PLAGUE IN THE NILGIRIS.

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In a healthy place like the Nilgiris plague is so unusual an occurrence as to be worthy of some note. I make no claim for originality in the following article but if I succeed in presenting a fairly interesting and readable account, especially for newcomers to the Corps, I am content. To begin with, a brief description of the Nilgiris to give an idea of the lie of the land, and also for the benefit of those who have never been there, may not be out of place.

DESCRIPTION OF THE NILGIRIS.

The Nilgiris consist of a solid mass of hills formed by the junction of the Eastern and Western Ghats. It is a high, steep-sided plateau of an average height of 6,500 feet with several peaks running up to over 8,000 feet. The plateau is roughly rectangular, bounded on the west and south-west by a bold line of hills called the Kundahs, several of the peaks of which are over 8,000 feet in height. These rise precipitously from the plain of the Wynaad, a richly fertile plain covered for the most part by thick forest, of an average height of 2,500 feet above sea-level and continuous with the vast table-land plain of Mysore. The north, east, and remainder of the south edges of the Nilgiri plateau are not specially prominent, but fall steeply to the plains below.

Thus on the south-east and curving round to the north is the plain of Coimbatore, of an average height of 1,000 feet above sea-level; on the south-west is Malabar, slightly lower than Coimbatore; on the west, the Wynaad; north-west again a portion of Malabar, of equal height to the Wynaad, and the remainder of the north boundary, Mysore.

The foot-hills are clothed in dense steamy jungles which are for the most part highly malarious and rich in game; the slopes themselves are very steep, either bare rocky precipices or, wherever there is a foot-hold, clothed thickly in vegetation which varies progressively from tropical through sub-tropical to temperate vegetation as one rises. There are many tea and coffee plantations scattered over the plateau and on the few not too steep slopes. The western half of the plateau consists of magnificent open rolling downs of fine green turf of a height varying between 7,000 and 7,500 feet and covered with scattered copses termed 'sholas.' The eastern half is 1,500 feet lower and more hilly, covered in scrub and reserve forests as well as with the inevitable plantations. In the
centre, between the two halves, Dodda-betta, the highest peak, rears his rounded green head to a height of 8,650 feet.

A fine road extending from the north-west corner to the south-west divides the Nilgiri plateau obliquely into a northern and a southern half. In the north-west is the Gudalur Ghat road, a fine engineering feat, where the road winds down precipitous slopes to the Wynaad 4,000 below, to proceed eventually in a northerly direction to Mysore State. In the south-east the road winds down the fairly steep slopes of Mettupalaiyam Ghat, through reserve forests and plantations to the plains of Coimbatore.

The air of the Nilgiris is most refreshing, being cool and somewhat rarefied and deliciously scented by the faint tang of eucalyptus, derived from the numerous Australian blue-gum trees which are being constantly planted to solve the fuel problem.

The town of Ootacamund (Ooty for short) lies in the centre of the plateau at the base of Dodda-betta and is more or less surrounded by three other hills all over 8,000 feet. Coonoor is situated at the eastern end of the main road where the Mettupalaiyam Ghat begins, and is about eight miles from Ooty as the crow flies. Wellington Cantonment lies adjacent to Coonoor and nearer Ooty. The main road from Coonoor to Ooty passes through Wellington bazaar. Lorries laden with goods of all kinds are constantly passing along the main road as the small mountain railway (the first, I believe, to be built in the British Empire), which ascends the Mettupalaiyam Ghat, can only carry a limited weight.

**DESCRIPTION OF OUTBREAK IN OOTACAMUND.**

Plague is one of the easiest diseases in the world to diagnose and one of the easiest diseases to miss. In practically every fresh outbreak in a new centre, the first few cases go undiagnosed until the persistent and mysterious death of these cases in spite of treatment suggests plague. Once it is suspected it can very soon be confirmed or disproved. In the present outbreak a case was admitted to the Government Hospital, Ootacamund, on July 30, 1937. It was a child, aged 10, who gave a history of an injury and complained of pain in the right groin. A diagnosis of suppurating gland with septicæmia was made but an incision into the gland failed to reveal the presence of pus. The child died on August 1. The Civil Surgeon was away at the time and on return, in discussing the case with his staff, plague was mentioned but ruled out as improbable. The next case (aged 15) was admitted on August 10, 1937, and died four hours later. Plague was suspected but smear and culture from a gland were negative for *B. pestis*.

The third case was admitted on August 12, 1937, and died the same day. Again a negative result from the culture was returned from the Pasteur Institute, Coonoor. The fourth case was admitted to a venereal ward for
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A venereal bubo. A post-mortem was performed and smears from the bubo were positive for *B. pestis*. The plague, though strongly suspected before, was not openly declared until positive bacteriological findings were established.

A careful house to house inquiry was then commenced and it was found that a number of the inhabitants who had developed symptoms suggestive of plague had migrated to various places in the Nilgiris and in the plains of Coimbatore from plague-infected portions of the Ooty. This is the usual difficulty one has to contend with in India. As soon as people commence to die mysteriously in any particular place, the ignorant and superstitious inhabitants keep quiet about it, as death certificates are unnecessary, and the bodies may be quietly disposed of, and the relatives quietly disappear from the neighbourhood, thereby disseminating the plague far and wide before the authorities suspect its presence.

In this instance human cases began to occur at the end of July, 1937, but the existence of an unusual mortality amongst rats was not brought to the notice of the authorities till August 12, 1937. It was not until August 17, when three wards of the municipality which surround the market were declared plague-infected, that reports of rat-falls were received from owners of private houses. All these rats were promptly examined and many declared plague positive; in these cases the houses were dealt with as described in connection with the outbreak in Wellington.

The present outbreak commenced, as one would expect, amongst the rat population of the market. Early rat-falls were suppressed by stallholders who at first were unwilling to co-operate. The earliest human cases were traced to the houses in the immediate vicinity of the market, i.e. in one or other of the three surrounding wards, and some of the cases were actual workers in the market. Subsequently plague broke out in other wards, infection having travelled from the grain bazaar in one of the infected wards to grain shops in adjoining wards. Altogether six municipal wards were infected of which the three surrounding the market were the most severely affected.

The previous outbreak of plague in Ooty occurred in 1922-23 and lasted only three months. Rats caught and examined at intervals in the "free" period since were not found infected, proving that there was no endemicity of plague in Ootacamund.

The source of the present epidemic was not difficult to ascertain. As has already been pointed out, most of the merchandise of the Nilgiris arrives by road, either from the north-west corner via the Gudalur Ghat from such places as Malabar in the west, Coorg, Kanara, Mysore and places further north, or up the Mettupalaiyam Ghat from the plains further south and east. It follows, therefore, that the plague was imported.

The nearest infected area was Gundlepet in Mysore State. This town
and neighbouring villages have been infected with plague for some time past. Grain (rice) and millet (ragi) are imported from Mysore State into the Nilgiris and presumably infection was brought by a rat or fleas in a bag of these goods.

The subsequent spread of the epidemic proved clearly that infection travelled with bags of grain or millet from grain-store to grain-store. All the early human cases had a definite association with some grain-store or shop.

In Coonoor, positive rats were reported on August 18, 1937. These came from just outside Coonoor market in the place where the principal rice go-downs are situated. Coonoor was declared plague infected. The first human case occurred on September 23, 1937, i.e. thirty-six days later. Exactly one month later, September 18, the first plague-positive rat was discovered in Wellington Market, a distance of only 1 to 1½ miles from Coonoor market, and the first human case in Wellington, occurred, curious coincidence, thirty-six days later on October 23.

Measures adopted to combat the plague were:

(i) Notification.—By the Cantonments Act 1924, Section 150, under penalty of a fine any outbreak of infectious disease must be notified immediately. As already mentioned the ignorant natives are frequently too scared to notify the authorities and prefer to slink off to some other neighbourhood.

(ii) Declaration of Plague-infected Areas.—This was publicly announced by the Collector of the District on the advice of the District Medical Officer. Movement of natives and merchandise to and from the place was controlled by the Police. Any native who entered the area from some outside non-infected area was not permitted to leave without production of an inoculation certificate.

In order to control the movement of grain (Ootacamund Municipality):

(1) The market was closed and the grains were not allowed to be taken out until all the market stalls with their contents had been fumigated. All existing grain stalls in the town were listed and their stocks removed and fumigated in the improvised motor-lorry disinfector. Wherever a rat-fall had occurred the stalls, etc., were fumigated with their contents undisturbed.

(2) Export of grains and potatoes from Ootacamund, unless previously disinfested, was prohibited.

Importation of goods from neighbouring districts was effectively controlled by locating a fumigation station at Gudalur and only fumigated products were allowed to enter the Nilgiris. A similar station was established by the Collector of Coimbatore at Mettupalayam.

(iii) Closure of the Infected Buildings till Fumigated.—The inhabitants were removed and housed in temporary shelters whilst the whole building, or in some cases the whole block, was made air-tight by pasting sheets of
newspapers over all the holes and cracks and fumigated with "Calcid" briquettes. This will be described in detail later.

(iv) Anti-rat Campaign (in Wellington Cantonment).—Temporary gangs of coolies were established under the supervision of the Sanitary Inspectors. These took it in turns to fumigate with cyanogas dust all the rat-burrows in the district. The rat runs were dug out and the number caught recorded daily. Any rat found dead other than from cyanogas poisoning, either by the gangs or private individuals, was sent to the Pasteur Institute, Coonoor. Some of these rats were found positive to plague. Immediately the building, shop or store associated with which the rat was found, was cleared of its inhabitants and fumigated. Subsequently, the grain was spread in the sun.

(v) Isolation of Cases.—In Wellington Cantonment a temporary shed constructed of bamboo matting in the Cantonment Hospital compound was used for nursing plague cases. The accommodation was sufficient for the few cases that occurred, but another site was ear-marked by the Cantonment authorities for the erection of further temporary sheds should a severe outbreak occur. In Ootacamund and Coonoor separate temporary isolation buildings were devoted to plague cases.

(vi) Segregation of Contacts.—Temporary camps with their own sanitary conveniences were erected. In Wellington a camp consisted of a couple of 160-pound tents borrowed from the Quartermaster of the unit stationed in Wellington. The camp was isolated as much as possible from the nearest dwellings.

(vii) Inoculation.—Anti-plague vaccine was obtained from the Haffkine Institute, Bombay. 3 cubic centimetres were generally injected in a single dose. 1 cubic centimetre with the remaining 2 cubic centimetres at a week's interval would probably have been better but this would have been impossible to arrange with the natives. If they received only 1 cubic centimetre they would probably never be seen again for their second dose. The military population was generally inoculated with 3 cubic centimetres in one dose, for the sake of convenience.

(viii) Orders and Propaganda.—Anti-plague regulations framed under Section 151 (1) of the Cantonments Act, 1924, were brought into force. Orders were issued by the Executive Officer under the advice of the Health Officer, Wellington Cantonment. Propaganda consisted of notices, posters, etc., prominently displayed advising people to be inoculated and pointing out the necessity of destroying all rats. A silent film was shown publicly in the market places illustrating the dangers of neglecting the precautions recommended. It was a pretty little story in which the villain and his accomplices die of plague and the hero and heroine come through unscathed because they were careful enough to be inoculated. The cleansing and fumigation of the dirty little go-down hovels wherein several families and
the inevitable cousins and connexions were housed, was clearly shown, and
the infallibility of early inoculation driven home. This, like propaganda
skilfully employed in other directions, was a most powerful weapon.
Even so, house to house inoculation had to be resorted to in the end,
particularly to get at women in purdah. In these cases the inoculator had
to be content with merely an arm thrust through the curtains.

**Detailed Description of Measures adopted in Wellington Cantonment.**

(a) In the middle of August, soon after hearing of the prevalence of
plague in Ootacamund, four rat catchers were employed and six dozen rat
traps were purchased in addition to two dozen traps already available; 1,150 rats were bagged up to October 31, 1937. (b) Cyanogas blower and
80 pounds of cyanogas dust were purchased. Rat burrows are treated with
cyanogas. (c) Temporary anti-plague regulations under Section 151 (1) of
the Cantonments Act, 1924, were framed and enforced. (d) Anti-plague
inoculations were carried out. (e) Propaganda on anti-plague measures by
means of magic lantern demonstrations were made. (f) Owners of in-
sanitary houses and houses containing rat burrows were served with notices
to make their houses rat proof. (g) Any dead rat found within the Canton-
ment limit was immediately sent to the Pasteur Institute, Coonoor, for
examination. (h) All grain shops and stalls in the market were disinfected
once a week by exposing the articles in the sun and stalls washed with
cresol.

The first positive rat-fall occurred on September 18, 1937, within
the Wellington Market. The market was closed for two days and
thorough fumigation of the godowns was carried out by means of calcid
briquettes. One baby duster and twelve tins of calcid briquettes were
purchased. Compulsory mass anti-plague inoculations were carried out. Rat catching and treating rat burrows with cyanogas were carried out more
vigorously. More vigilance was exercised in allowing articles such as dry
grains, cotton seeds, jaggery, potatoes, pulses and pressed fodder from out-
side areas to be brought into Cantonment. The market was ordered to be
closed for half a day once a week to allow thorough disinfection of the
stalls. When subsequent falls were reported the whole block of shops or
houses wherein the rat was found or nearest the place where the rat was
picked up was evacuated and fumigated.

Contact cases were isolated in tents and supplied with free rations
whilst their quarters were being fumigated.

Anti-plague regulations stated that (1) All persons from plague-infected
areas will be prohibited from entering Wellington Cantonment for residence
until further notice.

(2) Persons from plague-infected areas will not be allowed within
Cantonment limits unless in possession of certificates of recent anti-plague inoculation.

(3) Dry grains, cotton seeds, jaggery, potatoes, pulses, pressed fodder will not be brought into the Cantonment from plague-infected areas unless the vendors are in possession of certificates of disinfection from the recognized Health Authorities of these Districts.

(4) Anti-plague inoculation will be made compulsory in Wellington Cantonment in case of an outbreak of plague. Voluntary anti-plague inoculation will be carried out daily at the Cantonment Hospital till further notice.

(5) The Plague Officer will be authorised to order evacuation of infected houses, or houses in their neighbourhood, or generally of any infected locality.

(6) The Plague Officer will be authorized to order the owner or occupier of a building, booth or tent used for public entertainment to close the same for such period as he may fix.

(7) Rat catching will be carried out daily by the temporary staff employed till further notice.

(8) All rat burrows in the vicinity of the Cantonment Market will be treated with cyanogas and the market and all stores disinfected once weekly.

(9) Inhabitants are urged to report any case of fever or glandular swellings or pneumonia to the Cantonment Hospital without delay.

(10) Any rat-fall will be brought to the Cantonment Hospital without delay for examination: it should be placed in a tin and soaked in kerosene.

**Cyanogas and Calcid Briquettes.**

The basis in these substances is calcium cyanide Ca(CN)₂; in the first as a dust and in the second in the form of compressed briquettes of a specific size. The effective ingredient is the cyanogen radicle released in the form of hydrogen cyanide (HCN). On the basis of atomic weights of 40.1 for Ca and 52.0 for (CN)₂, pure calcium cyanide would contain 56.5 per cent of the CN radicle. "Calcid" is chemically a very pure product, about 88.5 per cent Ca(CN)₂, i.e. 50 per cent by weight of CN. This product give off its HCN almost immediately in the presence of moisture thus:

\[
\text{Ca}(\text{CN})_2 + 2\text{H}_2\text{O} = \text{Ca}({\text{OH}})_2 + 2\text{HCN}.
\]

The lime is rapidly changed into calcium carbonate by the presence of CO₂ in the air and the final residue is an innocuous one, harmless to both human beings and plant life.

Each "calcid" briquette weighs 20 grams, containing 10 grams of available cyanogen. The machine is known as the "Baby Duster," a handy portable machine which can be worn fixed to a shoulder strap. It
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consists of a metal case enclosing a grinder and fan which can be turned quite easily by a handle, and is so geared that a short turn of a handle causes quite a rapid revolution of the grinder and fan. A rectangular shaft fitting exactly a short column of "calcid" briquettes leads down to the grinder. A plunger fits in the shaft over the briquettes and keeps them pressed against the grinder by its own weight. When the handle is turned the briquette in contact with the grinder becomes powdered. The fan sucks the powder-charged air away from the grinder and blows it through a seven-foot hose-pipe attached to the machine. Quite a short turn of the handle is followed by a puff of smoke at the other end of the hose-pipe.

Cyanogas powder is worked by a pumping machine similar to a motor-tyre pump only larger. The powder is placed in a receptacle which fits on the end of the shaft of the pump and a hosepipe attached to the side of the pump carries the smoke away. The danger of poisoning when these machines are properly used is remote. No casualties occurred among the gangs working the machines.

The baby duster was used in the fumigation of buildings, and the cyanogas blower for rat-burrows. The great advantage of both of these methods is that rats are killed in their burrows and the sight of rats trapped and killed, offensive to some religious sections of the East, does not occur. Also the possibility of objectionable smells arising from the decomposed carcases is precluded.

Much of the surrounding land is undermined by numerous intersecting burrows. In using the blower a fresh looking rat-burrow was selected and the end of the hose-pipe placed therein, moist earth being packed around to prevent escape of smoke. After a few pumps smoke was seen emerging from several openings, some many yards away. These were blocked up with moist earth and pumping continued till no more smoke appeared. Many of the embankments on the golf course were largely undermined and were a considerable expense to maintain. In view of the excellent results obtained by the Cantonment rat-catchers, the club wisely decided to purchase a cyanogas blower of their own and now not a single rat-burrow is to be seen on the golf course!

As soon as a building was declared plague-infected as the result of finding a positive rat-fall in its vicinity, or by the development of plague in one of its inhabitants, it was fumigated by the baby duster. The inhabitants were temporarily removed to the plague camp, being provided with free rations. All cracks, etc., were blocked by pasting paper over them and the hose-pipe attached to the machine placed inside the building. The number of briquettes required was calculated from the total volume to be fumigated, in accordance with instructions issued by the firm.

In stores and shops the bags of grain, etc., were left in situ and after fumigation thoroughly aerated by spreading in the sun before being sold to
the public. Specimens of foodstuffs containing moisture, which were thought likely to be spoiled by the fumigations, were sent to the Public Analyst, Government of Madras, by the Municipal Health Officer of Ootacamund; it was shown that they were free from hydrocyanic acid and fit for human consumption. It was also found that bags of rice, other grains and millets were capable of hiding fleas; these were discovered generally in the seams and just inside the canvas bags to depths of about an inch in the contents.

**DESCRIPTION OF CASES OBSERVED IN THE CANTONMENT HOSPITAL, WELLINGTON.**

The cases were few, presumably as a result of the intensive anti-rat campaign and the energetic anti-plague inoculations carried out at the Cantonment Hospital. Seven cases were admitted of which two died. The following are brief notes of the cases:

**Case 1.**—Female, Mohammedan, aged about 22. Inoculated on September 28, 1937. Admitted on October 23, on account of high fever with pain and swelling in the right groin.

Patient toxic, with dry, furred tongue, sordes on the lips and teeth but no suffusion of conjunctiva observed.

Temperature 103.2° F. Pulse 132, feeble volume. Respiration 30, shallow.

Liver and spleen not palpable. Bowels constipated.

In the right groin, the femoral glands were enlarged and extremely tender. Gland puncture revealed the presence of *B. pestis*; the culture was examined at the Pasteur Institute, Coonoor.

**Treatment.**—Prontosil, intramuscular 5 cubic centimetres, was given twice daily for three days. This was followed up by neutral iodine 2 cubic centimetres intravenously every second day. A stimulant mixture was given throughout. Particular attention was paid to the nursing, in respect of regular feeding, sponging, etc. “Glucose D” and brandy were given *ad lib.* Locally, unguentum iodi (in the form of “Iodex”) was applied, and as soon as fluctuation was noticed the bubo was aspirated.

**Course.**—The temperature was continuously about 103-104° F. for the first two days. It then became remittent and on the fifth morning touched normal. After that the patient improved remarkably, but a slight discharge persisted from the needle-track of the gland puncture. She was discharged cured after a stay of thirty days in hospital.

**Case 2.**—Female, Mohammedan, aged 12. Uninoculated case. Admitted on October 26, 1937, on account of high fever with pain and swelling in the right axilla.

Patient toxic with white furred tongue and suffusion of the conjunctiva. Slightly delirious.
Temperature 104° F. Pulse 136. Respiration 32. Liver and spleen were not palpable.
Examination of gland juice from bubo in right axilla showed presence of *B. pestis*, both in direct smear and culturally.

*Treatment.*—Prontosil, I.M. 5 cubic centimetres, once daily for five days. A stimulant mixture as above was given throughout but no neutral iodine. Nursing as before.

*Course.*—High fever and delirium lasted only forty-eight hours. Thereafter the temperature fell to normal by lysis during the subsequent five days. The bubo was aspirated twice. It healed in a short time, but a hard nodule was left behind which, in spite of the regular use of iodex, persisted till her discharge on November 21.

Case 3.—Male, Hindu, aged about 18. Uninoculated case. Admitted on October 30, 1937. There was fever with pain and swelling in the right axilla. Patient very prostrated. Tongue dry and furred: sordes on lips and teeth. Temperature 102° F. Pulse not perceptible. Respiration 36, very shallow. The bubo in the right axilla was ill-defined and mainly round the anterior fold of the axilla and over the pectoral region. The arm was paralysed. Examination of gland juice revealed *B. pestis* on direct smear and culturally.

*Treatment.*—Prontosil was not given in this case. Hypodermic injections of strychnine and digitalis were given every four hours on the first day. A course of six injections of neutral iodine was given on alternate days. Nursing as before.

*Course.*—The patient improved remarkably. On the morning following admission, his temperature was normal but became intermittent; it rose to 100° to 101° F. every evening for the next ten days. The bubo became more circumscribed and was aspirated twice. A serous discharge persisted from the puncture of the wound for a very long time which necessitated keeping the patient in hospital for fifty-seven days until it had quite healed.

Case 4.—Male, Mohammedan, aged 3½. Uninoculated case. Admitted on November 7, 1937, with pain and swelling in the left groin and fever. Patient fairly comfortable and did not look particularly ill.

Temperature 101° F. Pulse 126. Respiration 28. Examination of gland juice showed *B. pestis* both in direct smear and culturally. The direct smear was kept as a record by the Pasteur Institute, Coonoor, as it showed one of the heaviest infections with *B. pestis* seen in a smear from a human case, and was very similar to the picture obtained in a spleen-smear from a rat dead of plague.

*Treatment.*—No prontosil and no neutral iodine was given (injections were opposed by the parents). General measures, stimulant mixture as before and good nursing were relied upon and the bubo treated locally with iodex. It was aspirated as before, when fluctuation occurred.
Course.—The child made an uneventful recovery and was discharged after twenty-two days in hospital.

Case 5.—Female, Hindu, aged about 54. Uninoculated case. Admitted on November 29, 1937, in a moribund state.

Patient’s eyes were bloodshot and she had a haggard appearance. She was violently delirious and nothing could be retained on account of severe vomiting. The right femoral glands were diffusely enlarged. Temperature 104° F. Pulse imperceptible. Respiration 36. She died three hours after admission. Gland puncture revealed presence of B. pestis.

She had been ill for at least three days in the bazaar before the illness was reported.

Case 6.—Female, Hindu, aged about 40. Uninoculated case. Admitted on December 5, 1937, with high fever and pain and swelling in the left groin.

The patient was fairly comfortable, and not particularly toxic in spite of continuous temperature of 103° to 104° F. which persisted for nearly a week. There was no delirium or blurring of the mental condition.

Treatment consisted of prontosil, I.M. 5 cubic centimetres, twice daily for three days and neutral iodine intravenous, thereafter.

Course.—Uneventful recovery: discharged cured on January 3, 1938.

This woman was the wife of a grain merchant.

Case 7.—Male, Hindu, aged 21. An immediate contact of Case 6. He, with several others, was isolated in the plague camp and was inoculated at the same time with the others.

On December 6, 1937, he was isolated; on December 8 he had bloodshot eyes and a characteristic drunken manner which quickly passed on to delirium. On December 9 slight swelling of the right cervical glands was observed and was evidently tender. On December 11 the patient died. Gland puncture showed presence of B. pestis.

This was the only typical textbook case of the series. He was evidently inoculated in the latent period and consequently developed the most severe toxæmia.

In these cases the stimulant mixture used was as follows:—

R Tinctura digitalis 3
Spirit. ammon. aromaticus 3
Tinctura nucis vom. 3
Aqua chloroformi 3
Sig.: 3 j t.d.s.

The neutral iodine was as follows:—

R Iodine 3
Potass. iodi 3
Aqua destillata 3
Sig.: 3 j

Made up aseptically and placed in sterile, glass-stoppered bottle.

Dosage: 2 c.c. intravenously on alternate days.
In Wellington, the first plague case that occurred was later discovered to be the wife of an Indian employee in the cycle-shop in barracks. True, she was separated from her husband, but no chances were being taken. The cycle-shop was cleared of its goods and carefully washed down with "Pesterine." This consisted of: Kerosene 20 parts, soft soap 1 part, water 5 parts.

In view of this occurrence, it was decided to inoculate all the men and married families, a measure which was commenced on November 2, 1937. A letter was drafted to the S.S.O. for publication in Station Orders.

This was as follows:

"Personal Prophylaxis. So far as bubonic plague is concerned this consists in warding off the attacks of fleas and bed bugs.

"Pesterine" is a good pulicide. It can be sprinkled over floors, bedsteads and walls. Flit or Shelltox sprayed over wooden floors and carpets in quarters, kills fleas very quickly.

"Plague is conveyed from rat to man by the rat flea and bed bug. Animals other than rats may serve as reservoirs of infection—domestic animals (in times of epidemic) may suffer.

"Certain forms of merchandise, especially grain and raw cotton, carry rats and fleas and should be avoided.

"When rats become ill or die, the fleas leave them and attack man. Certain rat fleas may remain infective for at least six weeks.

"There is an ambulatory form of plague in which the fever and prostration are slight. There may be some swelling and tenderness of the lymphatic glands and there is usually at the site of the flea bite a vesicle or pustule, this should be looked for.

"All three forms of plague present certain symptoms in common, e.g. sudden onset, sharp fever, dizziness, great prostration, a drunken gait, appearance and speech.

"The usual quarantine period is ten days. Exposure of bedding and clothes, mats, etc., to the sun (at 120° F.) for one hour is a valuable safeguard.

"It is of great importance to limit the food available for rats and to protect food supplies from their depredations.

"Rat destruction by the use of traps baited with tomatoes and scraps of fish should be carried out whenever practicable.

"All captured rats should be incinerated, but all ranks should be warned against handling dying or dead rats with their hands. Where rat-falls occur, the rat should be lifted with tongs or other appropriate implements and placed in a tin containing a little kerosene oil before despatching to the British Military Hospital, Wellington. Gloves should be worn before handling the rat."
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A lecture on plague was given to troops by the medical officer in the Garrison Cinema and was followed by the film already described.

As a result of these measures, not a single case of plague occurred among the military population, and the disease rapidly faded out of the Cantonment which was declared free from plague by the Collector of the Nilgiris on February 5, 1938.

Plague has by this time practically disappeared from the Nilgiris but a few rat-falls and an occasional human case are still occurring in some of the remoter villages to which it has spread.

Brief Discussion of Plague.

Except towards the end of the nineteenth century, plague as an epidemic disease was merely of historical interest. Then in 1896 it appeared in Bombay after an absence of 200 years. At that time it was raging in South China and as there was constant trade intercourse between Hong-Kong and Bombay it is believed that infection travelled by this route. True, plague was known to be endemic in remoter parts of India, but such a modern town as Bombay was considered invulnerable to its evil influence. It was a rude shock when plague not only ravaged Bombay but during the succeeding years spread to all parts of the Presidency and to other provinces in India. Much alarm was caused at the time, for it is evident, on studying the history of plague, that it has undergone a series of retrocessions and also recrudescences to violent devastating pandemics. These pandemics are characterized by diffuseness of spread or exceptional virulence or both, and have been self-limiting.

As already mentioned plague had been absent from Bombay for two hundred years; since the seventeenth century when it raged in Surat and Bombay for about six years, the intensity varying with the seasons. Now, with the outbreak at the end of the nineteenth century it was feared as the epidemic progressed, in spite of the early efforts of the authorities fighting to combat it, that the world was due for another pandemic. Plague has always spread by trade communications and, as these had extended and speeded up rapidly throughout the world, there was nothing to prevent an alarming pandemic throughout the civilized world. The best brains of the period worked tirelessly in Bombay, and the connexion between B. pestis, rats and fleas was elucidated.

Plague is essentially a disease of overcrowding, filth and foul air. In conditions of bad sanitation, human parasites, rats and their parasites, thrive and consequently the way is paved for plague. It cannot be too strongly emphasized that in attempting to eradicate the disease the primary object is to treat the soil in such a way that the seed of plague has no chance of growing and spreading. Fresh air and sunshine are powerful deterrents to plague. Plague-infected rats have frequently been
found dead in well-ventilated, clean houses without the inhabitants contracting the disease. Europeans in India are relatively immune for this reason. The reasonably satisfactory degree of sanitation obtained in a present-day controlled cantonment, coupled with a vigorous anti-rat campaign and mass inoculation, undoubtedly were the great deciding factors in the rapid control of the present outbreak.

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