazi, and its importance in an epidemiological point of view may be studied in Dr. Jholozan's recent work "*La Peste en Turquie dans les Temps Modernes, sa prophylaxie defecteuse, sa limitation spontanée,*" a work which introduces a new era in epidemiological research and practice. But it may be useful here to note that the recognition of an abortive or ambulant form of plague is no new thing. Simply the circumstances under which recent outbreaks of the disease have occurred, give occasion for greater attention to be devoted to this non-fatal and seemingly slight form. Thus Sydenham, in his observations on "The Pestilential fever and the Plague of the years 1665 and 1666," writes: "It happens also that at times tumours may break out without either fever of any important symptom as their precursors, although I suspect, for my own part, that chills or shivers, in some slight degree or other, and more or less perceptible, invariably precede. Those to whom this happens may walk about in public as usual, and attend to the common duties of life like healthy men taking no thought of regimen."

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In May 1877 there were observed on the outskirts of the city of Astrakhan and in the city itself a series of cases of sickness in which, after the patient had suffered for several days from a febrile state, sometimes acute, swellings of the lymphatic glands in the groin, the axillæ, the submaxillary space, &c., occurred, usually ending in suppuration. The patient was rarely disabled altogether in the febrile state, and when the glands began to swell, except that the swelling impeded motion, he was commonly able to get about as usual, and the appetite and general functions of the body became normal.

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Two hundred cases of this affection occurred in the city of Astrakhan, but it is to be assumed that in a non-fatal malady of this kind, rarely disabling the patient, many cases would escape notice, and this certainly appears to have been the case in the villages of the delta . . . . . .

Nevertheless it received a certain sort of attention at the time, but more particularly afterwards with reference to the events which followed at Vetlianka and in the villages on the banks of the Lower Volga in that part of its course. The medicial profession in the city of Astrakhan were much puzzled with the nature of the malady. One physician thought from the predominance of the affection of the glands of the neck that he had to deal with a form of mumps; others from the first regarded it as a slighter form of the plague then prevalent on the southern littoral of the Caspian; but the great majority appear to have looked upon it as a form of malarial poisoning, notwithstanding the absence of any disorder of the spleen. All, however, were of accord that the malady was new to the present generation of

medical men in the city, and wholly distinct from the syphilitic and scrofulous glandular affections with which they were familiar. Similar differences of opinion existed among the medical profession in St. Petersburg when the facts were reported there. Nevertheless certain medical men in Astrakhan did not hesitate to speak of the affection under the term of *Pestis nostras*, and Dr. Arkhengelsky of St. Petersburg used the phrase *Pestis ambulans*.

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The glandular sickness observed in the city and environs of Astrakhan in 1877 appears to have been observed there also in 1878 and 1879, but no definite particulars are given as to its prevalence in the two last-named years.

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(4) Prevention of Spread.

Prophylactic Measures.—The most effectual means for the protection of a community against the propagation of plague—the isolation of the sick, the destruction by fire of their clothes, and the whitewashing with lime and free ventilating of the domiciles in which cases of plague occur. The plague *reappeared in only one* out of 350 houses which had been *whitewashed* after an outbreak of plague in them, whilst its re-appearance in houses that had merely been abandoned for a time, after an attack of that disease, but which had not been whitewashed, *was of frequent occurrence.*

The other disinfectants tried, such as sulphur fumigations, lighting fires, and throwing a solution of sulphate of iron into the drains, gave no decided results, except when associated with the whitewashing and airing of the infected house.

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But it is pretty certain that the clearer view of what was desirable, indicated by some of the earlier measures, was quickly obscured by the panic which followed, and that sick and healthy were shut up indiscriminately in the infected houses, with the sad results which had been partially recognised even in this country over two hundred years ago.

"But if hereafter again a Plague should break out (which God forbid) with Submission to Superiors, I should think it not improper to appoint proper Accommodation out of the City, for such as are yet untouched in infected Families; and who should continue there for a certain time; the sick in the meantime to be removed to convenient Apartments provided on purpose for them: For by this means, that Practice, so abhorrent to Religion and Humanity, even in the Opinion of a Mahometan, of shutting up the sick and well together, would be avoided."—*Loimologia* or an Historical Account of the Plague in *London* in 1665. By Nath Hodges, M.D., and Fellow of the College of Physicians, who resided in the City all that Time. Edited by John Quincy, M.D. (2nd ed., 1720, p. 11). So also Mr. William Boghurst, a medical practitioner, who resided in St. Giles-in-the-Fields during the whole period of the plague in 1665, and who left a manuscript account of the outbreak, now in the British Museum, and from which extracts are given in Brayley's edition of Defoe's "A journal of the Plague Year":—"As soon as any House is Infected, all the sound people should be had out of it, and not shut up therein to be murdered!"

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