Local & Munl. (1898) Department.

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[Despatch Abstract.]

Bubonic Plague

Recording copies of letters from the Plague Commissioner of Hyderabad describing the measures taken to Stamp out plague in H.H the Nizam's Dominions

BACK PAPERS.

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

FURTHER PAPERS.

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

Government {1898} of Madras.

LOCAL AND MUNICIPAL.

Recd. } 1898. *Enclosures*

Regd. } *Spare copies*

G.O., No. 329-P., 14th April 1898.

APRIL.

Bubonic Plague.

Recording copies of letters from the Plague Commissioner of Hyderabad describing the measures taken to stamp out plague in His Highness the Nizam's Dominions.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers :—

From Surgeon-Lieutenant-Colonel E. LAWRIE, M.B., Plague Commissioner, Hyderabad, to the Secretary to Government, Hyderabad, dated Gunjoti, 8th March 1898, No. 791.

I have the honour to report that I have completed my tour in the Gunjoti district, and am proceeding to Naldrug on the 10th instant to inspect the infected villages in the Nizam's territory in the neighbourhood of Sholapur. The following statement will show His Highness' Government what has been undertaken in order to stamp out the infection of plague in this area.

2. I was accompanied on my tour by Mr. J. B. Buchanan, the Chief Engineer to His Highness the Nizam's Government, without whose personal assistance it would have been difficult, if not impossible, to execute works in connection with the expeditious establishment of isolation hospitals and segregation camps. Two lady doctors left Hyderabad with us and proceeded straight to Gunjoti, where they have been employed in rendering medical aid to women of this place and of Umerghi who have suffered from plague and its effects.

3. I left Hyderabad on the 22nd February 1898, fully impressed with the belief, founded upon the experience of those who were engaged in the Hongkong epidemics of plague, that the infection of this disease is to be found principally in the floors and walls of houses, and that it can be effectually destroyed by fire ; and I may remind the Government that in dealing with imported cases of plague during the last few months at Wadi, Shahabad, Gulburga, Murtoor, and in villages in the vicinity of Ahmednugger, this belief was, as far as can be judged, successfully acted upon. The result of my tour has been to prove that it is well founded, and it is now established on a more permanent or scientific basis.

4. I arrived at Homnabad on the 23rd February 1898, and was met there by Dr. Naidu, whose patrol parties had searched all the villages on and near the road from Hyderabad to Homnabad without encountering any cases of plague. From Homnabad I proceeded to Kalliani, which important centre was found to be free from plague, and from there to Sirsi, where the first cases of the disease were seen, 33 deaths having taken place. From Sirsi I came on to Gunjoti, and from Gunjoti I have visited in company with Mr. Stevens all the villages now plague-stricken in this area, viz., Umerghi, Terrori, Kajouri, Maraj, Bulsoor, and Nagaral. I may here state that in all the infected villages the orders of the Government of India with regard to evacuation, as well as the most perfect organisation for carrying out the Government rules for disinfection, had been completed before my arrival by Mr. A. H. Stevens—in such a manner that nothing remained to be done but to determine and execute a uniform plan for the destruction of the plague infection.

5. The general conclusions at which I have arrived from my inspection of the infected villages are, first, that the infection is excessively and in the most complex manner widespread ; and, secondly, that the area round Gunjoti and Umerghi constitutes by far the most important focus of infection in His Highness' Dominions, seeing that it directly threatens Hyderabad and Gulburga. Consequently Mr. Stevens was well advised to make this area his main point of attack in commencing the plague operations ordered by the Nizam's Government. In this area there are known to have been 550 deaths from plague, in the villages named in the margin, since the epidemic was first reported ; but Mr. Stevens and Mr. Jamshedji, the Nawab Sir Khurshed Jah's Taluqdar, have no doubt that this number is from 250 to 400 short of the actual number of deaths that have taken place, since the records for the first month or two are unreliable. The localisation of the infection in the different villages was complicated by the facts that for many weeks after plague began in the epidemic form the villagers concealed its existence as much as possible, and they do not even now in many cases know which houses are infected and which are not. Moreover, they unintentionally helped to spread the infection far and wide in each village by carrying their plague sick about from one house to another on short visits among their friends and relations. Many houses were undoubtedly infected in this way besides those which were numbered and marked "Infected" because people had been taken ill or had died in them.

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6. During our inspections of the villages the following points claimed special attention :—

I.—The disease itself and its treatment.
II.—The infection and its localisation.
III.—The employment of fire as a disinfectant.

I.—The disease itself and its treatment.

7. The impression created in my mind by the cases I have seen is that plague must be produced by inoculation with some putrid organic (probably animal) poison. The only disease I have seen which resembles it—and the resemblance is not complete—is the blood poisoning caused by what are called "dissection wounds *." Clinically plague is not a disease in which infection would be expected to take place through air or water ; and on the other hand it is just the kind of disease in which poison might be looked for in the discharges or exudations from the buboes either on the surface or in the interior of the body. Many of the plague cases which I inspected had superficial suppurating buboes. The discharges from these suppurating buboes directly infect clothes, beds, bedding, and the floors of houses. Many other cases again had no superficial buboes, but these patients had in all probability buboes in the glands in the interior of the thorax or abdomen. From cases of this kind, where the lungs or intestines are implicated, certain excretions, such as the sputum or intestinal discharges, become contaminated, and infect the clothes, bedding, beds, and the floors of houses. There is very little to add regarding the treatment of plague. I tried several drugs which might reasonably be expected to benefit the disease : nothing, so far as my limited experience goes, did any of the patients any good whatsoever.

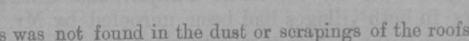
II.—The infection and its localisation.

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infection. It is an oval-shaped micro-organism which is found in the glands and in the blood in plague, and it occurs (*a*) singly, (*b*) in pairs, and (*c*) in chains—the bacillus, the diplo-bacillus, and the strepto-bacillus.

* (*a*) The bacillus. (*b*) The diplo-bacillus. (*c*) The strepto-bacillus.



It takes stains readily and then becomes coloured like the diagram, the stain used in the diagram being the same as that employed in our examinations, viz., thionin blue. Finally, it has been known since the Hongkong epidemic that plague can be produced in rats by inoculation with dust from infected houses.

9. From the date of our arrival at Sirsi—February 25th, 1898—systematic examinations of the dust and scrapings of the floors, walls and roofs of houses in various villages have been made. The floors of all houses in the plague-stricken villages are made of mud. They are for the most part the ground raised, rammed in and *leeped* over. At first only houses numbered and marked "Infected" were examined: we were subsequently led by accident to examine houses which had been regarded as uninfected. In examining the dust of a supposed uninfected house, for the purpose of comparison with that of a house known to be infected, we discovered the plague bacillus in large numbers. A systematic examination of all the houses supposed to be free from infection was therefore instituted in Gunjoti, and no less than 50 per cent. of them contained the plague virus and were undoubtedly infected. At first I was inclined to think that we had possibly made a mistake in regarding the bacillus we found as the true bacillus of plague. But this was wrong. A healthy field rat was inoculated with a scraping from the ground of an *uninfected* house in which the bacillus was found, and the animal died of plague within 36 hours.† The bacillus therefore is undoubtedly the plague bacillus.

10. The following facts were established by the examinations of, and inoculations with, the plague bacillus: —

(1) The plague bacillus was invariably found in the dust and scrapings of the ground of houses known to be infected, *i.e.*, houses in which plague patients had been ill or had died. Infected houses were examined in Sirsi, Gunjoti, Umerghi, Kajouri and Bulsoor.

(2) The plague bacillus was found in the dust and scrapings from the floors of more than 50 per cent. of the houses which had previously been regarded as uninfected.

(3) A healthy rat was inoculated with dust scraped from the ground in a supposed uninfected house (No. 28, uninfected) in which the plague bacillus was found to be present. The rat died within 36 hours, and on *post-mortem* examination it exhibited the usual signs of plague, viz., enlarged glands, congestions and hæmorrhages, and the plague bacillus was found in abundance in the peritoneal cavity, in the glands, and in the blood.

(4) The plague bacillus was found in grain which had been lying on the ground in an infected house.

(5) The plague bacillus was not found in the dust or scrapings of the roofs and walls of any of the houses examined.

(6) The bacillus was not found at a depth of more than an inch below the surface of the ground.

(7) The plague bacillus was found in dust taken from the floor of a house (No. 28, uninfected) immediately after the ground had been heated by igniting on it a thin layer of cow-dung fuel sprinkled with kerosine oil. A rat inoculated with dust from this floor immediately after the burning remained well until it escaped from its cage on the fourth day.

(8) In milk inoculated with dust containing the plague bacillus a growth and multiplication took place. The day after the inoculation from one to two bacilli to a field could be counted, on the fifth day from 45 to 65. In five days therefore each bacillus had increased to about 50.

(9) The plague bacillus was not found in the dug-up portions of the ground (floors) after they had been burnt in the kiln method.

* This was merely a diagram not intended for publication. This photo is a reproduction of a photo-micrograph of the plague bacillus taken by Yersin in the Pasteur Institute of Paris. It is photographed from Lechmame and Newmann's Hand Atlas of Bacteriology, plate 63.

† The body was burnt.

‡ 1000.

11. The practical value of the examinations of, and inoculations with, the plague bacillus is two-fold. In the first place, they showed that the clinical conclusions in paragraph 5, which are by no means put forward as original (similar conclusions were arrived at, before I saw indigenous plague at all, by Dr. H. Tripp, Lecturer on Anatomy, Hyderabad Medical School, who has been employed on plague operations for the last three months), are in the main correct. The virus of plague is most probably a putrid animal poison which falls to the ground, and does not spread through air, or even through water, unless it is excessively filthy; and it is taken into the human system mainly by inoculation. Many instances could be adduced from Mr. Stevens' experience here of sweepers who remained free from plague until they began to be employed in cleansing operations, and would appear to have become infected through the feet. In the second place, they have enabled us to determine and carry into execution a uniform plan for the destruction of the plague infection. With the help of the microscope, which after all is only a magnifying glass, the infection of plague can be traced and tracked about with as much precision as if it were visible to the naked eye. In case it is doubtful whether a given house is infected or not, an examination of the floors with the microscope settles the question at once, and very little is left to chance. On the other hand, when a house has been disinfected, an examination of the floors will show whether the disinfection has been complete or not, and it is therefore an almost infallible check on plague operations. For instance, the village of Bulsoor was beautifully clean at the time of our inspection, and Mr. Jamshedji had issued orders that the floors of the infected houses were to be dug up and buried. The village officials had dug them up, and in some cases had replaced them with earth and beaten it in. We selected two houses at random and examined the floors, and the plague bacillus was found in both. It is thus clear—and no one is more ready to acknowledge the fact than Mr. Jamshedji—that the floors of all the infected houses in the village will have to be dug up again and burnt.

III.—The employment of fire as a disinfectant.

12. A simple statement of what has been done since the 25th of February last will give the clearest idea of the difficulties which have been encountered in giving effect to the safe use of fire as a disinfectant. These difficulties have gradually disappeared as the localisation of the infection of plague by means of the microscope has become more precise and definite.

13. On the 25th and 26th of February the whole of the infected houses in the village of Sirsi were burned down with the consent of the villagers, who were liberally compensated. The plague bacillus was found in the floors of the houses, and this was taken as a reliable sign that the house was saturated with infection and must be destroyed. On my arrival at Gunjoti and Umerghi I found that all the infected houses in both villages had been unroofed by Mr. Stevens' orders, and the *chuppers* had been burnt. Arrangements were then made by Mr. Stevens to apply fire to the floors and walls of all the infected houses by means of cow-dung fuel and kerosine oil. While this work was progressing, we ascertained from examination of the roofs, walls and floors of the houses, which were going on all the time, that—

(i) the infection of plague is confined to the floors of the houses;

(ii) the kerosine oil method of burning the floors is dangerous; very often the house catches fire;

(iii) some parts of the floors may escape the action of the fire or be passed over through accident or carelessness.

(iv) the kerosine oil method of burning the floors does not always generate an amount of heat which is sufficient to destroy every particle of the infection.

This plan of burning was therefore for the above reasons abandoned, and the kiln method was introduced by Mr. Stevens on the 7th instant. In this method the floors of the house are dug up to a depth of one-and-a-half inches. The dug-up material is carefully removed to a short distance away from the house and made into a kiln, with cow-dung fuel underneath and all round it, the lower layers being

sprinkled with kerosine oil: this is set fire to and allowed to burn itself out. The dug-out part of the floor is thus reduced to ashes, and it is needless to say that no trace whatever of the infection of plague is left. As a precautionary measure the lower parts of the walls of the houses may be scraped, and the scrapings burned with the floors.

14. The only difficulty that remained was to know which floors to burn and which to leave alone. It is the work of some 35 minutes to find and stain the plague bacillus in one infected house, and in a village like Gunjoti there are at least 300 houses, each containing two or more rooms, besides small verandahs and courtyards. To make a microscopic search for the plague bacillus in every room of 300 houses would entail such an amount of physical labour as to be impossible. Accordingly, it has been finally decided, as the only practicable alternative to this microscopic search, that the floors of all the houses in the village are to be dealt with as infected and burnt on the kiln plan. In all the (marked) infected houses this will be done by Mr. Stevens' assistants: in all the others, it will be done by the owners under their supervision. The burning will be carefully checked, and wherever it is necessary the microscope will be employed in the checking process.

15. Each of the villages in the Gunjoti district which has been evacuated on account of plague is now in charge of a competent medical officer, who will, it is hoped, by maintaining isolation and segregation, and by constantly changing the sites of the numerous small village encampments, succeed before long in stamping out the disease. The destruction of the infection in the villages by digging out and burning the floors in kilns will then be undertaken by Mr. Stevens' staff of assistants, who are highly trained and reliable. The officers in charge of these men are Muhammadan gentlemen whose hearts are in their work, and who thoroughly understand the objects we have in view.

16. It only remains to state in this connection that the burning of the house floors by the kiln method meets with the entire approval of Sir Khurshed Jah's Taluqdar (Mr. Jamshedji), and I may add of all the village officials and of the villagers themselves.

17. However satisfactory it may be to be able to trace out the infection of plague and to destroy it by fire, there is no disguising the fact that the Nizam's Government have a most anxious and trying time to face during the next few months. It is not merely that the value of their plague operations will only be fully tested when the villagers begin to re-occupy their houses, and it is then seen whether recrudescences of plague occur or not, but in the villages round about Gunjoti re-infection from Sholapur will have to be guarded against. The most rigid precautions will have to be maintained in the infected area until plague is stamped out in this district, and also until it has been entirely stamped out in Sholapur and in Bombay.

From Surgeon-Lieutenant-Colonel E. LAWRIE, M.B., Plague Commissioner, Hyderabad, to the Secretary to Government, Hyderabad, dated Hyderabad Residency, 27th March 1898, No. 793 of 1898.

I have the honour to report that I proceeded to Bombay after leaving the infected villages in His Highness the Nizam's Dominions in order to verify, and if possible amplify, the work done in the districts with regard to the localisation of the infection of plague. The floors of the plague hospitals at Modykhana and Arthur Road and of several infected houses were examined, and I made myself acquainted with Dr. Haffkine's method of preparing the prophylactic serum for plague. I also made arrangements with Professor Haffkine for Dr. Mullanah and Mr. Syed Mahomed to study his plan of inoculation with a view to introducing it into use for those who care to have it in the Nizam's plague-infected districts. These gentlemen are now competent to inoculate and to teach others to inoculate with Professor Haffkine's serum.

2. I arrived in Bombay on the 12th of March, and on the 13th and 14th the floors of the European and Native hospitals at Modykhana were examined. These hospitals had been burnt down a fortnight previously: the Native portion had been occupied again for more than a week before the examination, the European portion had not been reoccupied. The bacillus of plague was not found in any part of the floor of the European hospital. In the Native hospital it was discovered in one or two places, principally at one spot where a man had been lying who was in attendance on his sick child. He was attacked with plague on the morning of the 14th instant, and when we examined the ground—a mud floor—close by the child's cot where he had been in the habit of sleeping, it was found to contain the bacillus of plague. The bacillus was also found in the floor at the Arthur Road hospital.

3. On the 15th instant we examined the floors of infected houses in the city of Bombay with Dr. Weir. On the 16th instant Dr. Weir examined several badly infected houses with us and showed us the action of a hose worked by a small engine by means of which the floors, walls and roofs of a house to be disinfected could be rapidly and thoroughly drenched with either water or disinfectants. A rat was inoculated with a solution made from the scrapings from the floor of another badly infected house in which the bacillus of plague was found. The rat was examined after death next day, and the plague bacillus was found in the blood and in the spleen. Every conceivable precaution was taken in the inoculation and *post-mortem* examination of this animal to guard against septic or other contamination. The bacillus exhibited the characteristic polar staining and the decolorisation with Gram's solution which are stated by experts to be typical of the organism of plague, but no cultivations were possible as our time was limited. These can be done, however, by experts in the well-equipped laboratories at Bombay.

4. Specimens of earth taken from a dug-up floor in an unroofed shed at Malabar Hill, where a patient had been taken ill with plague fourteen days before, were examined on the 17th instant. The floor had been exposed thoroughly to light and air during this period and it contained no bacilli.

5. Our work in Bombay tended to support the conclusions put forward in my report of the 8th of March 1898, that the infection of plague is to be found in the ground, and that it can be destroyed readily and cheaply by burning the floors of infected houses. But the experience of Poona, Kurrachee and many other places proves that the infection of plague either dies a natural death or that it can be destroyed by other methods than burning, and these points ought not to be left in doubt. For example, it ought to be authoritatively decided what are the effects of —

(*a*) Exposing the infection of plague to light and air.
(*b*) Drenching with water.
(*c*) Drenching with disinfectants.

6. I am aware that from a scientific point of view observations connected with the bacillus of plague must necessarily be regarded as incomplete unless they are verified by pure cultivations, for even with the most careful safeguards fallacies will creep in. In examining the ground for the bacillus of plague numerous other bacilli are met with, often in large numbers. The most common of these is the hay bacillus, which is almost invariably found in the mud floors of Indian houses that have been leeped.* On the other hand it is rare to find in the floors either the bacteria of putrefaction or pathogenic organisms. Only once as far as I am aware in examinations of the floors of more than 100 houses in the Nizam's villages and in Bombay did we meet with an organism of the latter kind, and this was the diplococcus of gonorrhea —the gonococcus.

7. The thanks of His Highness the Nizam's Government are due to Dr. Weir, the Health Officer of Bombay, Drs. Hojel, I.M.S., and Bernard, R.N., in medical charge of the European and Native plague hospitals at Modykhana, and to Dr. Haffkine, for their kindness and courtesy and for the assistance they rendered to myself and my assistants during our visits to the hospitals, the infected houses and the laboratories of Bombay.

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* Leeped means plastered over with liquid mud mixed with cowdung.

No. 853.

Forwarded to the Secretary to Government, Madras, Local and Municipal Department, for information and record.

HYDERABAD RESIDENCY, 1*st April* 1898. (Signed) E. LAWRIE, M.B., Surgn.-Lt.-Col., *Plague Commissioner.*

ORDER—No. 329-P., dated 14th April 1898.

Recorded.

(True Extract.)

H. TREMENHEERE,
Ag. Secretary to Government.

To all Collectors.
„ all Presidents of District Boards.
„ all Chairmen of Municipal Councils.
„ the President, Municipal Commission, Madras.
„ the Sanitary Commissioner.
„ the Surgeon-General.

Exd. A Raitt.

Government {1898} of Madras.

LOCAL AND MUNICIPAL.

S.A
Proof submitted for approval
MAS
26/4/98

Recd. } 1898. *Enclosures* 2 Trans
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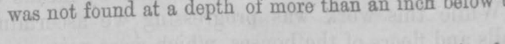
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9. From the date of our arrival at Sirsi—February 25th, 1898—systematic examinations of the dust and scrapings of the floors, walls and roofs of houses in various villages have been made. The floors of all houses in the plague-stricken villages are made of mud. They are for the most part the ground raised, rammed in and *leeped* over. At first only houses numbered and marked "Infected" were examined: we were subsequently led by accident to examine houses which had been regarded as uninfected. In examining the dust of a supposed uninfected house, for the purpose of comparison with that of a house known to be infected, we discovered the plague bacillus in large numbers. A systematic examination of all the houses supposed to be free from infection was therefore instituted in Gunjoti, and no less than 50 per cent. of them contained the plague virus and were undoubtedly infected. At first I was inclined to think that we had possibly made a mistake in regarding the bacillus we found as the true bacillus of plague. But this was wrong. A healthy field rat was inoculated with a scraping from the ground of an *uninfected* house in which the bacillus was found, and the animal died of plague within 36 hours.† The bacillus therefore is undoubtedly the plague bacillus.

10. The following facts were established by the examinations of, and inoculations with, the plague bacillus:—

(1) The plague bacillus was invariably found in the dust and scrapings of the ground of houses known to be infected, *i.e.*, houses in which plague patients had been ill or had died. Infected houses were examined in Sirsi, Gunjoti, Umerghi, Kajuri and Bulsoor.

(2) The plague bacillus was found in the dust and scrapings from the floors of more than 50 per cent. of the houses which had previous been regarded as uninfected.

(3) A healthy rat was inoculated with dust scraped from the ground in a supposed uninfected house (No. 28, uninfected) in which the plague bacillus was found to be present. The rat died within 36 hours, and on *post-mortem* examination it exhibited the usual signs of plague, viz., enlarged glands, congestions and hæmorrhages, and the plague bacillus was found in abundance in the peritoneal cavity, in the glands, and in the blood.

(4) The plague bacillus was found in grain which had heen lying on the ground in an infected house.

(5) The plague bacillus was not found in the dust or scrapings of the roofs and walls of any of the houses examined.

(6) The bacillus was not found at a depth of more than an inch below the surface of the ground.

(7) The plague bacillus was found in dust taken from the floor of a house (No. 28, uninfected) immediately after the ground had been heated by igniting on it a thin layer of cow-dung fuel sprinkled with kerosine oil. A rat inoculated with dust from this floor immediately after the burning remained well until it escaped from its cage on the fourth day.

(8) In milk inoculated with dust containing the plague bacillus a growth and multiplication took place. The day after the inoculation from one to two bacilli to a field could be counted, on the fifth day from 45 to 65. In five days therefore each bacillus had increased to about 50.

(9) The plague bacillus was not found in the dug-up portions of the ground (floors) after they had been burnt in the kiln method.

* This was merely a diagram not intended for publication. This photo is a reproduction of a photo-micrograph of the plague bacillus taken by Yersin in the Pasteur Institute of Paris. It is photographed from Lechmame and Newmann's Hand Atlas of Bacteriology, plate 63.

† The body was burnt.

‡ 1000.

11. The practical value of the examinations of, and inoculations with, the plague bacillus is two-fold. In the first place; they showed that the clinical conclusions in paragraph 5, which are by no means put forward as original (similar conclusions were arrived at, before I saw indigenous plague at all, by Dr. H. Tripp, Lecturer on Anatomy, Hyderabad Medical School, who has been employed on plague operations for the last three months), are in the main correct. The virus of plague is most probably a putrid animal poison which falls to the ground, and does not spread through air, or even through water, unless it is excessively filthy; and it is taken into the human system mainly by inoculation. Many instances could be adduced from Mr. Stevens' experience here of sweepers who remained free from plague until they began to be employed in cleansing operations, and would appear to have become infected through the feet. In the second place, they have enabled us to determine and carry into execution a uniform plan for the destruction of the plague infection. With the help of the microscope, which after all is only a magnifying glass, the infection of plague can be traced and tracked about with as much precision as if it were visible to the naked eye. In case it is doubtful whether a given house is infected or not, an examination of the floors with the microscope settles the question at once, and very little is left to chance. On the other hand, when a house has been disinfected, an examination of the floors will show whether the disinfection has been complete or not, and it is therefore an almost infallible check on plague operations. For instance, the village of Bulsoor was beautifully clean at the time of our inspection, and Mr. Jamshedji had issued orders that the floors of the infected houses were to be dug up and buried. The village officials had dug them up, and in some cases had replaced them with earth and beaten it in. We selected two houses at random and examined the floors, and the plague bacillus was found in both. It is thus clear—and no one is more ready to acknowledge the fact than Mr. Jamshedji—that the floors of all the infected houses in the village will have to be dug up again and burnt.

III.—The employment of fire as a disinfectant.

12. A simple statement of what has been done since the 25th of February last will give the clearest idea of the difficulties which have been encountered in giving effect to the safe use of fire as a disinfectant. These difficulties have gradually disappeared as the localisation of the infection of plague by means of the microscope has become more precise and definite.

13. On the 25th and 26th of February the whole of the infected houses in the village of Sirsi were burned down with the consent of the villagers, who were liberally compensated. The plague bacillus was found in the floors of the houses, and this was taken as a reliable sign that the house was saturated with infection and must be destroyed. On my arrival at Gunjoti and Umerghi I found that all the infected houses in both villages had been unroofed by Mr. Stevens' orders, and the chuppers had been burnt. Arrangements were then made by Mr. Stevens to apply fire to the floors and walls of all the infected houses by means of cow-dung fuel and kerosine oil. While this work was progressing we ascertained from examination of the roofs, walls and floors of the houses, which were going on all the time, that—

(i) the infection of plague is confined to the floors of the houses;

(ii) the kerosine oil method of burning the floors is dangerous; very often the house catches fire;

(iii) some parts of the floors may escape the action of the fire or be passed over through accident or carelessness.

(iv) the kerosine oil method of burning the floors does not always generate an amount of heat which is sufficient to destroy every particle of the infection.

This plan of burning was therefore for the above reasons abandoned, and the kiln method was introduced by Mr. Stevens on the 7th instant. In this method the floors of the house are dug up to a depth of one-and-a-half inches. The dug-up material is carefully removed to a short distance away from the house and made into a kiln, with cow-dung fuel underneath and all round it, the lower layers being

sprinkled with kerosine oil: this is set fire to and allowed to burn itself out. The dug-out part of the floor is thus reduced to ashes, and it is needless to say that no trace whatever of the infection of plague is left. As a precautionary measure the lower parts of the walls of the houses may be scraped, and the scrapings burned with the floors.

14. The only difficulty that remained was to know which floors to burn and which to leave alone. It is the work of some 35 minutes to find and stain the plague bacillus in one infected house, and in a village like Gunjoti there are at least 300 houses, each containing two or more rooms, besides small verandahs and courtyards. To make a microscopic search for the plague bacillus in every room of 300 houses would entail such an amount of physical labour as to be impossible. Accordingly it has been finally decided, as the only practicable alternative to this microscopic search, that the floors of all the houses in the village are to be dealt with as infected and burnt on the kiln plan. In all the (marked) infected houses this will be done by Mr. Stevens' assistants: in all the others it will be done by the owners under their supervision. The burning will be carefully checked, and wherever it is necessary the microscope will be employed in the checking process.

15. Each of the villages in the Gunjoti district which has been evacuated on account of plague is now in charge of a competent medical officer, who will, it is hoped, by maintaining isolation and segregation, and by constantly changing the sites of the numerous small village encampments, succeed before long in stamping out the disease. The destruction of the infection in the villages by digging out and burning the floors in kilns will then be undertaken by Mr. Stevens' staff of assistants, who are highly trained and reliable. The officers in charge of these men are Muhammadan gentlemen whose hearts are in their work, and who thoroughly understand the objects we have in view.

16. It only remains to state in this connection that the burning of the house floors by the kiln method meets with the entire approval of Sir Khurshed Jah's Taluqdar (Mr. Jamshedji), and I may add of all the village officials and of the villagers themselves.

17. However satisfactory it may be to be able to trace out the infection of plague and to destroy it by fire, there is no disguising the fact that the Nizam's Government have a most anxious and trying time to face during the next few months. It is not merely that the value of their plague operations will only be fully tested when the villagers begin to re-occupy their houses, and it is then seen whether recrudescences of plague occur or not, but in the villages round about Gunjoti re-infection from Sholapur will have to be guarded against. The most rigid precautions will have to be maintained in the infected area until plague is stamped out in this district, and also until it has been entirely stamped out in Sholapur and in Bombay.

From Surgeon-Lieutenant-Colonel E. LAWRIE, M.B., Plague Commissioner, Hyderabad, to the Secretary to Government, Hyderabad, dated Hyderabad Residency, 27th March 1898, No. 793 of 1898.

I have the honour to report that I proceeded to Bombay after leaving the infected villages in His Highness the Nizam's Dominions in order to verify, and if possible amplify, the work done in the districts with regard to the localisation of the infection of plague. The floors of the plague hospitals at Modykhana and Arthur Road and of several infected houses were examined, and I made myself acquainted with Dr. Haffkine's method of preparing the prophylactic serum for plague. I also made arrangements with Professor Haffkine for Dr. Mullanah and Mr. Syed Mahomed to study his plan of inoculation with a view to introducing it into use for those who care to have it in the Nizam's plague-infected districts. These gentlemen are now competent to inoculate and to teach others to inoculate with Professor Haffkine's serum.

2. I arrived in Bombay on the 12th of March, and on the 13th and 14th the floors of the European and Native hospitals at Modykhana were examined. These hospitals had been burnt down a fortnight previously: the Native portion had been occupied again for more than a week before the examination, the European portion had not been reoccupied. The bacillus of plague was not found in any part of the floor of the European hospital. In the Native hospital it was discovered in one or two places, principally at one spot where a man had been lying who was in attendance on his sick child. He was attacked with plague on the morning of the 14th instant, and when we examined the ground—a mud floor—close by the child's cot where he had been in the habit of sleeping, it was found to contain the bacillus of plague. The bacillus was also found in the floor at the Arthur Road hospital.

3. On the 15th instant we examined the floors of infected houses in the city of Bombay with Dr. Weir. On the 16th instant Dr. Weir examined several badly infected houses with us and showed us the action of a hose worked by a small engine by means of which the floors, walls and roofs of a house to be disinfected could be rapidly and thoroughly drenched with either water or disinfectants. A rat was inoculated with a solution made from the scrapings from the floor of another badly infected house in which the bacillus of plague was found. The rat was examined after death next day, and the plague bacillus was found in the blood and in the spleen. Every conceivable precaution was taken in the inoculation and *post-mortem* examination of this animal to guard against septic or other contamination. The bacillus exhibited the characteristic polar staining and the decolorisation with Gram's solution which are stated by experts to be typical of the organism of plague, but no cultivations were possible as our time was limited. These can be done, however, by experts in the well-equipped laboratories at Bombay.

4. Specimens of earth taken from a dug-up floor in an unroofed shed at Malabar Hill, where a patient had been taken ill with plague fourteen days before, were examined on the 17th instant. The floor had been exposed thoroughly to light and air during this period and it contained no bacilli.

5. Our work in Bombay tended to support the conclusions put forward in my report of the 8th of March 1898, that the infection of plague is to be found in the ground, and that it can be destroyed readily and cheaply by burning the floors of infected houses. But the experience of Poona, Kurrachee and many other places proves that the infection of plague either dies a natural death or that it can be destroyed by other methods than burning, and these points ought not to be left in doubt. For example, it ought to be authoritatively decided what are the effects of —

(*a*) Exposing the infection of plague to light and air.
(*b*) Drenching with water.
(*c*) Drenching with disinfectants.

6. I am aware that from a scientific point of view observations connected with the bacillus of plague must necessarily be regarded as incomplete unless they are verified by pure cultivations, for even with the most careful safeguards fallacies will creep in. In examining the ground for the bacillus of plague numerous other bacilli are met with, often in large numbers. The most common of these is the hay bacillus, which is almost invariably found in the mud floors of Indian houses that have been leeped.* On the other hand it is rare to find in the floors either the bacteria of putrefaction or pathogenic organisms. Only once as far as I am aware in examinations of the floors of more than 100 houses in the Nizam's villages and in Bombay did we meet with an organism of the latter kind, and this was the diplococcus of gonorrhea —the gonococcus.

7. The thanks of His Highness the Nizam's Government are due to Dr. Weir, the Health Officer of Bombay, Drs. Hojel, I.M.S., and Bernard, R.N., in medical charge of the European and Native plague hospitals at Modykhana, and to Dr. Haffkine, for their kindness and courtesy and for the assistance they rendered to myself and my assistants during our visits to the hospitals, the infected houses and the laboratories of Bombay.

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* Leeped means plastered over with liquid mud mixed with cowdung.

No. 329-P., 14TH APRIL 1898.

No. 853.

Forwarded to the Secretary to Government, Madras, Local and Municipal Department, for information and record.

HYDERABAD RESIDENCY, 1*st April* 1898. (Signed) E. LAWRIE, M.B., Surgn.-Lt.-Col., *Plague Commissioner.*

ORDER—No. 329-P., dated 14th April 1898.

Recorded.

(True Extract.)

for *Ag. Secretary to Government.*

To all Collectors.
" all Presidents of District Boards.
" all Chairmen of Municipal Councils.
" the President, Municipal Commission, Madras.
" the Sanitary Commissioner.
" the Surgeon-General.

Exd A Raitt.

Local & Munl. (1898) Department.

CURRENT No. 4860

50

(Print only St Louis' report of 8.327 March)

From

The Plague Commissioner,
Hyderabad

Order No. 329P. mis. dt 14.4.98

Recd
H.I.
13.4.98.

No. 853

Dated 1st April '98

Received 4th April '98

Registered do

Enclosures 9

Spare copies. –

SUBJECT.

Forwarding for information copies of certain letters and telegrams regarding plague.

To all Collrs ✓
" Presidents of D. Boards ✓
6/5/98 " Chairmen of M.C. ✓
" President, M.C. Madras ✓
6/5/98 Sanitary Comr. ✓3
Surgeon General ✓6

Ltr 4/4/98

Ltr 4/4/98

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

18

No. 791 of 1898.

From

Surgn.-Lieut.-Colonel E. LAWRIE, M.B.,
Plague Commissioner,
Hyderabad,

To

MAHOMED AZIZ MIRZA, Esq.,
Secretary to Government,
Hyderabad.

Dated Gunjoti, *8th March* 1898.

Sir,

I have the honour to report that I have completed my tour in the Gunjoti district, and am proceeding to Naldrug on the 10th instant to inspect the infected villages in the Nizam's territory in the neighbourhood of Sholapur. The following statement will show His Highness's Government what has been undertaken in order to stamp out the infection of plague in this area.

2. I was accompanied on my tour by Mr. J. B. Buchanan, the Chief Engineer to H. H. the Nizam's Government, without whose personal assistance it would have been difficult, if not impossible, to execute works in connection with the expeditious establishment of isolation hospitals and segregation camps. Two lady doctors left Hyderabad with us and proceeded straight to Gunjoti, where they have been employed in rendering medical aid to women of this place and of Umerghi who have suffered from plague and its effects.

3. I left Hyderabad on the 22nd of February 1898, fully impressed with the belief, founded upon the experience of those who were engaged in the Hongkong epidemics of plague, that the infection of this disease is to be found principally in the floors and walls of houses, and that it can be effectually destroyed by fire; and I may remind the Government that in dealing with imported cases of plague during the last few months at Wadi, Shahabad, Gulburga, Murtoor, and in villages in the vicinity of Ahmednugger, this belief was, as far as can be judged, successfully acted upon. The result of my tour has been to prove that it is well founded, and it is now established on a more permanent or scientific basis.

4. I arrived at Homnabad on the 23rd of February 1898, and was met there by Dr. Naidu, whose patrol parties had searched all the villages on and near the road from Hyderabad to Homnabad without encountering any cases of plague. From Homnabad I proceeded to Kalliani, which important centre was found to be free from plague, and from there to Sirsi, where the first cases of the disease were seen, 33 deaths having taken place. From Sirsi I came on to Gunjoti, and from Gunjoti I have visited in company with Mr. Stevens all the

villages now plague-stricken in this area, *viz.*, Umerghi, Terrori, Kajouri, Maraj, Bulsoor, and Nagaral. I may here state that in all the infected villages the orders of the Government of India with regard to evacuation, as well as the most perfect organisation for carrying out the Government rules for disinfection, had been completed before my arrival by Mr. A. H. Stevens—in such a manner that nothing remained to be done but to determine and execute a uniform plan for the destruction of the plague infection.

5. The general conclusions at which I have arrived from my inspection of the infected villages are, first, that the infection is excessively and in the most complex manner widespread ; and secondly, that the area round Gunjoti and Umerghi constitutes by far the most important focus of infection in His Highness's Dominions, seeing that it directly threatens Hyderabad and Gulburga. Consequently Mr. Stevens was well advised to make this area his main point of attack in commencing the plague operations ordered by the Nizam's Government. In this area there are known to have been 550 deaths from plague, in the villages named in the margin, since the epidemic was first reported ; but Mr. Stevens and Mr. Jamshedji, the Nawab Sir Khurshed Jah's Taluqdar, have no doubt that this number is from 250 to 400 short of the actual number of deaths that have taken place, since the records for the first month or two are unreliable. The localisation of the infection in the different villages was complicated by the facts that for many weeks after plague began in the epidemic form the villagers concealed its existence as much as possible, and they do not even now in many cases know which houses are infected and which are not. Moreover they unintentionally helped to spread the infection far and wide in each village by carrying their plague sick about from one house to another on short visits among their friends and relations. Many houses were undoubtedly infected in this way besides those which were numbered and marked "infected" because people had been taken ill or had died in them.

Villages.	Deaths.
Gunjoti	233
Umerghi	172
Terrori	14
Chincholy	1
Bulsoor	42
Sirsi	41
Maraj	16
Nagaral	3
Others	12
Total ...	550

6. During our inspections of the villages the following points claimed special attention :—

(1) The disease itself and its treatment.
(2) The infection and its localisation.
(3) The employment of fire as a disinfectant.

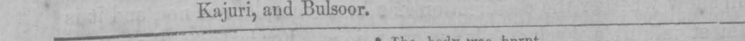
I.—The disease itself and its treatment.

7. The impression created in my mind by the cases I have seen is that plague must be produced by inoculation with some putrid organic (probably animal) poison. The only disease I have seen which resembles it, and the resemblance is not complete, is the blood poisoning caused by what are called "dissection wounds." Clinically plague is not a disease in which infection would be expected to take place through air or water ; and on the other hand it is just the kind of disease in which poison might be looked for in the discharges or exudations from the buboes either on the surface or in the interior of the body. Many of the plague cases which I inspected had superficial suppurating buboes. The discharges from these suppurating buboes directly infect clothes, beds, bedding, and the floors of houses. Many other cases again had no superficial buboes, but these patients had in all probability buboes in the glands in the interior of the thorax or abdomen. From cases of this kind, where the lungs or intestines are implicated, certain excretions, such as the sputum or the intestinal discharges, become contaminated, and infect the clothes, bedding, beds, and the floors of houses. There is very little to add regarding the treatment of plague. I tried several drugs which might reasonably be expected to benefit the disease : nothing, so far as my limited experience goes, did any of the patients any good whatsoever.

II.—The infection and its localisation.

8. The bacillus of plague indicates the presence of the virus or infection of the disease, and practically the term bacillus is synonymous with the terms virus and infection. It is an oval-shaped micro-organism which is found in the glands and in the blood in plague, and it occurs (*a*) singly, (*b*) in pairs, and (*c*) in chains—the bacillus, the diplo-bacillus, and the strepto-bacillus.

(*a*) The bacillus. (*b*) The diplo-bacillus. (*c*) The strepto-bacillus.



It takes stains readily and then becomes coloured like the diagram, the stain used in the diagram being the same as that employed in our examinations, *viz.*, thionin blue. Finally it has been known since the Hongkong epidemic that plague can be produced in rats by inoculation with dust from infected houses.

9. From the date of our arrival at Sirsi—February 25th, 1898—systematic examinations of the dust and scrapings of the floors, walls, and roofs of houses in various villages have been made. The floors of all houses in the plague-stricken villages are made of mud. They are for the most part the ground raised, rammed in and *leeped* over. At first only houses numbered and marked "infected" were examined : we were subsequently led by accident to examine houses which had been regarded as uninfected. In examining the dust of a supposed uninfected house, for the purpose of comparison with that of a house known to be infected, we discovered the plague bacillus in large numbers. A systematic examination of all the houses supposed to be free from infection was therefore instituted in Gunjoti, and no less than 50 per cent. of them contained the plague virus and were undoubtedly infected. At first I was inclined to think that we had possibly made a mistake in regarding the bacillus we found as the true bacillus of plague. But this was wrong. A healthy field rat was inoculated with a scraping from the ground of an *uninfected* house in which the bacillus was found, and the animal died of plague within 36 hours.* The bacillus therefore is undoubtedly the plague bacillus.

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* The body was burnt.

X Since writing the above after my return from Bombay I have had a case of this kind under treatment. Hakim Cowaji was dressing a case of gangrene and inoculated himself with some of the discharge through the scratch in the ring finger of his left hand. He at once developed symptoms almost identical with plague and had a large bubo in the left arm-pit and an abscess between the pectoral muscles

X This was nearly a duplication. This Photo is a photograph of the plaguebacillus in the Institute of Paris. Dr. Yersin and Newmann's Hand

apram not intended for publication reproduction of a Photo-micrograph taken by Yersin in the Pasteur Photographed from Lehmann at Leis of bacteriology plate 63

X-1000

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This plan of burning was therefore for the above reasons abandoned, and the kiln method was introduced by Mr. Stevens on the 7th instant. In this method the floors of the house are dug up to a depth of one-and-a-half inches. The dug up material is carefully removed to a short distance away from the house and made into a kiln, with cow-dung fuel underneath and all round it, the lower layers being sprinkled with kerosine oil: this is set fire to and allowed to burn itself out. The dug out part of the floor is thus reduced to ashes, and it is needless to say that no trace whatever of the infection of plague is left. As a precautionary measure the lower parts of the walls of the houses may be scraped, and the scrapings burned with the floors.

14. The only difficulty that remained was to know which floors to burn and which to leave alone. It is the work of some 35 minutes to find and stain the plague bacillus in one infected house, and in a village like Gunjoti there are at

least 300 houses, each containing two or more rooms, besides small verandahs and courtyards. To make a microscopic search for the plague bacillus in every room of 300 houses would entail such an amount of physical labour as to be impossible. Accordingly it has been finally decided, as the only practicable alternative to this microscopic search, that the floors of all the houses in the village are to be dealt with as infected and burnt on the kiln plan. In all the (marked) infected houses this will be done by Mr. Stevens's assistants: in all the others it will be done by the owners under their supervision. The burning will be carefully checked, and wherever it is necessary the microscope will be employed in the checking process.

15. Each of the villages in the Gunjoti district which has been evacuated on account of plague is now in charge of a competent medical officer, who will, it is hoped, by maintaining isolation and segregation, and by constantly changing the sites of the numerous small village encampments, succeed before long in stamping out the disease. The destruction of the infection in the villages by digging out and burning the floors in kilns will then be undertaken by Mr. Stevens's staff of assistants, who are highly-trained and reliable. The officers in charge of these men are Mahomedan gentlemen whose hearts are in their work, and who thoroughly understand the objects we have in view.

16. It only remains to state in this connection that the burning of the houses floors by the kiln method meets with the entire approval of Sir Khurshed Jah's Taluqdar (Mr. Jamshedji), and I may add of all the village officials and of the villagers themselves.

17. However satisfactory it may be to be able to trace out the infection of plague and to destroy it by fire, there is no disguising the fact that the Nizam's Government have a most anxious and trying time to face during the next few months. It is not merely that the value of their plague operations will only be fully tested when the villagers begin to re-occupy their houses, and it is then seen whether recrudescences of plague occur or not, but in the villages round about Gunjoti re-infection from Sholapur will have to be guarded against. The most rigid precautions will have to be maintained in the infected area until plague is stamped out in this district, and also until it has been entirely stamped out in Sholapur and in Bombay.

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

Plague Commissioner.

THE TIMES OF INDIA PRESS—1236-98

4P 2

Plague—Hyderabad State.

No. 793 of 1898.

From

SURGN.-LIEUT.-COLONEL E. LAWRIE, M. B.,
PLAGUE COMMISSIONER,
Hyderabad.

To

MAHOMED AZIZ MIRZA ESQ. B. A.,
SECRETARY TO GOVERNMENT,
Hyderabad.

Dated Hyderabad Residency, March 27th 1898.

SIR,

I have the honour to report that I proceeded to Bombay after leaving the infected villages in His Highness the Nizam's Dominions in order to verify and if possible amplify the work done in the districts with regard to the localisation of the infection of plague. The floors of the plague hospitals at Modykhana and Arthur Road and of several infected houses were examined, and I made myself acquainted with Dr. Haffkine's method of preparing the prophylactic serum for plague. I also made arrangements with Professor Haffkine for Dr. Mullanah and Mr. Syed Mahomed to study his plan of inoculation with a view to introducing it into use for those who care to have it in the Nizam's plague infected districts. These gentlemen are now competent to inoculate and to teach others to inoculate with Professor Haffkine's serum.

2. I arrived in Bombay on the 12th of March, and on the 13th and 14th the floors of the European and Native hospitals at Modykhana were examined. These hospitals had been burnt down a fortnight previously: the Native portion had been occupied again for more than a week before the examination, the European portion had not been reoccupied. The bacillus of plague was not found in any part of the floor of the European hospital. In the Native hospital it was discovered in one or two places, principally at one spot where a man had been lying who was in attendance on his sick child. He was attacked with plague on the morning of the 14th Instant, and when we examined the ground, a mud floor close by the child's cot where he had been in the habit of sleeping, it was found to contain the bacillus of plague. The bacillus was also found in the floor at the Arthur Road Hospital.

3. On the 15th Instant we examined the floors of infected houses in the City of Bombay with Dr. Weir. On the 16th Instant Dr. Weir examined several badly infected houses with us and showed us the action of a hose worked by a small engine by means of which the floors, walls, and roofs of a house to be disinfected could be rapidly and thoroughly drenched with either water or disinfectants. A rat was inoculated with a solution made from the scrapings from the floor of another badly infected house in which the bacillus of plague was found. The rat was examined after death next day, and the plague bacillus was found in the blood, and in the spleen. Every conceivable precaution was taken in the inoculation and post-mortem examination

Judicial

of this animal to guard against septic or other contamination. The bacillus exhibited the characteristic polar staining, and the decolorisation with Gram's solution which are stated by experts to be typical of the organism of plague, but no cultivations were possible as our time was limited. These can be done however by experts in the well-equipped laboratories at Bombay.

4. Specimens of earth taken from a dug up floor in an unroofed shed at Malabar Hill, where a patient had been taken ill with plague fourteen days before, were examined on the 17th Instant. The floor had been exposed thoroughly to light and air during this period, and it contained no bacilli.

5. Our work in Bombay tended to support the conclusions put forward in my report of the 8th of March 1898, that the infection of plague is to be found in the ground, and that it can be destroyed readily and cheaply by burning the floors of infected houses. But the experience of Poonah, Kurrachee, and many other places proves that the infection of plague either dies a natural death, or that it can be destroyed by other methods than burning, and these points ought not to be left in doubt. For example it ought to be authoritatively decided what are the effects of

(*a*). Exposing the infection of plague to light and air.
(*b*). Drenching with water.
(*c*). Drenching with disinfectants.

6. I am aware that from a scientific point of view observations connected with the bacillus of plague must necessarily be regarded as incomplete unless they are verified by pure cultivations, for even with the most careful safeguards fallacies will creep in. In examining the ground for the bacillus of plague numerous other bacilli are met with, often in large numbers. The most common of these is the hay bacillus, which is almost invariably found in the mud floors of Indian houses that have been leeped.* On the other hand it is rare to find in the floors either the bacteria of putrefaction or pathogenic organisms. Only once as far as I am aware in examinations of the floors of more than 100 houses in the Nizam's villages and in Bombay, did we meet with an organism of the latter kind, and this was the diplococcus of gonorrhea—the gonococcus.

7. The thanks of His Highness the Nizam's Government are due to Dr. Weir, the Health Officer of Bombay; Drs. Hojel I. M. S., and Bernard R.N., in medical charge of the European and Native Plague Hospitals at Modykhana; and to Dr. Haffkine, for their kindness and courtesy and for the assistance they rendered to myself and my assistants during our visits to the hospitals, the infected houses, and the laboratories of Bombay.

I have the honour to be,
Sir,
Your Most Obedient Servant,

EDWARD LAWRIE,
SURG. LT.-COLONEL,
Plague Commissioner.

* Leeped means plastered over with liquid mud mixed with cowdung.

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1 Printed Copy of letter N^o 793 of 27 March 98 to the Home Secretary Bd.

1 Printed Copy of letters N^os 260, 273, 275, 278, 280 & 281 of 18, 21, 22 & 23 March 98 respecting the Plague Cases

1 Printed Copy of telegrams from Plague Officers.

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Dr Ketkar Bhr

Offg Plague Cmsr

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