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Contributors

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REPORT ON PLAGUE

IN THE

GOLD COAST

IN

1908.

BY

W. J. SIMPSON, M.D., C.M.G., &c.

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LONDON :

J. & A. CHURCHILL,

7, GREAT MARLBOROUGH STREET.

February, 1909.

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W. J. KIRBY JR. ENGINEER

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REPORT ON PLAGUE

IN THE

GOLD COAST

IN

1908.

TO THE RIGHT HONOURABLE

THE EARL OF CREWE,

HIS MAJESTY'S SECRETARY OF STATE FOR THE COLONIES.

MY LORD,

I have the honour to submit that part of my report on my visit to West Africa which relates to the outbreak of Plague in the Gold Coast Colony, the part relating to sanitary matters in various West African Colonies having already formed the subject of a separate report.

PLAGUE ON THE GOLD COAST FROM FIRST WEEK OF JANUARY TO THE SECOND WEEK OF MAY, 1908.

2. At a meeting of the Legislative Council held at Accra, on the 25th May, 1908, I made a statement on the outbreak of the plague in the Gold Coast Colony. As this statement describes the chief facts relating to the epidemic up to that time I propose to reproduce it here.

“ In compliance with your Excellency's request I am here to-day to submit to the Honourable Members of the Legislative Council a statement on the recent outbreak of plague in the Gold Coast Colony. I am happy to be able to report that the epidemic is a thing of the past, and that there have been no cases of plague within the Municipal area of Accra since the 8th of April, and no case or death in the Colony since April 10th.

“ The Port of Accra and the Gold Coast Colony were declared free of
 “ plague by your Excellency on May 1st ; this declaration might have been made
 “ sooner but I was anxious that every investigation that was possible should
 “ be made, in order that the declaration should carry with it certainty as to
 “ the position.

“ The disease was first recognised as plague in the first week of January,
 “ but there can be little doubt that deaths had occurred from plague at an earlier
 “ period. The registration of deaths in Accra is in a very unsatisfactory state in
 “ several ways and one of them is that it does not give the necessary information
 “ which would at once enable the Government to become cognisant of the
 “ existence of any infectious disease or the threatening of an epidemic ; at present
 “ it is useless as a record of the cause of death. This defect in the registration,
 “ I understand, will be remedied, and it is very important that it should be,
 “ because while the defect continues there is always great risk of an epidemic
 “ disease acquiring, without the knowledge of the Government, such a foothold
 “ as to render it extremely difficult to be grappled with afterwards even by
 “ application of the most rigorous measures.

“ Once it is known there is an outbreak of an infectious disease the
 “ powers acquired under the new Ordinance for the prevention of the spread of
 “ infectious and contagious diseases places the Government in a much better
 “ position than ever it was before for dealing effectively with the outbreak.

“ I have not been able to trace the origin of the outbreak. Many theories
 “ accounting for the importation of the disease have been put forward, but none
 “ of them on investigation seem to be based on any reliable data, and therefore I
 “ will not trouble you with them. Perhaps I should mention, for it is not
 “ generally known that this is not the first outbreak of plague on the West
 “ Coast of Africa. In 1899, there was a severe epidemic in Grand Bassam in
 “ French Territory.

“ There is evidence to show that the infection of plague was present
 “ in Accra at least a month or two before it assumed epidemic proportions.
 “ This is not an unusual circumstance. Plague, except in the pneumonic form,
 “ seldom breaks out suddenly, causing many deaths within a short time. On
 “ the contrary, the spread of the disease is generally slow and insidious at first.
 “ The infection also sometimes exists among the rats for considerable periods
 “ before the inhabitants are attacked in any noticeable numbers. This appears
 “ to have been the case at Accra. From what can be learnt by inquiry rats
 “ were dying as far back as August and September of 1907. They may have
 “ been dying earlier than that, but not in such numbers as to attract attention.
 “ In the same months there was an unusual mortality among pigs and fowls,
 “ several owners lost 50 and more pigs, and some lost their whole stock. In
 “ the month of November many rats died and it was at this time that several
 “ cases of swellings set down as guinea worm occurred in the groin. This is
 “ a very unusual situation for guinea worm and as several of the cases proved
 “ fatal they would rather indicate plague of the bubonic type. There also

“ occurred in this month of November in James Town 6 deaths in one family, the members of which dwelt in several huts but within the same compound. Later other families were attacked, and in December quite a number of people died of the new disease which was characterised by fever, swelling in the groin or arm pit, and rapid death. Some appeared to be quite well on one day or a little squeamish but insufficiently sick to keep them indoors, the next day they were dead. The suddenness of attack and death was a marked feature as it nearly always is in plague, and gave rise in some instances in the minds of the natives to a suspicion of poisoning. The unusual mortality came to the knowledge of the Medical Officers of the Government towards the end of December, and no small credit is due to them in recognising a disease with which none of them were familiar. It demands much skill to diagnose and a good deal of courage to officially declare the existence of plague in a town and in a country where the disease was unknown before. The consequences of such a pronouncement are always serious, trade and the ordinary avocations of life are interfered with and disturbed and the inconvenience and the losses entailed are always great. Still, when the Medical Officers were satisfied that the disease was really plague, Dr. Garland, the Deputy Principal Medical Officer, had no hesitation in announcing it, and the Government immediately took steps to combat the epidemic and prevent its spread. That these measures have been attended with success the shortness of the duration of the epidemic and the comparatively small number of cases and deaths that have occurred sufficiently testify.

“ The total number of cases recorded in the Colony since January 5th is 302, of which 258 proved fatal. Of these fatal cases 127 occurred in Accra, 131 in other parts of the Colony. Of the 131 deaths outside Accra, 25 were in outlying villages. Thus there were 6 deaths at Kwabenyang and Mayera, 8 at Temma, 8 at Gbawe, 1 at Oblogo, 1 at Ablekuma Market and 1 at Dodowa.

“ The remaining 106 deaths were in the Central Provinces, 64 of which were at Niankano, 19 at Brewa, 12 at Anamabu, 8 at Edentumera and Aiduya, 2 at Cape Coast, and one at Winneba.

“ Most of the 168 cases in Accra were of the bubonic type. Of the 168 cases 87, or over 51 per cent., were reported after death and 81, or slightly over 48 per cent., were admitted to hospital. Of these 81 cases treated in the hospital 41, or 50·6 per cent., recovered. This is an excellent percentage of recoveries for plague. The usual percentage of recoveries in bubonic plague, except among Europeans, is seldom over 25 and sometimes even less than that percentage. Outside Accra, the majority of the 134 cases were of the pneumonic type, which is the most fatal form of the disease. Very few were treated in hospital, and of these only 3 recovered, one of which was of the pneumonic type and he had been previously inoculated, and the other two were bubonic in their character.

“ The pneumonic variety of plague is the most infectious as well as the most fatal, and it was to this variety that the spread of plague outside Accra was mainly due.

“ The disease in Accra was intimately associated with an epizootic of plague among rats. I have already said that many had been noticed to be dying. On examination later some of these were found to have died of plague. A regular examination was instituted of rats brought from different localities in Accra, and Dr. Graham, who was in charge of the Laboratory and carried on this very valuable work in connection with the plague, was not infrequently able to point out localities infected with plague that were later attacked with human plague before preventive measures could be adopted in them.

“ In other instances the measures taken were sufficient not only to stamp out the rat infection in the locality but prevent human infection.

“ This epizootic I am glad to be able to state was confined to Accra. In none other of the places attacked were the rats infected, which is very important, because it gives good cause for believing that the disease is permanently stamped out in those places, and that it is to Accra chiefly that attention has to be directed to prevent any recrudescence of the disease.

“ I think Government may be congratulated on this satisfactory state of things, for at one time I confess affairs looked anything but promising.

“ The history of the conveyance of plague from Accra to some of the more important localities in the Central Province emphasises the importance of promptly circumscribing by suitable measures the area where plague occurs, and preventing sick persons escaping and travelling to other villages. I consider that the land cordon with its system of passports to the inoculated was a very effective means of checking the spread of the disease to other places without at the same time unduly interfering with trade interests. After its establishment there was no instance of a sick person infecting villages beyond the cordon. The infection of the Central Province occurred before its establishment. For instance, the infection at Nianyano was imported towards the end of January into that village by a sick person from Accra who had travelled from James Town with two persons who were returning to their homes at Anamabu. They only remained a few hours at Nianyano where they were hospitably entertained in the house of one of the villagers and the sick man's wants attended to. Shortly after leaving Nianyano the sick man died. He had been suffering from fever and cough and spitting of blood. Five days after the sick man's visit the owner of the hut in which the sick man had been accommodated was attacked and died, fever, cough and spitting of blood being the most prominent symptoms of his illness. A few days after the Nianyano villager's funeral, some of those who attended his funeral were attacked with the same symptoms and died. After this the infection spread in the village with the result that 64 persons died of the disease. Owing to the rapidity and fatality of the disease and the comparative remoteness of the village, the Government did not hear of this terrible outbreak until nearly 60 of the villagers had died. When once heard of vigorous measures were taken, the village was evacuated, the inhabitants were encamped out on

“ the plains at least a mile away. The whole of them were inoculated with Haff-
 “ kine’s Prophylactic, and as there was no satisfactory way of disinfecting the huts
 “ other than by fire they were burnt. The effect of the measures was soon
 “ evident, less than half a dozen cases occurred and the outbreak was at an end.
 “ To Dr. Eldred, Dr. Fish of the Basel Mission, and to Mr. Grimshaw, the
 “ Acting Provincial Commissioner, is due great credit for their services in con-
 “ nection with this epidemic, and Dr. Fish deserves special commendation not
 “ only for the part he took in stamping out the epidemic, but for the service
 “ which he was able to render by his knowledge of the language in persuading the
 “ acting chief, for the old one had died from plague, to prevent his people from
 “ fleeing to other villages at the time they were turned out of their own. I can
 “ testify that the people of this village acted nobly under a great calamity.

“ Nianyano is built on a small hill and most of the houses are crowded
 “ together, the thatchings of the roofs encroaching very much on the central
 “ courtyard, leaving only a small opening to the sky. The result is that the huts
 “ are dark and badly ventilated and the rooms are devoid of fresh air. The
 “ outbreak was particularly violent in the worst houses, and at the time of its
 “ suppression had not invaded the few in the village built on more sanitary
 “ lines. The Director of Public Works has promised to have Nianyano surveyed,
 “ and I would recommend that before it is permitted to be rebuilt that good
 “ streets should be constructed, and that attention should be paid to securing
 “ more open space in the courtyards and between the houses and better lighting
 “ and ventilation of the rooms. The inhabitants are comfortable in their
 “ temporary shelters in the plain and I understand they do not intend to re-
 “ occupy Nianyano until after the rains. It would be a thousand pities if the
 “ opportunity were not taken of remodelling the village.

“ The two companions of the man who died after leaving Nianyano pro-
 “ ceeded on their journey leaving their comrade behind and arriving at
 “ Anamabu shortly afterwards, took ill and died of pneumonic plague mixed
 “ with the bubonic variety. Dr. Webb saw one of them during life and
 “ certified him to be suffering from bubonic plague and pneumonia. Besides
 “ this importation of plague into Anamabu the infection had been already
 “ conveyed into that town a few days previously by canoemen from Accra who
 “ had brought a sick man as far as Winneba, where he had succumbed and
 “ was buried. Two of the canoemen soon after their arrival at Anamabu were
 “ attacked with plague and died, and the infection spread among the more
 “ immediate relatives, causing in all 12 deaths. Fortunately the existence of
 “ the disease at Anamabu was soon known and Dr. Lorena was sent there at
 “ an early stage and was successful in arresting the disease. Before his arrival,
 “ however, one of the villagers at Brewa had attended the funeral of one of the
 “ earlier cases at Anamabu and on his return to Brewa he soon sickened and
 “ died of fever, cough and spitting of blood, in fact with the same symptoms as
 “ the man whose funeral he had attended had suffered from. The infection
 “ thus introduced into Brewa spread rapidly in this man’s family, but the
 “ vigorous measures taken there by Dr. Lorena, Lieutenant Stokes and Mr.
 “ Grimshaw soon brought the outbreak under control, but not before 19 deaths
 “ had occurred.

“ Brewa and Anamabu being only a few miles from Cape Coast Castle, it was most important to prevent infection spreading further westwards. In adopting stringent measures for this purpose, the chief of Anamabu gave every assistance and information that was possible. The same cannot be said of the sub-chief of Brewa at the earlier stage, but later he improved. In this connection I would also mention the very strenuous efforts made by the principal people of Cape Coast, among whom the Honourable Mr. Sarbah was the most prominent to save Cape Coast from infection, and I have no doubt that it was due to their vigilance and to that of Dr. Purkis and other Government Officers there that Cape Coast escaped a serious epidemic. In Cape Coast some 6,000 rats were destroyed and the town was maintained in a remarkably cleanly state.

“ Two villages, Edentumera and Aiduya, owed their infection to Brewa, the circumstance being that the native medicine man coming from one of these villages attended the first cases in Brewa, when doing so he brought his wife with him. He was attacked with plague at Brewa and died and his wife returning to Aiduya brought the infection there and was attacked in a few days and died. There were in all 8 deaths from plague in those two villages and this was successfully dealt with by Dr. Webb. The outbreaks in the vicinity of Accra were all traceable to Accra, and they were very effectually combated, checked and arrested by Dr. Hunt and Dr. Eldred, who also did excellent work in Accra itself in the suppression of the disease.

“ The Preventive measures adopted by the Public Health Committee appointed to combat the plague in Accra were of two kinds, one was directed to check and suppress the disease in the town ; the other was to prevent its extension beyond the town either by land or water.

“ To suppress the disease in the town the measures employed were :—

“ (1) Removal of the sick to hospital.

“ (2) Isolation in health camps of persons closely associated with the sick person or infected house and their inoculation with Haffkine's Prophylactic ; a badly infected area in James Town was completely evacuated and so was a small area in Ussher Town.

“ (3) Fumigation of the infected house and its contents, and when this was impossible, owing to the ruinous condition of the hut or other cause, the destruction of the hut.

“ (4) Destruction of rats by poison, rat traps, and rat virus.

“ (5) Inoculation with Haffkine's Prophylactic.

“ Of these measures inoculation was the most popular, over 16,000 persons residing within the Municipal limits were inoculated, and such was its popularity, and the eagerness with which it was sought, that people actually struggled and fought with one another to be among the first to be done.

“ I am inclined to think that with the exceptionally bad conditions existing in Accra from a sanitary point of view the inoculations did more than any other measure to save the situation. The inoculation also played a very conspicuous part in checking the several outbreaks in different parts of the Colony. The total number inoculated in the Colony amounted to over 31,000, and the same desire to be inoculated was manifested wherever the disease broke out.

“ There was another measure which exercised a decidedly beneficial effect in Accra, and as it was carried out before my arrival I feel that I ought to give it special mention. I refer to the evacuation of the most infected part of James Town where some 200 families were removed west of the Lagoon. This measure was carried out by the Public Health Committee of which Dr. Garland and the Honourable A. Willoughby Osborne were most active members, and to them should be given the credit of inaugurating this excellent measure. I would also draw attention to the very valuable services of the Manche Ababio of James Town, who through a very trying period has done everything that was asked of him and has persuaded his people to remain for close on four months away from the infected area.

“ It is an area which unfortunately is in such an insanitary condition owing to the state of the huts which are huddled together upon it, absence of ventilation and light, impossibility of effective drainage, that it is inadvisable that any but the best houses in it should be reoccupied ; and to prevent the risk of recrudescence of plague the area should be cleared of most of its houses, levelled and laid out afresh on sanitary lines. Your Excellency has, I believe, already appointed a Committee to deal with this area.

“ Turning now to the measures taken to prevent the disease spreading from Accra. They consisted in :—

- “ (1) The supervision and inspection of all cargo shipped from Accra and the fumigation of all sacks and coverings containing cocoa and other produce.
- “ (2) Medical inspection of passengers and the inoculation of all deck passengers and other natives leaving Accra by sea at least a week prior to the departure, and the fumigation of their clothing and effects.
- “ (3) The fumigation of parcel post mails.
- “ (4) The establishment of a land cordon round Accra extending from the Sekum River on the west to the village of Ningua on the east and bounded on the north by the villages of Nsawam, Nsaki and Teimang.
 “ No person from Accra was allowed to pass through the cordon without a passport bearing the impress of his or her thumb mark and signed by a Government Medical Officer stating that the bearer had been inoculated at least a week prior to the date of such passport.

" The regulations relating to land restrictions worked very well, and nearly
 " 4,000 passports were issued while they were in force. So did the other
 " regulations work well except those relating to deck and native passengers
 " travelling by sea. As a matter of practice captains of ships would not take
 " any native passengers, sometimes they were not inclined to take cargo, and
 " occasionally they refused first-class passengers. In fact it appears to me that
 " much of the inconvenience to the merchants and the shipping generally was
 " due to the captains of the ships having, their own notions about plague and
 " quarantine laws, and these depended largely on their individual susceptibilities.
 " Now on the West Coast of Africa, with ordinary precautions there is not the
 " slightest danger of a ship becoming infected with plague. There are no ports
 " such as exist in other parts of the world where vessels enter a harbour and are
 " brought up alongside a quay. In such ports there is considerable risk of the
 " rats in a vessel lying alongside of an infected quay becoming infected with
 " plague, and of the vessel afterwards carrying the infection to other ports of a
 " similar kind. But in West Africa there are no ports that I know of of this
 " description, and certainly Accra is not one. The vessels remain out at the
 " roadsteads one or two miles from the shore, and cargo is carried to them in
 " surf-boats. It is impossible with ordinary precautions such as were adopted
 " here for the ships to become infected either by rats or by cargo. The only
 " way in which infection could be carried was by passengers or their luggage,
 " and this was provided against in a most thorough manner by inoculation and
 " medical inspection of the passengers and disinfection of the baggage. Yet I
 " am bound to say that owing to the timidity of many of the captains, probably
 " from a misunderstanding as to what quarantine against plague meant, the
 " adequacy of the measures which were intended to interfere as little as possible
 " with commerce and yet secure safety were not appreciated and were not made
 " use of. Possibly some of this fear and the action based on it in vessels
 " going south were due to the apprehension of long quarantine detention in
 " foreign ports. I am not in a position to state how far this was justified. For
 " Southern Nigeria and German Territory there was apparently no reason to be
 " apprehensive. As regards Spanish and Portuguese regulations I am not
 " able to say, but when I return to England I hope to learn, and if there is
 " unnecessary stringency will represent it in order that if possible the regula-
 " tions may be brought more into true harmony with modern science.

" I have only one other subject to touch on, and it is the possibility of a
 " recrudescence of the disease in Accra. This should, if possible, be prevented.

" With that object in view Dr. Barker, who did such excellent work in
 " Cape Coast a few years ago at the time of a crisis there, has been specially
 " appointed Medical Officer of Health for Accra. Under him there is a
 " special staff for cleansing and fumigating houses and for the destruction of
 " rats. Arrangements have also been made for the regular examination of
 " rats so that an early warning may be given, and I am in hopes that the
 " measures will be successful and there will be no recrudescence. If there is
 " it will be dealt with at once, and probably the number of cases may not be
 " more than half-a-dozen and there will be no outbreak. I have every

" confidence in Dr. Barker's abilities to either prevent a recrudescence or stamp
 " it out at once without having the port subjected to quarantine for any
 " long time.

" I have already mentioned the names of a number of Medical Officers
 " who spared neither time nor energy nor themselves in combatting successfully
 " the disease. They were Drs. Hunt, Eldred, Lorena, Fisch, Purkis, Webb,
 " Jupe and Barker. Dr. Garland deserves much praise for the excellent work
 " he did during the absence of the Principal Medical Officer. Dr. Langley,
 " after his arrival, did also splendid work, and Dr. Graham performed very
 " important duties in the laboratory. Dr. Savage and Dr. Papafio also rendered
 " good service.

" Among the non-medical workers the most conspicuous was
 " Mr. Osborne, whose services were invaluable, and whose energy and resource
 " were untiring. I don't think it is possible to appreciate too highly the services
 " Mr. Osborne has rendered to Accra during the time of plague. I would
 " also mention Mr. Church, Mr. Crowther, Captain Lees, Major Kitson and
 " Captain Collins. To the latter is due the efficiency of the Sanitary Cordon,
 " which he frequently visited at a good deal of personal inconvenience to
 " himself. Mr. Harragin did also good work in connection with the isolation
 " camp. There were also the members of the Public Health Committee,
 " official and non-official members, and in this connection I would record that
 " a great deal of assistance was received from the merchants through their
 " representatives on the Committee. To all the officers I have mentioned and
 " to the Public Health Committee, individually and collectively, I tender my
 " very best thanks for their great assistance and co-operation in a very
 " successful campaign.

" I would also beg most cordially to thank your Excellency and the
 " officers under you for the facilities afforded me in carrying out the special
 " work that brought me to the Gold Coast."

SECOND OUTBREAK OF PLAGUE AT ACCRA.

3. On June 3rd, nine days after this statement was made, a woman
 died from pneumonic plague in Accra. A period of 56 days had intervened
 between this and the previous ascertained death from plague, which had also
 been pneumonic.

On inquiry it was found to be a case imported from one of a group
 of villages, Fannah by name, extending along the sea shore from a few miles
 distant from Accra to the Sakum river within the limits of the cordon.

To these villages a large number of people from Accra had fled. There
 had been rumours early in April that some suspicious deaths had occurred in
 two of the villages and a medical officer had been sent out immediately to them

to inquire and take the necessary measures. He, however, reported, after what appeared to be a thorough investigation, that the deaths were not due to plague, and that there had not been any cases of sickness or deaths for some time, either in the suspected or adjoining villages.

He had evidently been misled by the head men and people, for it afterwards turned out that this information was incorrect. As a matter of fact, there were cases of plague. The deceased woman, Sackiokoa, who died on June 3rd in Accra, had been living in one of the villages. She arrived in Accra on the 25th May with her brother, two sons and one daughter. Both the brother, Ayie Kuai, and one of the sons named Lartey were ill at the time. The brother died on the 26th and the son on the 30th of May. Both were buried without medical certificates. The mother of Lartey then took ill and died on June 3rd. An examination of the body demonstrated that she died of pneumonic plague. Her other son (Mensa) and daughter (Korkoi) were attacked with the same kind of plague and died on June 4th. The history of this family was that early in May, Ashong, the mother of Sackiokoa had caught pneumonic plague from one of the cases in the village and had died; a few days later her mother-in-law, Okali, was attacked and died; a few days later still, Kwai Diaba, son of Ashong, was attacked and died, and then two neighbours, Akō and Afuah, friends of the family.

The family becoming alarmed migrated to Accra, and following them some other families from the village. Among the latter was Kofi, a male who came from Fannah on the 31st of May, and died in Accra the same day. He was also buried without medical certificate. There came also from Fannah in the first days of June, Anna Kudjd, an infant, who died in Accra on June 6th and was found by examination to have succumbed to pneumonic plague. The disease thus established itself in Accra again, but this time purely in the pneumonic form. The next four cases were contacts of Sackiokoa, all women; one died on June 5th, the other three on June 8th.

A woman, Koko Quaguley, who washed Kofi's body, died on June 7th, and another woman, Kwartekei Mensah, who assisted Koko Quaguley to wash the body, died on June 8th. Then, on June 9th, Mary Bruce died; her exact connection with the preceding could not be traced. The next eleven cases, two of which occurred in Christianborg, were either traceable to the family of Koko Quaguley or branching families of Sackiokoa. 23 deaths from pneumonic plague occurred in Accra and suburbs between the 3rd and 26th of June. In addition to these there were three deaths from pneumonic plague at Labadi, a fishing village about three miles east of Accra. The infection

owed its origin to the same source at Accra. Kuao, the brother of Chief Tago of Labadi, was a medicine man and had been to Fannah and Accra to treat some of the cases; he died on June 6th, his sister died on June 12th, and the aunt died on June 19th. Botiano, also a village immediately on the west bank of the Sakum river, was infected by a man from Fannah ill with the disease coming to the village to be attended by the medicine man, his half-brother. He died of the disease, and the medicine man was next attacked and died, after which seven others more or less related were attacked and died, the last death taking place on the 21st of June. All suffered from pneumonic plague.

The total in this outbreak from the time of its discovery, *i.e.*, from the 3rd of June to the 26th, was 35 cases, all fatal, of which 23 occurred in Accra and its suburbs, and the remainder in the two villages mentioned.

It was easier to deal with this outbreak effectively because every link in the chain of infection was ascertained, and measures of precision and on a large scale were put into operation which checked and controlled the outbreak in a very short time.

The infection was apparently in three cases contracted in laying out and washing the body, while in the remainder it was related to a close personal association of the sick with the healthy. The exact manner the infection was conveyed from the sick to the healthy leaves room for conjecture. The conditions of West African life are not favourable to any special differentiation. A remarkable feature observed in the post-mortem lesions of 12 of the cases in which the stomach and intestines were opened and carefully examined was the hæmorrhagic and congested state of parts of the mucous membrane of the stomach, the patchy hæmorrhagic areas in the small intestine and the congested state of the head of the pancreas where it is connected with the duodenum. The lesions conformed with similar ones noted in some of the earlier cases in March, and in some of the cases in the third outbreak of pneumonic plague in July. Microscopic examination of sections did not disclose in the hæmorrhages, either in the intestines or glands, any plague bacilli, but as the specimens had been preserved in formalin this may account for their non-detection, as in lung tissue, demonstrated when fresh to be full of plague bacilli, no plague bacilli could be detected in those portions also preserved in formalin.

THE THIRD OUTBREAK IN ACCRA.

4. On the 28th of July a death occurred from pneumonic plague in Accra, the last having been on the 26th of June. This was followed by two other

deaths, one on the 30th of July, the other on the 4th of August. All three persons had lived together. A number of their friends and relatives were sent to the isolation camp and three of them were attacked with pneumonic plague, the first on the 6th August, the next on the 11th, and the last on the 17th. The circumstances of the outbreak appeared to point to the infection arising from some clothing or other effects from an infected house and, subsequently, personal contact. A single case of pneumonic plague occurred in Accra on October 13th.

PNEUMONIC AND BUBONIC VARIETY EXISTED AT AN EARLY PERIOD OF THE FIRST OUTBREAK AT ACCRA.

5. At the time when plague was first recognised in Accra—in January—there existed the two forms, pneumonic and bubonic, not infrequently associated but also distinct from one another. Whether the first case in Accra several months earlier was bubonic, which in some later cases affected the lungs and originated the pneumonic form, or whether the first case was pneumonic and gave rise in some subsequent cases to the bubonic form it is now impossible to say. In favour of the view that the first cases were bubonic, there is, concomitant with a fatal epizootic among rats in the latter months of 1907, a history of several cases of glandular swellings in the groins, some fatal and some not fatal, which were attributed to guinea worm by the natives themselves.

EXCEPTIONAL PREPONDERANCE OF PNEUMONIC PLAGUE IN THE GOLD COAST EPIDEMIC.

6. The importance of the Gold Coast epidemics does not lie so much on which type of plague gave rise to the other, for this transition has occurred elsewhere, but in the great preponderance of pneumonic plague. Hitherto the usual percentage of pneumonic cases in an epidemic has not been observed to be high in the numerous outbreaks of this pandemic, 7 per cent. being viewed as about the normal. But the epidemic on the Gold Coast shows that that percentage is not an invariable standard of relationship between the one and the other, and that, under certain conditions, the bubonic may be displaced by the pneumonic form, which may, in its turn, occupy the whole field of the outbreak.

The epidemic on the Gold Coast is remarkable for the large proportion of the pneumonic variety of the disease as compared with the bubonic. More than 50 per cent. of the cases were of this type. In Accra itself most of the cases were bubonic in the first epidemic, though pneumonic cases occurred now

and again, and more particularly towards its end. Outside Accra there was no other type than the pneumonic except in the instance of two persons, and these were, in both cases, subsequent to the pneumonic outbreak.

In the second and third outbreaks in Accra there was only the pneumonic type.

In Accra the first epidemic was associated with a plague epizootic among rats, but the second and third, and the epidemics outside Accra, had no such association.

PNEUMONIC CASES WITH UNDEFINED SYMPTOMS.

7. The majority of cases of pneumonic plague were readily recognisable by the serious illness of the patient, the difficulty of breathing, and the blood-stained sputum with bacilli in it; but there were others in which there was an absence of any special symptoms of illness until a few hours before death, and in these, unless suspicion had been aroused by the fact that they had been in association with patients suffering from pneumonic plague, even the most experienced might have been misled in the diagnosis of the disease. A case of this kind occurred at Brewa and is worth recording. It was that of a man who had been isolated for nine days because of having come in contact with a pneumonic case. He was seen on the evening of the eighth day as usual, but further than slight symptoms of fever, rather a typical tongue and occasional cough without blood-stained sputum, there was nothing which under ordinary conditions would have raised suspicion. He died during the night, and the post-mortem examination showed pneumonic plague with much gelatinous effusion over the region of the heart.

SUMMARY.

8. The notable facts connected with the epidemic of plague on the Gold Coast may be summarised as follows :—

1. The occurrence of bubonic and pneumonic plague in Accra during the first outbreak with a plague epizootic among the rats.
2. The extension and prevalence of the pneumonic form of the disease beyond Accra to the exclusion of the bubonic.
3. The prevalence only of the pneumonic form in the second and third outbreaks in Accra.
4. The spread of the pneumonic form both in Accra and in other localities without rat or flea infection.
5. Numerous cases of the pneumonic form with ill-defined symptoms.

The facts seem to indicate that the potentialities of plague to reproduce epidemics corresponding in their nature to those of the 14th century still exist under favourable conditions, that the spread of the disease may be readily facilitated by pneumonic cases with undefined symptoms, and that such epidemics do not require for their propagation or extension either rats or fleas, though they may be reinforced and maintained in a locality by rat infection.

SPECIAL REPORTS.

9. Reports connected with the plague by Drs. Garland, Graham, Connal, and Pickels are submitted, as they deal with the subject from different and important aspects. Those by Drs. Graham, Connal and Pickels are of special scientific interest, and the researches which they deal with make the Gold Coast epidemic particularly instructive. The results show that there are other blood-sucking parasites on rats besides fleas, for instance, ticks (*Ixodes rarus* and *Rhipicephalus Sanguineus*) and lice (*Hæmatopinus*) as well as numerous Entozoa, all of which may in future have to be taken into consideration when investigating the modes by which bubonic plague spreads. Then there was the rarity of the *Mus Rattus* in Accra. Again, it was demonstrated that the Danyez virus generally requires to be exalted before it can be depended upon, and that it can be exalted if sufficient care is taken. The post-mortems on plague cases showed also a very marked localised congestion and hæmorrhagic condition of the head of the pancreas and that part of the duodenum which comes in contact with the pancreas. Unfortunately owing to the method of preserving the specimens the full meaning of this could not be interpreted, but it is something to look for in cases of plague that may occur elsewhere as it may throw further light on causation and extension of the disease.

I have the honour to be, my Lord,

Your obedient Servant,

W. J. SIMPSON, M.D.

May 1st, 1909.

SHORT HISTORY OF OUTBREAK.

By Dr. GARLAND, Deputy Principal Medical Officer.

About the month of December it was reported that dead rats were found in parts of Government House, a converted castle the stonework of which was of considerable age. Some of the rats were found under the floor; attention being called to their presence by the objectionable odour. About the second week in November ratin had been laid down in the castle, and it was thought by me that the mortality amongst the rats might be due to this.

About the beginning of this year rumours were circulated to the effect that a new disease had broken out in Accra characterised by some fever, the occurrence of buboes, and that it had a rapidly fatal issue.

Up to this time the natives neither reported cases of illness nor death. I afterwards learnt that the native fetish doctors and herbalists had been attending cases and that they charged a fee of £1 for attending any cases of this disease, and hence the natives gave the name "one pound" to this disease.

On the 3rd January I received further rumours and, after consulting with Dr. Hunt and Dr. Eldred, I decided to have systematic inquiries made and to get all suspicious cases examined.

Two cases in hospital with fever and enlarged femoral glands were examined; one was diagnosed as appendicitis, the other as simple lymphadenitis, and it was subsequently shown that both were correct.

On the 5th, a krooboy was conveyed to hospital suffering from pneumonia from which he subsequently died; we held a post-mortem examination. Dr. Eldred did the macroscopic work and I did the microscopic notes attached, CASE I. We were not in a position to say that the micro-organism was not the *micrococcus pneumoniae crouposæ*.

An inoculation experiment on a guinea pig was carried out from this case, a scraping of lymphatic gland being used. The experiment was negative.

On the 7th, a suspicious case of death was reported in the town. I had written to the District Commissioner to ask him to grant an order for the post-mortem examination of any suspicious cases, and I now sent Dr. Eldred to request an order and to proceed to inspect the body. As a result the body was ordered to be conveyed to the Government mortuary. On the 8th the microscopic examination of gland smears was completed, *vide* CASE III. Our suspicions were now thoroughly aroused, but we were not thoroughly agreed as to identification of the bacillus pestis.

There was a large ulcer of septic nature on the leg, and there was marked polymorphism in the micro-organism found in the smears.

On the 8th, the body of a young girl was conveyed to the mortuary; a post-mortem examination was made and smears obtained from sections of different organs; these were examined on the 9th, *vide* CASE IV. The thumb

and index finger of the right hand showed signs of severe injury, and had a gangrenous appearance. We were not agreed as to the identity of the bacillus pestis.

During the afternoon of the 9th Dr. Eldred and I held a post-mortem examination of the bodies of two krooboyes, and I obtained smears; results shown in CASES VII. and VIII. As a result of this examination we were convinced that we were dealing with plague, and we carried out an experiment on a guinea pig with a small section placed in the mouth, the guinea pig being then placed under observation. Dr. Eldred and I had been working from early morning to about 6 p.m., when our examination was complete. I at once proceeded to interview His Excellency the Acting Governor, and informed him as to our opinion, with the result that immediate action was taken, as shown in the subsequent memoranda, etc.

On the night of the 9th we succeeded in getting in the first live case, and I saw this case in conjunction with Drs. Hunt and Eldred, and gave orders to the latter, who was in medical charge, to obtain an extract of gland juice hypodermically; a blood film was also taken. Having fixed and stained these specimens they were left to dry, it being then nearly midnight. Result of examination on 10th shown in CASE V.

On the morning of the 10th a rat received from Government House was examined; it was found that the spleen and liver smears contained bacillus pestis. The guinea pig experimented on on the 9th died on the 11th and gland smears were taken. The bacillus pestis was found in the organs examined and positive confirmation given to our diagnosis.

In conclusion, I beg to state that no material existed for a positive diagnosis prior to the completion of our examinations of the 8th; and the extraordinary mixture of micro-organisms baffled us and gave rise to some doubt and difference of opinion as to what we were dealing with; a septicæmia might have been induced in either case and the issue was considerably obscured. The services of a trained bacteriologist had not been available, and our work was carried out under conditions of difficulty.

From the 5th I had specially asked for any dead rats that might be found, but prior to the 10th I received one specimen only, which was in such an advanced state of decomposition that it was of no use for our purposes.

I understand this outbreak was preceded by great mortality amongst the pigs near Accra and that a rapidly fatal disease had been evident for some time. I also received rumours that the owners of pigs which died actually cut up and sold portions of the flesh.

An outbreak amongst fowl occurred at the beginning of the year co-incidental with the outbreak of plague. I examined a duck which had died from this disease, but could not find any micro-organism.

I observe that it was not until some time after a positive diagnosis had been made by me that a case of this disease was observed and reported by either of the native medical practitioners in Accra.

This fact is of some value in the fact that it shows how thoroughly the natives concealed the occurrence of this epidemic.

CLINICAL NOTES ON SOME OF THE CASES.

It would appear that the pneumonic type of the disease was fortunately rare.

Many of the cases terminated with appalling suddenness. The constitutional symptoms being of slight nature, in fact the history in some cases was that of sudden death. The number of post-mortems in which ante-mortem as well as post-mortem clots were found suggests syncope as being a cause of death in a large number of cases.

The factor which determines the formation of this clot is not certain. No great number of bacilli have been found in the clots examined, and it would appear that some toxin was the most likely cause.

Convulsive seizures were a prominent symptom in some cases. The lymphatic glands chiefly involved were the femoral. Bacilli pestis were found in the urine of some cases but rarely found in the blood, and then only shortly before death.

The tongue of nearly every patient presented a very characteristic thin bright white fur.

Cases which recovered presented very marked emaciation.

NOTES ON SOME FATAL CASES.

CASE I.

4/1/08.

Boy, aged about 14.

Taken ill two days before, with following symptoms.—Temperature 106, rapid feeble pulse, tenderness right iliac region and tender gland in R. groin.

Admitted to Hospital on 3rd, tumour to be felt in R. iliac region, like inflamed appendix, temperature remained high, great prostration, tongue thick white fur, face very sunken, gland in groin about size of walnut, patient died comatose on 4th.

Post-mortem could not be obtained but following points noted.—Rigor-mortis very marked an hour after death, and axillary temperature 101.5. Gland examination—Negative.

CASE II.

5/1/08.

Krooboy admitted to Hospital with symptoms of very acute lobular pneumonia and enlargement of spleen and liver. Died about two hours after admission.

P.M. no rigor-mortis one hour after death. No external ulcers or injuries.

<i>Brain</i>	...	Normal.
<i>Lungs</i>	...	Very general pneumonia on both sides lung in many places liver coloured and quite solid, in other parts congested and muco-purulent.
<i>Heart</i>	...	Auricles were dilated and all the chambers of the heart filled with a peculiar decolorized, tough, whitish ante-mortem clot, which gradually merged into the ordinary P.M. clot towards the orifices.
<i>Liver</i>	...	Very large, estimated weight about 80 ozs. congested. No signs of abscess.
<i>Spleen</i>	...	Slightly enlarged and congested.
<i>Intestines</i>	...	Normal.
<i>Kidneys</i>	...	Slightly enlarged.
<i>Glands</i>	...	Glands in both groins inflamed, inflammation extended up to iliac chain. Cervical glands on left side enlarged.

MICROSCOPIC EXAMINATION OF BLOOD BEFORE DEATH.

No parasites, large increase of polynuclear leucocytes, some malarial pigment.

Gland smears taken after death, as follows :—

<i>Spleen</i>	...	...	...	Negative.
<i>Liver</i>	...	...	...	Negative.
<i>Kidneys</i>	...	...	...	Negative.
<i>Lungs</i>	...	...	...	Numerous micrococci corresponding to <i>Pneumococcus</i> .
<i>Lymphatic Glands</i>	...	...	...	Micrococci corresponding to <i>Pneumococcus</i> . Considerable polymorphism of microorganisms mostly like <i>micro-coccus pneumoniae</i> <i>crouposæ</i> .

CASE III.

7/1/08.

Girl, aged about 13.

B.I.D. Dead about six hours, no rigor-mortis. Injury to index finger right hand, resembling dry gangrene. Brain, kidneys, liver and spleen appeared normal.

<i>Heart</i>	...	Both auricles dilated, dark clot.
<i>Lungs</i>	...	Very diffuse and slight pneumonia.
<i>Glands</i>	...	Those in right groin enlarged and inflamed, iliac on both sides enlarged and inflamed.

MICROSCOPIC EXAMINATION.

Smears as follows :—

<i>Liver</i>	...	...	...	...	Negative.
<i>Lungs</i>	...	...	...	...	Negative.
<i>Brain</i>	...	...	...	...	Small Colonies cocci.
<i>Spleen</i>	...	...	...	...	Negative.
<i>Lymphatic Glands</i>	...	...	...	...	Swarming with cocci.
<i>Pleural Effusion</i>	...	...	...	...	Negative.
<i>Kidneys</i>	...	...	...	...	Colonies cocci.

A severe injury had been sustained in the index finger and thumb of the right hand; the tip of the index finger looked gangrenous. There was considerable polymorphisms found.

CASE IV.

8/1/08.

Girl about 7 or 8.

B.I.D. No rigor-mortis, dead about 8 hours.

<i>Brain...</i>	...	...	Normal, except slight congestion of meninges.
<i>Lungs</i>	...	...	Very slight patchy congestion.
<i>Heart...</i>	...	...	Both auricles dilated and filled with ante-mortem clot as described in Case I.
<i>Vena Cava</i>	...	...	Purulent looking clot.

Liver, spleen and kidneys appeared normal.

Some sticky lymph in peritoneum.

Right groin, gland enlarged and hæmorrhagic, iliac glands enlarged on both sides.

MICROSCOPIC EXAMINATION.

<i>Lymphatic Glands</i>	...	...	Micrococci.
<i>Heart Clot</i>	...	...
<i>Vena Cava Clot</i>	...	...	Large cocci in one specimen.
<i>Liver</i>	...	...	Bacilli like organisms, some bipolar.
<i>Kidneys</i>	...	...	Negative.
<i>Brain...</i>	...	...	Negative.
<i>Lungs</i>	...	...	Negative.
<i>Peritoneal Effusion</i>	...	...	Negative.
<i>Spleen</i>	...	...	Micrococci scanty, somewhat like diplococci, but presents appearance of being in round capsule.

An ulcer on the leg was present in this case. The micro-organisms in the lymphatics and spleen might have been micrococci; there was much polymorphism.

CASE V.

9/1/08.

A woman, aged about 40, was admitted to hospital about 8 p.m. on 9/1/08.

History.—Taken ill 10 a.m. that morning, pain and swelling in right groin, vomiting, headache and backache.

Present condition.—Respiration, normal; pulse about 100 low tension; heart and lungs normal; ditto abdomen; enlarged and very tender gland in the groin. Temperature 101; tongue white pearly fur. Patient did not appear in much distress. 9 a.m. temperature 103; blood examination negative, blood very thin. Some of gland secretion removed hypodermically and smear taken, found to be swarming with bipolar cocco-bacilli. 10/1/08—temperature normal; patient feeling much better; gland not so swollen. Removed to contagious diseases hospital, where she died at about 2 p.m. after one convulsion. P.M.—Gland very inflamed, hæmorrhagic infiltration around it.

MICROSCOPIC EXAMINATION.

A woman admitted on night of 9th died on 10th. A blood slide was taken on night of 9th—negative. A slide of juice of femoral lymphatic was taken and found to contain bipolar, micro-organisms resembling plague bacilli. After death a post-mortem was held and a spleen and lymphatic gland smear taken; both presented bipolar bacilli.

CASE VI.

Woman, aged about 40.

B.I.D. Dead about 12 to 14 hours.

<i>Heart</i>	...	Auricles dilated, dark clot.
<i>Lungs</i>	...	Slight patchy pneumonia.
<i>Liver</i>	...	Enlarged and congested.
<i>Spleen</i>	...	Ditto.
<i>Intestines</i>	...	Very inflamed and hæmorrhagic.
<i>Glands</i>	...	No very distinct enlargement.

MICROSCOPIC EXAMINATION.

<i>Lung Smear</i> ...	i.	Bipolar looking, organisms seem more like two cocci in capsule.
	ii.	Swarms micrococci.
<i>Liver</i>	...	i. Negative.
	ii.	
<i>Spleen</i>	...	Streptococci also a bipolar; micro-organism not diagnosed.

CASE VII.

Krooboy, aged about 20.

B.I.D. Rigor-mortis marked, dead one hour.—No noticeable wound or sores.

<i>Brain</i>	...	Slight congestion of meninges.
<i>Heart</i>	...	Right ventricle and R. auricle dilated and full of ante-mortem clot.
<i>Lungs</i>	...	Normal.
<i>Liver</i>	...	Slight congestion.
<i>Spleen</i>	...	Enlarged, slight congestion.
<i>Kidneys</i>	...	Normal.
<i>Glands</i>	...	R. inguinal gland enlarged not inflamed. Left one very inflamed and hæmorrhagic with much infiltration around. Iliac glands slightly enlarged both sides. Rigor-mortis marked, one hour after death.

MICROSCOPIC EXAMINATION.

<i>Lymphatic Enlarged</i>	...	Bipolar bacilli.
<i>Spleen</i>	...	Swarming bipolar bacilli.
<i>Clot from Heart</i>	...	A few bipolar bacilli.

CASE VIII.

9/1/08.

Krooboy, aged about 12.

B.I.D. Dead about four hours—Rigor-mortis marked.

<i>Brain</i>	...	Not examined.
<i>Lungs</i>	...	Normal.
<i>Heart</i>	...	Auricles dilated, ante-mortem clot found in both auricles and in R. ventricle.
<i>Liver</i>	...	Slight congestion.
<i>Spleen</i>	...	Very enlarged and congested.
<i>Glands</i>	...	Inguinal on both sides enlarged and inflamed.

MICROSCOPIC EXAMINATION.

<i>Lymphatic Inflamed</i>	...	Negative.
<i>Lymphatic Enlarged</i>	...	Bipolar organism.
<i>Spleen</i>	...	Do. do.
<i>Liver</i>	...	Do. do.
<i>Heart</i>	...	Do. do.
<i>Brain</i>	...	Negative.

REPORT ON THE PLAGUE LABORATORY AT ACCRA, 1908.

By Dr. W. M. GRAHAM.

A room in the boys' school at Jamestown was acquired, and a plague laboratory was equipped there by Professor Simpson with the apparatus he had brought with him from England; a fly-proof post-mortem room was built, and the systematic examination of rats for plague was begun at Accra on the 15th February, 1908.

From this date a detailed macroscopic and microscopic examination of all rats received at the laboratory was made daily, the results being registered on a printed form prepared for the purpose.

The greater number of the rats examined were caught in steel rabbit traps, and the injuries caused by the traps gave rise to hæmorrhages which were at first misleading. The rats were caught, collected, and ticketed by the Sanitary Department, and on arrival at the laboratory were placed in drums containing an antiseptic by which cutaneous parasites were killed. They were then laid on a table and opened by an incision from anus to snout. The groin, axillary, submaxillary and retroperitoneal glands, the spleen, liver and lungs were inspected, and smears from the spleen and any enlarged gland made for microscopic examination.

In every suspicious case a culture on neutral Agar Agar slope was made from the heart blood or glands.

Each afternoon the addresses from which infected rats had been obtained were communicated to the Sanitary Department.

RATS.

Two species of rat were received at the laboratory—

(A) *Cricetomys gambianus* (Waterhouse).

(B) *Mus decumanus*.

No specimen of *Mus rattus* was obtained. This rat, therefore, must be very rare or entirely absent.

(A) *Cricetomys gambianus*: Colour, on the back a dark grey-brown, becoming lighter and greyer on the flanks. Abdomen, thorax, muzzle and inner aspect of limbs a pale buff.

Ears: Thin, large, carried erect, the distal part of the concha a slate grey, the proximal part a pale buff. Oral bristles numerous, black, stiff and long.

Paws: Anterior, with four digits with nails and a rudimentary thumb, five horny pads on palm.

Paws: Posterior, five digits and six horny pads on sole.

The length of the tail is slightly greater than the combined length of the head and body, the extremity is of a dirty white colour for more than a quarter of the entire length, the remainder is of a grey colour. The rings are very slightly marked. The tibia and fibula are united. The molar formula is $\frac{3}{3}$, the teeth decreasing in size from one to three. There are three ridges on the first molar and two ridges on the second and third molars.

The cheeks are highly distensible, and form pouches in which considerable quantities of food are often found.

The measurement of an average adult gave the following result :—

From snout to tip of tail	...	...	...	27½ inches
Tail	...	...	...	14 „
White part of tail	...	...	...	6 „
Number of young	...	...	...	three to six.

The average number is four, which is not often exceeded. Food : uncooked Indian corn, and palm oil nuts and cocoa beans. These are all common articles of native food and are to be found lying about in every native house.

This rat is a favourite article of food and is trapped for the purpose by the natives in many localities. It is the rat most frequently met with in native dwellings, and is said to be most numerous in houses during the rainy season. It is a good climber, often ascending trees, roofs, etc. It usually digs a burrow running straight between the entrance and exit holes, and makes its nest in its burrow. The females are apparently slightly larger than the males. The longest measurement for this rat was 29 inches from tip of tail to snout.

Native names :—

Ga-Obishi.

Fanti-Okussi.

Hausa-Guffia

PARASITES.

The following parasites were found infesting this rat.

(a) *Pulex Cheopis* (R.).—This is the common flea found on this rat at Accra. It was found on every rat examined immediately after death, and frequently was found in considerable numbers.

Ixodes rasus (Neumann).—This tick was found on the legs and abdomen of several rats. I have found the same tick on antelope in Ashanti and in Kumasi. It frequently attaches itself to persons who walk through grass.

(b.) *Ctenocephalus serraticeps*.—This flea was found occasionally on this rat. It is very common on dogs at Accra.

(c.) *Rhipicephalus sanguineus* (Latr).—This tick was found occasionally on the hind legs and abdomen. It is the common dog tick here, and is frequently found on man. It is most common on dogs during the dry season, becoming rarer during the wet season. Its place being then taken by another species.

(d.) *Amblyomma variegatum* (F.).—This tick was found on the hind leg of this rat. It is the commonest cattle tick here. I have never seen it attack man.

(e.) *Ornithodoros talage* (Guerin-Meneville).—It is usually found in the nests of penguins at the Cape or free under stones. I have not previously found it on the Gold Coast.

(f.) *Hæmatopinus* (Sp. Nov.).—This louse is of a whitish colour and measures 1·9 mm. in length. Its colour makes it difficult to find.

I attach a detailed drawing of this insect.

(g.) The larva of a fly, *Ochromyia anthropophaga* (Blanch).—When full grown this larva measures 1·5 cm. by 0·6 cm. It is a white colour which, when it leaves its host, soon changes to a brown and then to a black colour. The 10 segments of which it is composed are thickly studded with sharp

thorns. In the female rat these larvæ are found in the subcutaneous tissue of the legs and of the abdominal wall. In the male rat they are found, in addition, in the scrotum which is sometimes riddled with holes. Occasionally two or three larvæ occupy the same cavity, but each communicates with the air by a separate circular opening in the skin.

On arriving at maturity the larva widens the opening in the skin, pushes itself through, falls to the ground and rapidly buries itself some inches deep. The pupal state occupies 16 to 17 days.

I shall attach photographs of larva and fly.

(h.) *An Orthopteron hemimerus talpoides* (Walker).—This insect is of an orange colour and is flattened vertically. It is wingless, and the abdomen ends in a pair of long stylets. The size varies greatly, an average insect being 14 mm. long, or without the stylets 10 mm. long. The colour also varies, the young being of a paler tint. The mandibles are tridentate; the antennæ have 11 segments: maxillary palps 5, and labial palps 3 segments; the tarsus has 3 joints, the terminal one being armed with two nails. The insect lives in the fur of the rat's back, usually about the root of the tail. It is very active and runs rapidly through the fur. When at rest it may often be seen holding a few hairs of the rat's fur in its mandibles. It appears to be a commensal only and unable to draw blood.

I attach a detailed drawing of this insect.

CESTODES.

(i.) *Darainia (Guineensis Sp. Nov.)*:—

Strobila...	...	length, 50 to 60 cm.
Scolex ...	...	breadth, 0.70 mm.
First distinct proglottis	...	breadth, 0.9 mm.; length, 0.15 mm.
Middle proglottis of chain	...	breadth, 4.0 mm.; length, 1.5 mm.
Terminal proglottides ...	...	breadth, 2.0 mm.; length, 3.0 mm.
Egg capsules ...	...	0.27 mm. by 0.33 mm.

The scolex is small and irregularly quadrilateral in shape with four circular suckers separated from each other by longitudinal broad grooves. There is a well-defined neck. The proglottides are of very unequal size.

Following the neck they are small, indistinct, and much broader than long. The succeeding segments become longer and broader and suddenly much longer than broad in the last few inches of the strobila.

Genital pores are unilateral at about the junction of the interior and middle-thirds of the proglottides. The eggs are collected together in capsules containing five to seven eggs.

This cestode was found in the small intestine of 88 per cent. of the *Cricetomys gambianus* examined at the plague laboratory during the period April 23rd, 1908. All adult rats were infested. It was only in the younger rats that the worm was not found.

The host of the cysticercus stage of the worm is not known, but may be an orthopteron parasitic upon this rat. The infection of this insect would be facilitated by its preference for the fur above the tail and close to the anus of its host.

A careful consideration of these facts has raised in my mind the important question whether these rat cestodes may not be concerned in the propagation of the *B. pestis*, and whether the cysticercus stage of the worm, which is passed in the body of some arthropod, may not be the cause of the quiescent period and subsequent recrudescence of plague epidemics.

(j.) *Cœnurus serialis* (P. Gervais).—The cysts were found beneath the parietal peritoneum of the abdominal wall. On evaginating a head it was found to have a circlet of hooks and four suckers, and to be separated from the body by a well-defined neck. The cysts were oval, with small seed-like bodies showing through the clear cyst wall.

Length of cysts ... 19 mm. Breadth ... 11 mm.

Smaller cysts were found in the walls of the heart beneath the external pericartium.

Size ... 4 mm. to 6 mm.

NEMATODES.

(k.) *Heterakis* (*Sp. ?*) (Dujardin, 1845).—The worm is of a white colour and was found in the duodenum of the rat.

Male ... 11 mm. long, 0.35 mm. broad.

Female ... 14 mm. long, 0.43 mm. broad.

(l.) *Ankylostoma* (*Sp. ?*).—The female worm was alone found. It is of a pale yellow colour and was found free in the abdominal cavity of this rat. Length of female 31 to 33 mm.

(m.) *Oesophagostoma* (Molin) *Sp. ?*.—Found free in small intestine; of a blood-red colour. Female: Anus at extremity, vulva a short distance in front of anus, mouth unarmed. Length 6 mm.

Male: A caudal bursa, two equal spicules, mouth as above. Length, 4 mm.

(B) *Mus decumanus*: Relatively few specimens of this rat were received at the laboratory. When it is borne in mind that *Mus decumanus* is not fastidious in its tastes, and produces eight to eleven young at a birth, while *Cricetomys gambianus* produces only three to six, this disparity of numbers appears difficult to explain. Two possible propositions present themselves.

1. The local environment may be unfavourable to this species.
2. A recent epizootic may have decimated the species which has not yet had time to recover its former numerical position.

There is no evidence available sufficient to prove either proposition, but it is at least significant that the first rat found dead of plague in Accra (January 9th) was a *Mus decumanus*, and that the epizootic among this species ceased just a fortnight earlier than that among the *Cricetomys gambianus*. It appears then at least probable that plague began among *Mus decumanus* and subsequently extended to *Cricetomys gambianus*; a fortnight being the interval separating the respective epizootics of the two species. Enquiries among the natives have elicited conflicting statements that could be used to prove either proposition. One statement attributes the introduction of plague

to this species. My informant stated that bales of compressed hay are imported as forage for mules. That on opening one of these bales at a house in Jamestown some rats (*Mus decumanus*) escaped from the bale, and their escape was followed by the outbreak of plague in the quarter, and my informant (Sanitary Inspector) believed, in the particular house where they escaped.

M. decumanus has been found to be the dominant species at Cape Coast, largely outnumbering *Cricetomys Gambianus*.

PARASITES.

The only cutaneous parasites found on this rat were two species of fleas.

(a) *P. cheopis*.—Only occasionally found.

(b) *C. serraticeps* (on a single rat only).

This rat being of smaller bulk cools more rapidly than *Cricetomys Gambianus* and is earlier deserted by its cutaneous parasites.

NEMATODES.

(c) *Ascaris* (*sp.* ?).—The worm is of a white colour and 25 mm. to 28 mm. long.

CESTODES.

(d) *Hymenolepis diminuta* (Rud.).—This worm was found in 62·5 per cent. of the rats examined during the period 23-4-08 to 10-5-08.

The host of its cysticercus stage is known to be an Arthropod. The usual host is *Asopia farinalis*, but it also infests *Anisolabis annulipes*; an Orthopteron.

(e) *C. fasciolaris* (Rud.).—These small cysts are frequently found in the liver of this rat, either single or in twos, showing as clear vesicles of about 5 mm. diameter beneath the peritoneum covering this organ.

Native names :—Ga-Kwakwe agbo, Fanti-Okussi, Hausa-Kosu.

MUS MUSCULUS.

Specimens of this mouse were received at the laboratory chiefly from the bungalows of Europeans. None of them was found infected with plague. This mouse is very similar in appearance to the common English house mouse, and its habits appear to be the same.

PARASITES.

No fleas were found. The only parasites discovered on this mouse were :—

(a) An *Acarien* belonging to the *Dermanyssinae*.

(b) *A. Pediculus*—(*Sp. Nov.*). This louse is of dirty white colour and measures 1·24 mm. in length.

I attach a sketch showing details.

Native names :—Ga-Kwakwe, Fanti-N'kura.

MUS BARBARUS.

This mouse was received at the laboratory, but was not found infected with plague. It is the common field mouse of the Gold Coast, and is popularly called the Zebra mouse from the pale lateral longitudinal stripes on its body.

PARASITES.

(a) The only parasites found was an Acarien of the family Gamasidae and sub-family Dermanyssinae. The mandibles are didactyle and armed with teeth, and there is an anal and a sternal plate on the ventral surface which corresponds to the description of Lophoptes. (Megn.)

Native names :—Ga—Ngan kwakwe. Fanti—Abotu kura.

CATS.

Cat—*Felis domestica* (L).—A number of cats were sent for examination. Of these two had been killed in a house where human cases of plague had died a few days previously. One of these cats was found to be infected.

PARASITES.

1. Fleas—*C. serraticeps*.—This was the only species of parasites found upon the cats.

GUINEA PIG.

Guinea Pig—*Cavia cobaya*. (Schreb.)

A guinea pig which had been used to test the condition of infectiveness of a native dwelling, where human cases of plague had occurred, died three days after its removal from the house and was examined at the laboratory. It was found to have died of plague. The cervical and groin glands were enlarged and cultures of the heart blood gave positive results.

PARASITES.

1. No fleas were found.
2. *Gyropus ovalis* (Nitzsch).—This insect is of a dirty white colour with yellow markings on venter and on the edges of the head and thorax. It was found in considerable numbers in the fur.

I attach a detailed drawing.

BACTERIOLOGY.

During the epidemic all smears taken for diagnostic purposes were microscopically examined and cultures from the blood or organs of plague cases were made at the plague laboratory. The phenomena relied upon to prove the identity of the plague bacillus were :—

1. The production of Stalactites in neutral broth.
2. The production of involution forms on salt Agar Agar slopes (2.5 per cent. Sodium Chloride).
3. Growth of typical colonies in 24 hours on + 10 Agar Agar slopes incubated at 25° C.
4. Bipolar staining in smears or cultures from groin glands.
5. The presence in smears and cultures from lymph glands of a non-gram-fast bipolar staining bacillus.

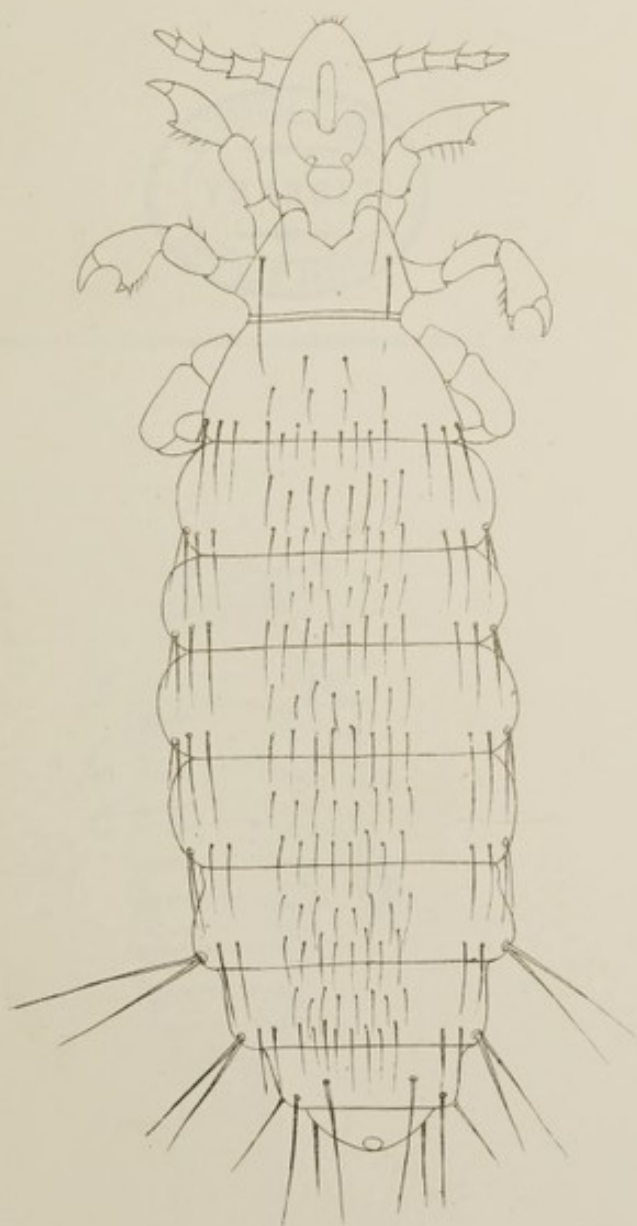
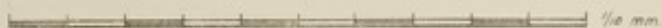
W. M. GRAHAM, M.B.

ACCRA.

24/6/08.

HAEMATOPINUS (Sp. Nov. ?) ($\times 83$)
From CRICETOMYS GAMBIANUS, ACCRA, 1908.

W. M. G.
f. PAGE 28.





ORTHOPTERON.

found on CRICETOMYS GAMBIANUS, ACCRA, 1908.

N, PAGE 23.

MANDIBLE, Ant. Surface.

W.M.G.

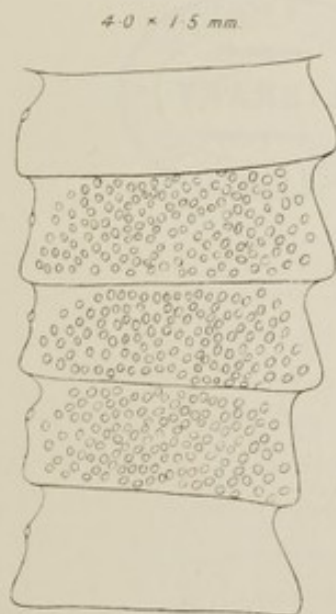




DAVAINIA, (Sp. Nov.)
 from CRICETOMYS GAMBIANUS, ACCRA, 1908.
I, PAGE 23.



SCOLEX x15.



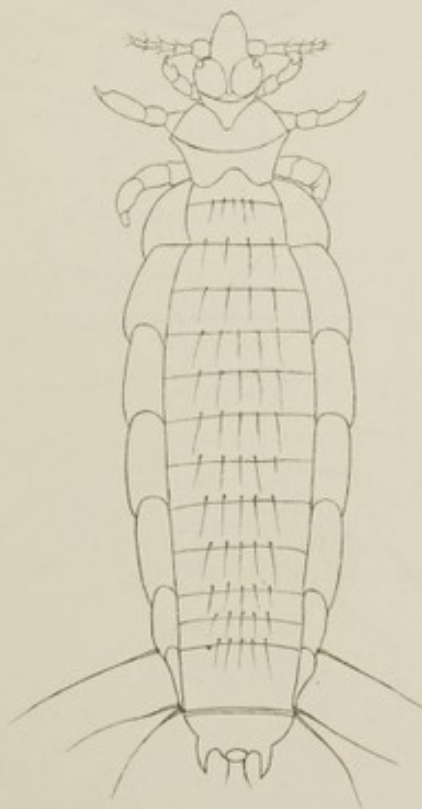
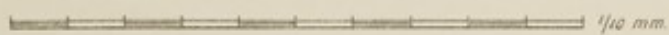
MIDDLE PROGLOTTIDES.



TERMINAL PROGLOTTIDES.



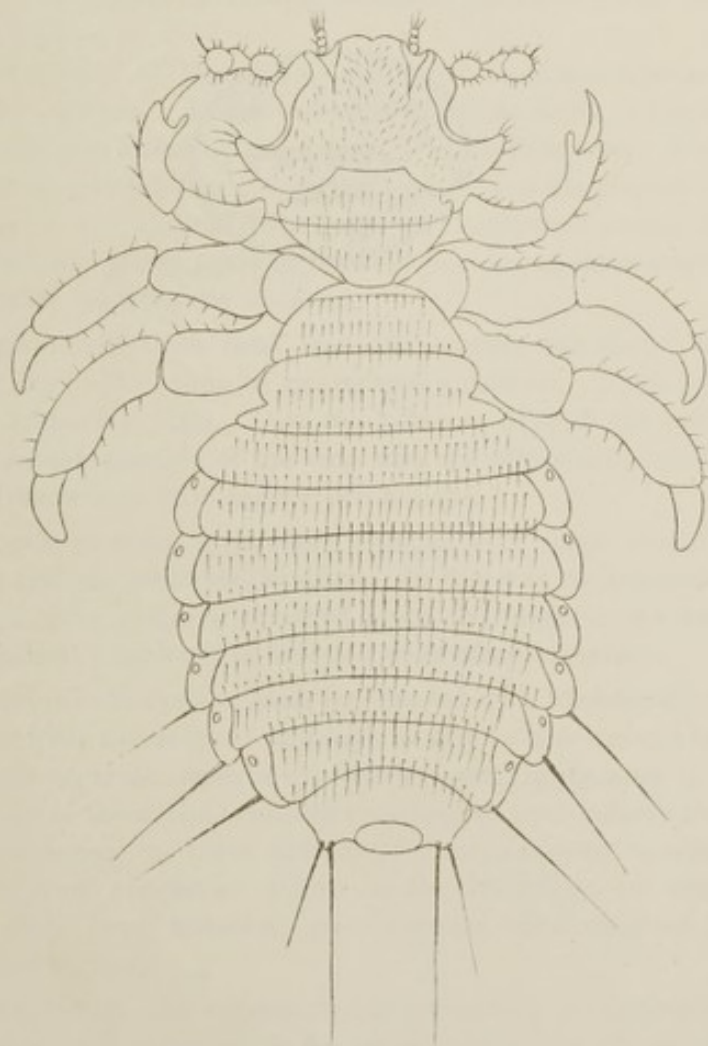
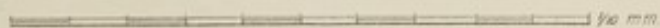
PEDICULUS. (Sp. Nov.?) (x 83)
from MUS MUSCULUS. ACCRA, 1908.
6, PAGE 25.





♂ *GYROPUS OVALIS*, (NITZSCH.)

2, PAGE 26.





REPORTS BY DR. A CONNAL.

(I)—INTENSIFICATION OF THE DANYSZ VIRUS.

Both the Danysz and the Liverpool variety of the Rat-virus were found to have deteriorated in strength to such an extent that feeding captive rats solely with infected food for as long as ten days produced no illness in the animals.

Following the directions laid down by Professor Simpson, experiments were carried out with a view to intensifying the virus on the same lines as met with success in South Africa.

Live rats were procured, and the following procedure was adopted :—

The material from the original cultures of the Danysz virus, sent out from England, was grown in Danysz bouillon for twenty-four hours, at a temperature of 37.5° c.

A small quantity of this (from one to two cc.) was injected into the peritoneal cavity of a rat. At the end of twenty-four hours, if death had not ensued, the animal was killed by chloroform. The inflammatory exudate from the peritoneum was withdrawn in a sterile pipette, and transferred to a sterile test-tube, where it was allowed to aerate for twenty-four hours at 37.5° c. This aerated fluid was grown again in bouillon, and the cycle re-started by the injection of another rat from the material.

The original cultivation used was one bearing the date "30th April, 1908," as being the limit of time of guaranteed virulence. These experiments were begun on 12th July, 1908. Care was taken to have all the culture-media alkaline. The actual injection of the virus and the subsequent recovery of the peritoneal fluid were done with aseptic precautions.

At each post-mortem, smears and cultures were made from the spleen, the heart-blood and the peritoneal exudate. In this way contaminations could be detected, and pure cultures obtained from the spleen or the heart-blood, should the peritoneal fluid itself be infected with other organisms.

At the end of each cycle, a fresh rat was fed with the intensified growth, and another rat with the original material, so that a check could be kept on the results. Four separate series of experiments were made more or less concurrently. In two of these, the organism remained in pure culture throughout. In the other two series, on three occasions, contaminations occurred in the peritoneal fluid, from accidental injury to the intestines, on opening the abdomen. In each case, however, pure cultures were obtained from the spleen and the heart blood.

Unusual difficulty was experienced in preventing contaminations in the culture-media, due, most probably, to the moist heat of the climate favouring the growth of yeast-fungi and other organisms.

In Accra, four species of rats are commonly met with—

1. *Mus decumanus*.
2. *Mus rattus*.
3. *Cricetomys gambianus* (Waterhouse).
4. A small brown field rat.

M. Decumanus is the most common, and *M. Rattus* the least common.

Species 1 and 2 are found in the houses, in the stores and on the sea beach. They are voracious, eating grain, bread, flesh, etc., and they have a decided preference for decomposed fish and stinking meat. They do much damage in the stores, gnawing the woodwork, the leather covers of ledgers, etc.

Species 3 and 4 frequent the fields and compounds, only rarely entering the houses. They are mainly herbivorous.

Mus Musculus is not so common as at home.

The first injection, in each series of experiments, was made into the small field-rat, and it was found that the virus was intensified sufficiently to kill these by feeding, after two passages through the peritoneum.

The third rat in each series was either *M. Decumanus* or *M. Rattus*, and other four passages through the peritoneum (six passages in all) were required to enable the virus to kill these species by feeding.

The field rats never survived the injection longer than six to eight hours. In the earlier stages, *M. Decumanus* and *M. Rattus* lived eighteen to twenty-four hours, but later, this period was shortened to eight or twelve hours after injection.

In the feeding experiments, the field rats never lived longer than five days, four days being the usual period. *M. Decumanus* and *M. Rattus* survived the feeding for eight to ten days.

Signs of illness appeared soon after the injection. Abdominal swelling became apparent in three or four hours, the respirations were rapid, the fur was raised, and walking was difficult. The animal usually lay on its belly in a corner of the cage.

The post-mortem appearances of the injected rats were:—congestion of the superficial vessels: slight inflammation of the glands of the neck, axilla and groin: enlargement of the spleen: congestion of the liver and of the kidneys: intense inflammation of the peritoneum, with an exudate, turbid in the earlier animals and purulent in the later ones: swelling and redness of the mesenteric glands: very marked congestion of the intestines with hæmorrhagic areas in the first rats of the series, and areas of necrosis in the later rats: and swelling and redness of the Peyer's patches.

The signs of illness in the fed rats usually began on the third day in the field-rats, and on the fifth or sixth day in *M. Decumanus* or *M. Rattus*. The commonest signs observed were: loss of appetite, lethargy, rapid respirations, tremors, raised fur, staggering gait and emaciation.

The post-mortem appearances in the fed rats were: little subcutaneous fat, enlargement of the superficial glands, swelling and congestion of the spleen, deep congestion of the liver, pallor of the kidneys, patches of inflammation in the intestines, congestion, and in some cases actual ulceration of the Peyer's patches, and enlargement of the mesenteric glands.

As regards *Mus Cricetomys*, the experiments were less complete and not so satisfactory. In the first place, difficulty was experienced in getting a

sufficient number of them, as they are wary and difficult to trap. They are large unwieldy animals to handle.

Intra-peritoneal injection of the non-intensified virus did not kill this species within two days, and when the animal was chloroformed at the end of this time, only a slight inflammation of the peritoneum was found, with little or no exudation. The seventh and eighth rats in two of the series of experiments were of this species (*M. Cricetomys*), *i.e.*, rats 1 and 2 were the field-rat, 3, 4, 5, and 6 were *M. Decumanus* or *Rattus*, and 7 and 8 were *M. Cricetomys gambianus*. The injections were not carried farther than this on account of the risk of weakening the organism again. Only one of the control animals died (at stage 8 of the series), but all the others were decidedly ill within fourteen days of feeding. The signs of illness and the post-mortem appearances were similar to those already described. Table I. gives the details in Series I. of the experiments.

At this period (31st July, 1908) a number of cultures were made on agar, for distribution. The same precautions were taken to have the media alkaline. Some of the agar was made in the ordinary way with Liebig's Extract of Meat, and the rest was made from newly killed, healthy rats, by chopping them up finely after discarding the skin, head, feet and intestines. This latter procedure was suggested by Dr. R. M. Buchanan, City Bacteriologist, Glasgow. No decided difference was noticed between the organisms in these two varieties of medium, but the growth was more rapid and more abundant in the rat-agar than in the ordinary agar.

Weekly doses were distributed in Accra, as follows :—

Date.	No. of Doses.	Place.
31/7/08	200	Charter's House (infected area).
7/8/08	400	King Edward Street
14/8/08	400	Commercial Stores.
21/8/08	600	" " "
28/8/08	200	" " and private bungalows.
4/9/08	600	" " "
11/9/08	400	" " "
TOTAL 2,800		

In Accra, it was found that the rats ate the infected bread very readily if it had a strong odour. Accordingly, instead of following the usual directions for the preparation of the virus, by shaking the agar-culture in saline solution, the organism was grown directly in a large quantity of Danysz Bouillon, in Ehrlenmeyer flasks.

This fluid, after twenty-four hours' incubation, showed an abundant growth, and had developed a strong smell. The bread was soaked in this fluid, diluted with an equal quantity of saline solution, and distributed in the evening. By morning, as a rule, every piece of bread had disappeared. As regards the results of this general distribution of the virus, no definite information was obtained up to the middle of September, 1908, when my term of special duty expired. The Agents in the various commercial stores stated

that they had noticed a decided diminution in the number of rats fourteen to twenty-one days after the virus had been laid down. No dead rats were found, and no sickly animals were observed.

The agar cultures of the virus in tubes, sealed with paraffin, were distributed as follows :—

Date.	Axim.	Sekondi.	Cape Coast.	Tarquah.	Kitta.	Winnebah.
12/8/08	...	12	18	18	8	8
26/8/08	...	12	18	18	6	6
9/9/08	...	12	18	18	6	6
		36	54	54	20	20—Total 204.

Instructions regarding the mode of preparation of the virus were sent to each of these stations, along with a tin of Danysz Extract for making bouillon.

Over 1600 agar tubes of the intensified virus were left in stock on 13th September, 1908, ready for use, and it was anticipated that this supply would last for at least two months.

No.	Hour and date of injection.	Hour and date of death.	Condition of peritoneal exudate.	Organism pure in			Species of rat.	Results of the feeding experiments.
				Peritoneal exudate.	Heart blood.	Spleen.		
1	1 p.m. 12/7/08	9 p.m. 12/7/08	Turbid	+	+	+	F.R.	No effect on F.R., M.D., M.R., C.G.
2	9 a.m. 15/7/08	3 p.m. 15/7/08	"	+	+	+	F.R.	F.R. died in 4 days. M.D. unaffected.
3	3 p.m. 17/7/08	10 a.m. 18/7/08	"	+	+	+	M.D.	F.R. died in 4 days. M.D. and M.R. unaffected.
4	10 a.m. 20/7/08	1 a.m. 21/7/08	Purulent	+	+	+	M.D.	M.D. transient illness on 6th day.
5	8 a.m. 23/7/08	6 p.m. 23/7/08	"	+	+	+	M.R.	M.D. decided illness 5th to 7th days.
6	9 a.m. 26/7/08	4 p.m. 26/7/08	"	+	+	+	M.R.	M.D. and M.R. died in 9 days.
7	8 a.m. 29/7/08	1 a.m. 30/7/08	"	+	+	+	C.G.	M.D. and M.R. died in 9 days. Transient illness 12th day in N.B.
8	8 a.m. 2/8/08	6 p.m. 2/8/08	"	+	+	+	C.G.	M.D. and M.R. died in 9 days. C.G. died on 14th day.

F.R. = Field-rat. M.D. = *Mus decumanus*. M.R. = *Mus rattus*. C.G. = *Cricetomys gambianus*.

(II)—POST-MORTEM EXAMINATIONS.

All the patients who died from plague, in the Contagious Diseases Hospital, and in the town or neighbourhood of Accra, were examined for the purposes of verification. In addition, all the cases dying under suspicious or unknown circumstances were brought to the post-mortem room.

Many deaths only came under notice when the relatives sought a burial permit, and in no case was a certificate granted until the cause of death was ascertained.

A total of 95 post-mortem examinations was made between 3rd June, 1908, and 8th September, 1908. Of this number, 26 were plague cases, and these will be treated in a separate section of this report.

The remaining 69 are classified as follows :—

DISEASE.	Males.	Females.	TOTALS.
Malaria	5	5	10
Acute Pneumonia	6	2	8
Dysentery	4	3	7
Phthisis Pulmonalis	3	2	5
Chronic Nephritis, etc.	0	4	4
Acute Gastro-Enteritis	2	2	4
Tubercular Peritonitis	2	2	4
Organic Heart Disease	1	2	3
Broncho-Pneumonia (acute)	2	1	3
Empyema	1	1	2
Aneurism	1	1	2
Septic Salpingitis	0	2	2
In Pregnancy... ..	0	2	2
Too Decomposed	1	1	2
Septicæmia	0	1	1
Miliary Tuberculosis	1	0	1
Erysipelas	0	1	1
Acute Leukæmia	1	0	1
Strangulated Hernia	1	0	1
Rupt. Gastric Ulcer	0	1	1
Septic Peritonitis	1	0	1
Acute Osteomyelitis	1	0	1
Malformation of Heart	0	1	1
Unviability	1	0	1
Marasmus	1	0	1
25	35	34	69

AGE PERIODS.

0-1 Year.			1-2 Years.			2-3 Years.		
Broncho-Pneumonia ... M.			Empyema M.			Malaria (2) M.		
Unviability M.			Broncho-Pneumonia... M.			Malaria F.		
Gastro-Enteritis... .. M.			Tub. Peritonitis (2) ... M.			Dysentery F.		
Malaria M.						Phthisis F.		
Malaria (3) F.								
Congenital Heart ... F.								
Pneumonia F.								
Septicæmia F.								
Male 4.	Female 6.		Male 4.	Female 0.		Male 2.	Female 3.	
TOTAL ... 10.			TOTAL ... 4.			TOTAL ... 5.		
14·4 per cent.			5·79 per cent.			7·2 per cent.		
3-4 Years.			4-6 Years.			16-20 Years.		
Dysentery M.			Leukæmia M.			Dysentery (2) ... M.		
Dysentery F.			Malaria M.			Pneumonia M.		
Broncho-Pneumonia ... F.			Malaria F.			Miliary Tuberculosis M		
			Empyema F.			Pregnant F.		
			Tub. Peritonitis ... F.					
Male 1.	Female 2.		Male 2.	Female 3.		Male 4.	Female 1.	
TOTAL ... 3.			TOTAL ... 5.			TOTAL ... 5.		
4·3 per cent.			7·2 per cent.			7·2 per cent.		

AGE PERIODS—continued.

21-24 Years.			25-30 Years.			31-40 Years.		
Sep. Peritonitis ...	...	M.	Phthisis ...	...	M.	Pneumonia (2) ...	...	M.
Phthisis ...	...	M.	Dysentery ...	...	M.	Phthisis ...	...	M.
			Pneumonia ...	...	M.	Aneurism ...	...	M.
			Marasmus ...	...	M.	Strangulated Hernia...	...	M.
			Pregnant ...	...	F.	Malaria ...	...	M.
			Too Decomposed ...	...	F.	Osteomyelitis ...	...	M.
			Salpingitis ...	...	F.	Phthisis ...	...	F.
			Tub. Peritonitis ...	...	F.	Heart Disease ...	...	F.
						Dysentery ...	...	F.
						Erysipelas ...	...	F.
Male 2.	Female 0.		Male 4.	Female 4.		Male 7.	Female 4.	
TOTAL ...	2.		TOTAL ...	8.		TOTAL ...	11.	
2·8 per cent.			11·5 per cent.			15·9 per cent.		

41-50 Years.			51-60 Years.			61-70 Years.		
Pneumonia ...	...	M.	Pneumonia ...	...	M.	Heart Disease ...	...	M.
Too Decomposed ...	...	M.	Pneumonia ...	...	F.	Gastro-Enteritis ...	...	M.
Aneurism ...	...	F.	Chr. Nephritis ...	...	F.	Chr. Nephritis ...	...	F.
Chr. Nephritis (2) ...	...	F.	Salpingitis ...	...	F.	Heart Disease ...	...	F.
Gastro-Enteritis...	...	F.	Rupt. Gastr. Ulcer ...	...	F.			
			Gastro-Enteritis ...	...	F.			
Male 2.	Female 4.		Male 1.	Female 5.		Male 2.	Female 2.	
TOTAL ...	6.		TOTAL ...	6.		TOTAL ...	4.	
8·6 per cent.			8·6 per cent.			5·79 per cent.		

Percentage of Males ...	...	...	...	...	...	...	50·72
" Females ...	...	...	...	...	...	...	49·27
" Children, under 1 year	...	...	...	...	...	...	14·4
" " 2 years	...	...	...	...	...	...	20·29
" " 3 "	...	...	...	...	...	...	27·5
" " 4 "	...	...	...	...	...	...	31·8
" " 6 "	...	...	...	...	...	...	39·1
" Cases 20 "	...	...	...	...	...	...	46·2
" " 24 "	...	...	...	...	...	...	48·9
" " 30 "	...	...	...	...	...	...	60·8
" " 40 "	...	...	...	...	...	...	76·8
" " over 40 "	...	...	...	...	...	...	23·18
" " 50 "	...	...	...	...	...	...	14·4

41 or 59·4 per cent. were due to Acute diseases.

10 or 14·4 " " " Tubercular diseases.

10 or 14·4 " " " Malaria.

8 or 11·5 " " " Acute Lobar Pneumonia.

The great majority of the cases were examined within twenty-four hours of death.

The two cases which had been dead for four days and which were not diagnosed, showed a very advanced degree of putrefaction.

Three of the cases of acute pneumonia had purulent pericarditis and empyema in addition, and a fourth had pneumococcal septicæmia. Such complications may account for the high mortality rate of pneumonia amongst the natives.

Of the Aneurism cases, in the male patient there was rupture into the trachea, and in the female there was erosion of the sternum and a secondary septic pneumonia of the left lung.

Four of the cases of Phthisis Pulmonalis had advanced cavity-formation in one lung, and condensation with caseous nodules in the other lung, besides having tubercular foci elsewhere.

The fifth case, that of a child, had an acute double broncho-pneumonia.

A large proportion of all the cases had intestinal *Ascarides Lumbricoides*, and it was not an uncommon sight to see these worms crawling from the mouth or nostrils as the body lay on the mortuary table.

Pleural adhesions of old standing were very common. As a rule the lungs were singularly free from pigmentation.

Cirrhosis of the liver was frequently met with, a "hob-nailed" appearance being present in many of the cases over thirty years of age.

In two cases of acute gastro-enteritis, females of advanced years, the spleen was remarkably small, no bigger than a tangerine orange, and suggestive of cicatricial atrophy. Tape worms were only once met with, the variety being *T. solium*.

Many of the bodies were smeared with a greenish-yellow powder, of a very pungent odour. This had been applied by native "medicine men." In most cases, apparently, the powder had been simply rubbed on the skin, but in some instances small cuts had been made, like "wet-cupping," and the powder applied to these.

Several of the cases were strongly suggestive of poisoning, the result, probably, of Fetish customs. The two pregnant women in particular come under this category, while some of the cases of gastro-enteritis were also suspicious.

On two occasions an analysis was made on samples of bread sold in the native market. Although the flour had previously been proved to be of good quality, undue acidity and an excess of moisture were found conditions likely to favour fermentation. The crumb, also, contained numerous fine particles of gritty sand. These factors, and the impure drinking water, may conduce to the prevalence of acute gastric and intestinal diseases.

III.—POST-MORTEMS ON PLAGUE CASES.

From 3rd to 26th June, 1908, twenty-one cases of plague were examined, and other five post-mortems were done between 29th July, 1908, and 15th August, 1908. Of the total twenty-six cases, twenty-three were pneumonic plague, two others had septicæmia in addition, and the last had septicæmic plague solely. There were no cases of bubonic plague during this time.

The percentage of females was 80·7, and 73 per cent. were aged from forty years upwards. These two occurrences may be explained by the fact that the oldest female relatives, according to the native custom, prepare the corpse for burial. It is usual to wrap the body in all the "cloths" that

belonged to the person in life. This dressing requires much manipulation as the body lies on the floor of the hut. The dust which is raised during these proceedings, and which is inhaled with every breath, must contain countless numbers of plague bacilli, because the patients, during their illness, expectorate freely and never use a rag or receptacle for the sputum. Another argument lies in the fact that the women of the household sleep in a different apartment, sometimes even in a different house, from the men. The male patients were all married, and were never the sole death from plague in a household. Direct contact was proved in each of the twenty-six cases except one.

The youngest case was aged one year and the next youngest was sixteen years.

The difficulty in getting accurate statements with regard to age, especially with the older people, is very great, and the probable error, after the age of fifty years, is at least plus or minus ten.

The ascertained ages were:—

Males: 1 year, 29 years, 30 years, 40 years (2). Total 5.

Females: 16 years, 23 years, 30 years (2), 40 years (2), 45 years (2), 48 years (2), 50 years (3), 56 years, 58 years, 60 years (3), 65 years (2), 75 years. Total 21.

The septicæmic case was aged 40 years. (Female.)

The two cases with pneumonic and septicæmic plague were aged 40 years and 56 years. (Females.)

In every case smears and cultures were taken from the lungs, the heart-blood and the spleen.

Positive.				Positive.			
Smears	{	Lungs	... 26.	Cultures	{	Lungs	... 26.
		Blood	... 2.			Blood	... 3.
		Spleen	... 10.			Spleen	... 13.

Specimens and sections were preserved in most cases, for histological examination.

The organism recovered from the lungs was cultivated in Agar, at room temperature, and then submitted to the following tests:—

1. Decolourisation by Gram's Method of staining.
2. Production of involution forms on dry agar.
3. Stalactite formation in oil-broth. (Haffkine's test).
4. Infection of a guinea-pig by rubbing into the nasal mucous membrane, or by subcutaneous injection.

Typical smears were preserved, and many were sent to other stations for reference.

The post-mortem appearances presented marked similarity; general venous congestion of the tissues, the muscles very dark in colour, with considerable oozing of dark blood on section: lung consolidation in different stages, and often more or less patchy, varying from a stage of acute congestion to one of a brownish or yellowish-red hepatisation, with much oozing of a sanguineo-purulent fluid on section: the bronchi congested and filled with secretion: great enlargement and redness of the bronchial glands: a gelatinous or sero-fibrinous pleural exudate, with sub-pleural petechiæ: an excess of

yellow serous pericardial fluid, with subpericardial petechiæ: intense congestion of the fauces and the trachea, especially near the bifurcation: occasionally ulceration of the tonsils: infrequently congestion of the oesophagus: a marked hæmorrhagic congestion of the gastric and duodenal mucous membrane, and a patchy redness, sometimes very extensive, throughout the jejunum, ileum and colon: little or no enlargement or redness of the mesenteric glands; the head of the pancreas notably congested: the spleen seldom enlarged, but always dark-red in colour and of firm consistence: the liver and kidneys darkly congested.

The smears from the lungs were always characteristic. The most useful stain was dilute carbol-fuchsin. Under the microscope, most of the field was occupied by plague bacilli, and although these were present in immense numbers, they did not tend to group or clump together, but were evenly distributed around fairly numerous red blood corpuscles, leucocytes and endothelial cells. The bacilli varied in size and in shape, coccoid forms being numerous. Their staining power also varied, and the bi-polar appearance was present in the majority.

The organisms grew readily on ordinary agar and on rat agar. The best growth was observed at a temperature of 25° c. to 30° c..

A table giving the proportion of the lobes affected is appended.

As regards the clinical signs and symptoms of the disease, the following were the most important amongst the few cases that were treated:—

As far as could be ascertained, in eleven cases the average duration of illness was 3·27 days, the longest period being eight days (?), and the shortest one day (?).

The patients were acutely ill. The respirations were rapid and the alae nasi were called into play. The pulse was quick and soft. The tongue was moist, with a little white fur in the centre, and with pink tip and edges. The fauces were acutely congested. Dulness over an area of the lung could usually be found, with tubular breathing, and fine crackling rales. Occasionally pleural friction could be detected. Some degree of tympanitis existed, and there was no splenic enlargement. The motions were frequent and loose. The urine was of the usual febrile characters. The sputum was abundant, of a thin watery consistency, and of a brownish colour. There was usually mental exhilaration rather than stupor, and mild delirium with considerable restlessness. There was never any respiratory difficulty or cyanosis as death approached. The cases resembled those of acute lobar pneumonia, except that the sputum was watery, the illness was more acute and the death more sudden.

Yersin's curative serum was tried, both subcutaneously and intravenously, but with no beneficial effect.

The sputum from these cases, and from all suspicious cases in the town, was examined. (1) By stained smears; (2) by cultivation on agar slopes; and (3) by rubbing into the nasal mucous membrane of a guinea-pig or a rat. This last method was found to be the most reliable, causing the death of the animal in from three to four days, if positive.

Sixty-three specimens of sputum were examined.

AGE PERIODS OF PLAGUE CASES.

1-2 yrs.	16-20 yrs.	21-24 yrs.	27-30 yrs.	31-40 yrs.	41-50 yrs.	51-60 yrs.	61-70 yrs.	71-80 yrs.
1 M.	1 F.	1 F.	2 M. 2 F.	2 M. 2 F.	7 F.	5 F.	2 F.	1 F.

LOBES OF LUNGS AFFECTED.

1	Right base alone	...	...	...	...	...	8
2	Left base alone	...	...	...	...	...	4
3	Both bases equally	...	...	...	...	...	4
4	Right base more advanced than left	...	...	...	...	...	3
5	Left apex alone	...	...	...	...	...	2
6	Whole left lung and right base	...	...	...	...	...	1
7	Whole left lung alone	...	...	...	...	...	1
8	Left base more advanced than right	...	...	...	...	...	1
9	Right apex alone	...	...	...	...	...	1

AGE AND SEX IN LOBES AFFECTED.

1	2	3	4	5	6	7	8	9
M. 29 yrs.	M. 1 yrs.	M. 40 yrs.	M. 40 yrs.	F. 23 yrs.	F. 50 yrs.	F. 16 yrs.	F. 40 yrs.	F. 75 yrs.
F. 48 "	M. 30 "	F. 30 "	F. 45 "	F. 50 "	—	—	—	—
F. 48 "	F. 45 "	F. 30 "	F. 60 "	—	—	—	—	—
F. 50 "	F. 56 "	F. 58 "	—	—	—	—	—	—
F. 60 "	—	—	—	—	—	—	—	—
F. 60 "	—	—	—	—	—	—	—	—
F. 65 "	—	—	—	—	—	—	—	—
F. 65 "	—	—	—	—	—	—	—	—
M. 1, F. 7 = 8	M. 2, F. 2 = 4	M. 1, F. 3 = 4	M. 1, F. 2 = 3	F. 2	F. 1	F. 1	F. 1	F. 1

DURATION OF ILLNESS.

1 day	F. 16 yrs.					1
2 days	F. 35 yrs.	F. 70 yrs.				2
3 days	F. 23 yrs.	F. 40 yrs.	M. 40 yrs.	F. 50 yrs.	F. 56 yrs.	5
4 days	F. 60 yrs.	F. 60 yrs.				2
8 days	F. 40 yrs.					1

4.—INOCULATION OF PIGS AND CHICKENS.

Attempts were made to cause plague in young pigs and chickens. The material used in each case was taken from a verified case of human plague.

The first series of experiments were done on five young pigs and two chickens, all able to feed themselves.

A different method of inoculation was adopted in each of the animals.

Pig (1) had lung-juice (made by finely chopping the infected lung substance) poured down the nose and throat.

Pig (2) ate pieces of infected lung and had also lung-juice poured down the nose and throat.

Pig (3) had a subcutaneous injection of five cubic centimetres of lung-juice.

Pig (4) had the skin of the abdomen scarified, and lung-juice well rubbed into the raw surface.

Pig (5) was fed on bronchial glands, spleen and clotted heart-blood.

Chickens (1) and (2) were fed on pieces of infected material.

Pigs (1), (2) and (3) were inoculated on 18th June, 1908, with material from the patient Ahiney, who died on 17th June, 1908. Nine days later, pigs (1) and (2) were again fed with infected material, portions of the lungs, liver, spleen, heart, intestines, glands and clots of blood from a guinea-pig which had died from plague, four days after inoculation with the organism recovered from the lungs of the same patient (Ahiney). Pig (4) and chicken (1) were inoculated, on 19th June, 1908, with lung-juice from the patient Dainsua who died on 18th June, 1908. Pig (5) was fed on 26th June, 1908, with material taken from the case of Mrs. Addoo, who died on that day. While the animal was drinking from a feeding-cup, it broke off, chewed and swallowed some portions of the spout, and it was hoped that these would damage the intestinal mucous membrane, and favour the absorption of the plague bacilli.

Chicken (2) was fed with the material from a guinea-pig which had died from septicæmic plague, three days after inoculation per nasam, with the sputum of a case of human plague.

In the second series of experiments, pig (1), on 6th August, 1908, was again fed with infected material from a fresh case of human plague (a woman, Korkodai, who died on that day). The animal greedily ate parts of the infected lung and spleen, and swallowed some clotted blood until it choked and seemed satisfied. On this date, too, pig (5) had a subcutaneous injection of fifteen cubic centimetres of lung juice, clotted blood and pleural exudate from the same case (Korkodai).

All the animals were watched for more than forty days after inoculation. Their normal temperature and weight had been previously ascertained, and thereafter the temperature was taken per rectum morning and evening, and the weight was registered on each alternate evening.

The chickens had no rise of temperature, and there never were any signs of illness.

The pigs developed an illness which was essentially the same in each, but differed in severity according to the mode of infection. In none was the disease fatal.

This illness was characterised by a rise of temperature within 24 to 36 hours; an equally rapid fall ensued, followed by an exacerbation as high or higher than the primary rise in a similar period of time, and thereafter there was a second fall, succeeded by a slow, slight rise, and gradual defervescence with small remissions.

Pigs (4) and (1) and (5) on their second occasions had the least severe illnesses, while pig (3) was the most acutely ill. The signs of illness were: emaciation, blood-shot eyes, rapid respirations, nasal discharge, glandular swellings, constipation, and staggering gait. In some, there was loss of appetite.

Pigs (3) and (5) (the latter after its second inoculation) developed marked glandular swellings in the neck and groin. These did not suppurate, and they all disappeared within three weeks.

In pig (3), at the end of the first week of illness, there was a large irregular area of sloughing, three inches long, by two inches broad, and three-quarters of an inch deep, at the site of injection. This took over six weeks to heal. At various times, too, abscesses appeared, notably at the right elbow-joint, and on the left tarsus. These were incised, and smears and cultures were made from the peculiar curdy matter which they contained, but the plague bacillus was not found. The animal (pig 3), lost three and a quarter pounds in weight within a fortnight (original weight, fifteen and three-quarter pounds). At the end of three months it had lost another pound and a half, when it was killed by chloroform. At the post-mortem, nothing note-worthy was found except an abscess behind the upper end of the sternum, from which the plague bacillus again was not isolated.

In pig (5), although it received, at its second inoculation, three similar doses to pig (3), there was no sloughing. At the three sites of injection, however, abscesses appeared in a few days. These were incised within ten days, but the plague organism was not found. The animal lost two pounds in weight in six weeks at the end of which time it was chloroformed. At the post-mortem no gross lesions were observed, nor was *B. Pestis* recovered from any of the organs.

The weights of pigs (1), (2) and (3) and (4) were first taken four days after the infection, and (1), (2) and (4) all gained in weight from that date. Pig (5) in its first illness also gained in weight.

Pigs (3) and (5) were the only animals killed for post-mortem examination. All the other pigs completely recovered within two months of inoculation.

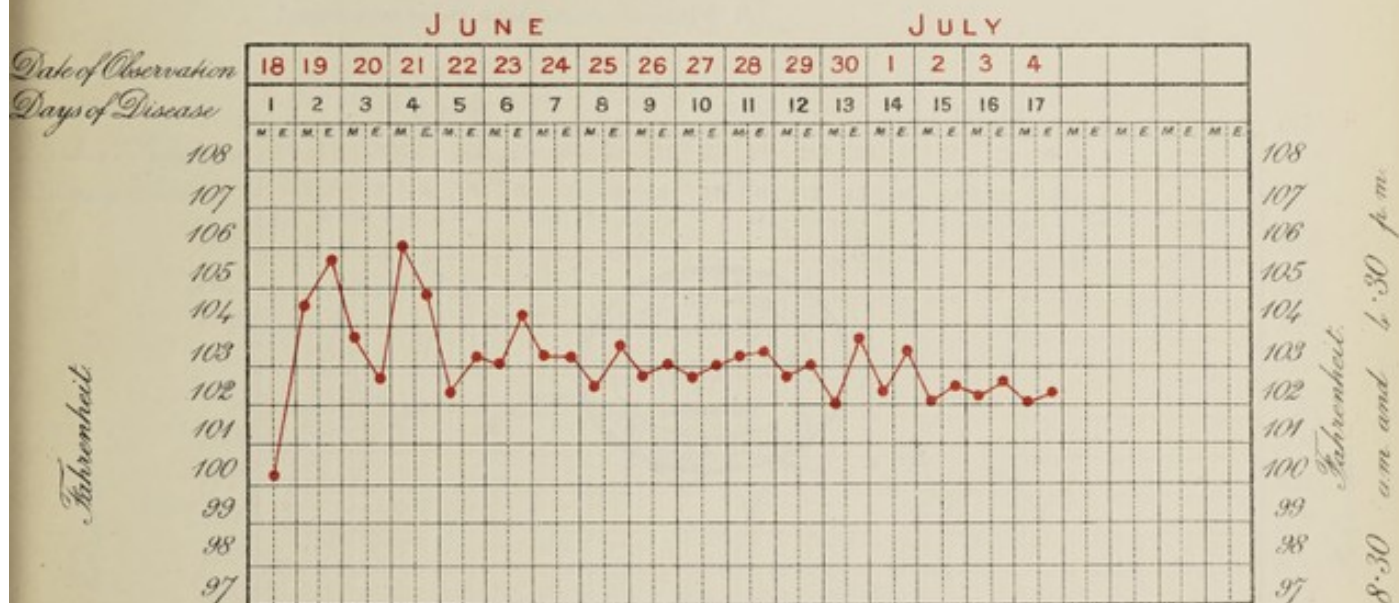
PIG (1). Male. Trunk and Head black, legs white.

Date:—18th June, 1908.

Time:—9 a.m.

Method of infection:—Lung juice of Ahiney (17/6/08) poured down nose and throat
About $\frac{3}{8}$ fl given.

Temperature before administration:—100.2° F

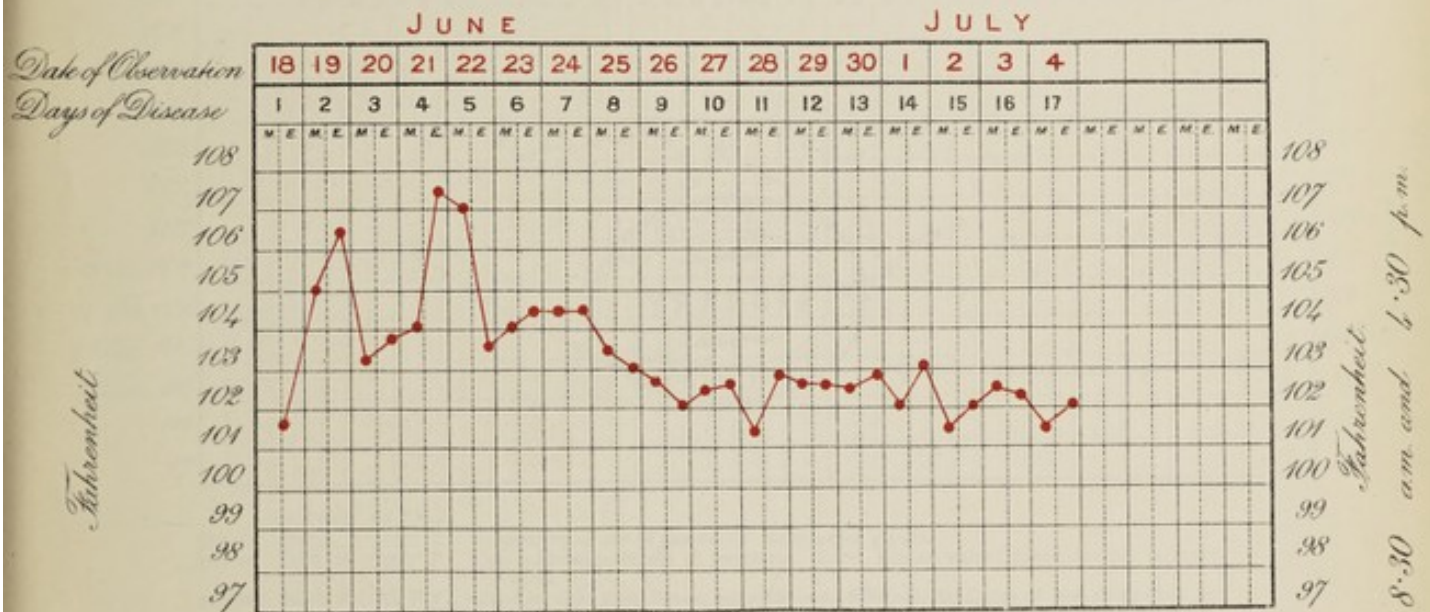


	A.M. Temp.	P.M. Temp.	
19/6/08	104.6° F.	105.6° F.	Eyes clear.
20/6/08	103.8° F.	102.8° F.	
21/6/08	106° F.	104.8° F.	"Snuffling" breathing. Emaciating.
22/6/08	102.4° F.	103.2° F.	No glandular enlargements. Rapid respirations and "snuffling." Eyes red. Stands unsteadily and c legs wide apart. Wants to rest. Weight, 14 lbs.
23/6/08	103.4° F.	104.2° F.	Constipated motions with slight trace of blood and mucus. Rectum congested. Takes food.
24/6/08	103.2° F.	103.2° F.	Proctitis worse. Eyes not red. Looks better. Stands steadily. Weight, 14½ lbs.
25/6/08	102.6° F.	103.6° F.	Considerable strains at defecation.
26/6/08	102.8° F.	103° F.	Still some proctitis and snuffling; otherwise better. Weight, 14 lbs.
27/6/08	102.8° F.	103° F.	A little pus in motions. Was fed on half of liver, heart, spleen, intestine and infected glands, and left lung of guinea-pig which died to-day, after inoculation from culture of lung of Ahiney 2½ days ago.
28/6/08	103.2° F.	103.4° F.	Looks brighter. Is steadier. Proctitis less. Eyes clear. Weight, 14 lbs.
29/6/08	102.8° F.	103° F.	Fattening up. Improvement continued.
30/6/08	102° F.	103.6° F.	Weight, 14½ lbs.
1/7/08	102.4° F.	103.4° F.	Looks well. Congestion of rectum, almost gone.
2/7/08	102° F.	102.4° F.	Weight, 14½ lbs. Respirations and motions, normal.
3/7/08	102.4° F.	102.6° F.	Appears quite well again.
4/7/08	102° F.	102.4° F.	Weight, 15 lbs. Bright and lively.

Presence of *B. Pestis* in infected material in each case verified by:—(1) Haffkine's Test. (2) Production of involution forms on dry agar. (3) Chain-growth in bouillon. (4) Injection into guinea-pig, and recovery therefrom, a bipolar bacillus, gram-negative.



Temperature before administration:—101.6° F.



	A. M. Temp.	P. M. Temp.	
19/6/08	105° F.	106·4° F.	Eyes slightly bloodshot in evening.
20/6/08	103·2° F.	103·8° F.	Eyes red. Emaciating.
21/6/08	104° F.	107·4° F.	"Snuffling" and rapid respirations. Considerable proctitis. Very unsteady when standing, and walks shakily. Takes food.
22/6/08	107° F.	103·6° F.	Rapid respirations. Nasal catarrh. Eyes red. Prefers lying down. Has emaciated considerably. Weight, 11½ lbs.
23/6/08	104° F.	104·4° F.	Eyes less red. Still wet nose and rapid breathing, and proctitis.
24/6/08	104·4° F.	104·4° F.	Much the same. Weight, 12 lbs.
25/6/08	103·4° F.	103° F.	Decided general improvement. Brighter. Steadier.
26/6/08	102·6° F.	102° F.	Weight, 12½ lbs. Proctitis gone.
27/6/08	102·4° F.	102·6° F.	Fed on right lung and half of liver, spleen, heart, intestine and infected glands of guinea-pig which died to-day, after inoculation by culture from lung of Ahiney 2½ days ago.
28/6/08	101·4° F.	102·8° F.	Weight, 12½ lbs. Improvement continued.
29/6/08	102·6° F.	102·6° F.	Proctitis gone. Beginning to fatten. Active.
30/6/08	102·4° F.	102·8° F.	Weight, 12½ lbs.
1/7/08	102° F.	103° F.	Looks quite well again.
2/7/08	101·4° F.	102° F.	Weight, 12½ lbs.
3/7/08	102·4° F.	102·2° F.	
4/7/08	101·4° F.	102° F.	Normal appearance.



PIG (3). Female. All black. Left ear nicked.

Date:—18th June, 1908.

Time:—5.30 p.m.

Method of infection:—5 c.c. lung juice from Ahiney (17/6/08) injected subcutaneously into abdominal wall.

Temperature before administration:—102.4° F.

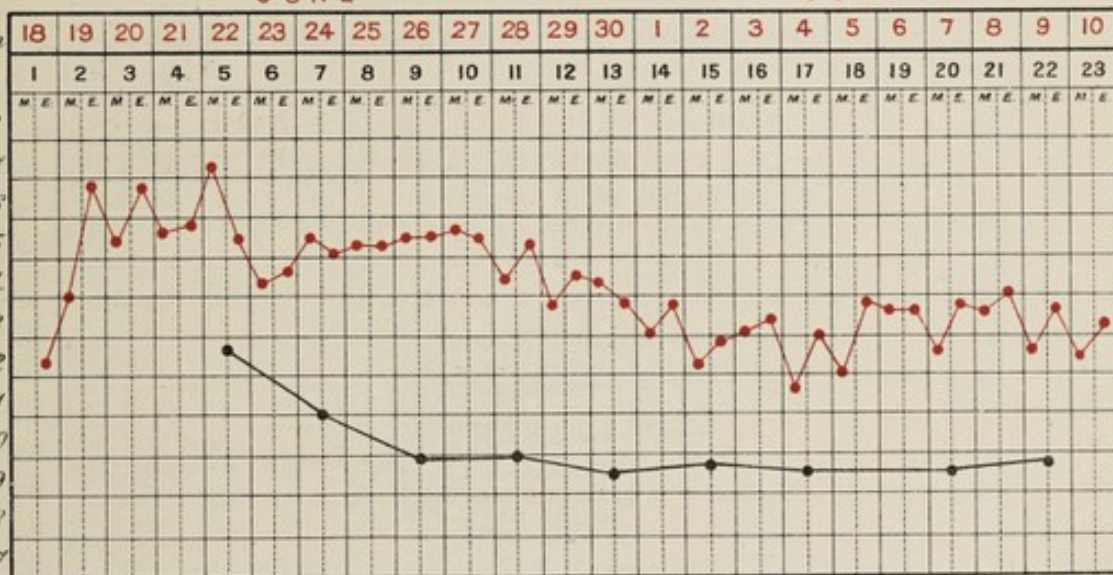
JUNE

JULY

State of Observation
Days of Disease

Fahrenheit

108
107
106
105
104
103
15 lbs. 102
14 lbs. 101
13 lbs. 100
12 lbs. 99
98
97



108
107
106
105
104
103
102
101
100
99
98
97

Fahrenheit
8.30 a.m. and 6.30 p.m.

	a.m. Temp.	p.m. Temp.	
19/6/08	104° F.	106.8° F.	No swelling at site of puncture. No enlarged glands.
20/6/08	105.4° F.	106.8° F.	Some infiltration at site of puncture. Gland, size of walnut, freely movable in right groin.
21/6/08	105.6° F.	105.8° F.	Gland in right groin firmer, same size and additional gland, size of pea, alongside. In left groin two or three small glands like peas. Gland, size of bean, in right side of neck. Infiltrated mass at site of puncture.
22/6/08	107.2° F.	105.4° F.	Is emaciating. Stands unsteadily, legs wide apart, hangs head, but walks well. Takes food. Eyes red and nose dry. Infiltrated mass, 3½ ins. square, at site of puncture. Glands in groins as before, but gland in right side of neck now size of chestnut, and evidently tender. Weight, 15½ lbs.
23/6/08	104.2° F.	104.6° F.	Infiltrated mass spreading up right side of thorax. Gland in right side of neck larger, but in right groin smaller and softer. Gland in left groin like hazel nut. Still takes food and is not more unsteady.
24/6/08	105.4° F.	105° F.	Infiltrated mass now triangular, apex in axilla, base at line joining anterior part of fold of groins, confined to right side. Glands rather smaller and softer. Eyes less red. Balance steadier. In evening, skin over infiltrated mass beginning to slough. Weight, 14 lbs.
25/6/08	105.2° F.	105.2° F.	Ragged hole, 1½ ins. long, ¼ in. broad, ½ in. deep, in centre of infiltrated mass, with sloughing greyish-white walls and floor. All glands rather smaller and softer. Animal more active and worse tempered. Eyes clear.
26/6/08	105.4° F.	105.4° F.	Emaciation proceeding and slough extending. Smears and cultures made from slough, groin gland and neck gland. No B. Pestis seen in smears. Weight, 13 lbs.
27/6/08	105.6° F.	105.4° F.	Slough extending. Animal weak but not unsteady in gait. Glands still softer but not breaking down.
28/6/08	104.4° F.	105.2° F.	Condition unchanged except for progressing slough.
29/6/08	103.8° F.	104.4° F.	As before. Weight yesterday, 13 lbs.
30/6/08	104.2° F.	103.8° F.	Sloughing cavity big enough to admit a fist. Small abscess right elbow joint containing white fine curdy matter. Smear negative of B. Pestis. Cultures made on 26/6/08 show mainly B. Pyocyaneus. Staphyl. Aur. and diplococci. Weight, 12½ lbs.
1/7/08	103° F.	103.6° F.	Thick curdy matter exuding from vagina. Smears show no B. Pestis. Animal still weak and thin, but takes food. Nose dry, but eyes clear. Clay coloured stools.
2/7/08	102.2° F.	102.8° F.	Cultures made on 30/6/08 (from elbow abscess) and from vaginal discharge on 1/7/08 show mainly B. Pyocyaneus, and no B. Pestis. Vaginal discharge still profuse.
3/7/08	103° F.	103.4° F.	Weight yesterday 12½ lbs. Slough still extending.
4/7/08	101.6° F.	103° F.	Weight, 12½ lbs. No vaginal discharge.
5/7/08	102° F.	103.8° F.	Abscess on elbow, disappeared.
6/7/08	103.6° F.	103.6° F.	Large abscess left tarsus and four or five small ones on abdomen; posterior to slough. Smears from all, negative of B. Pestis. Contents of abscesses, the same curdy matter. Animal still weak and prefers to lie down.
7/7/08	102.6° F.	103.8° F.	Weight, 12½ lbs. Abdominal abscesses gone but tarsus still swollen and discharging freely.
8/7/08	103.6° F.	104° F.	Glands in groins now very minute and in right side of neck, like hazel nut, soft but not fluctuant. Plate culture tarsus-pus, shows mainly B. Pyocyaneus.
9/7/08	102.6° F.	103.6° F.	Weight, 12½ lbs. Condition much the same.
10/7/08	102.4° F.	103.2° F.	Healthy granulations now in slough-cavity. Guinea-pig inoculated with tarsus-pus culture yesterday.



FIG (4). Female. All black. Right ear nicked.

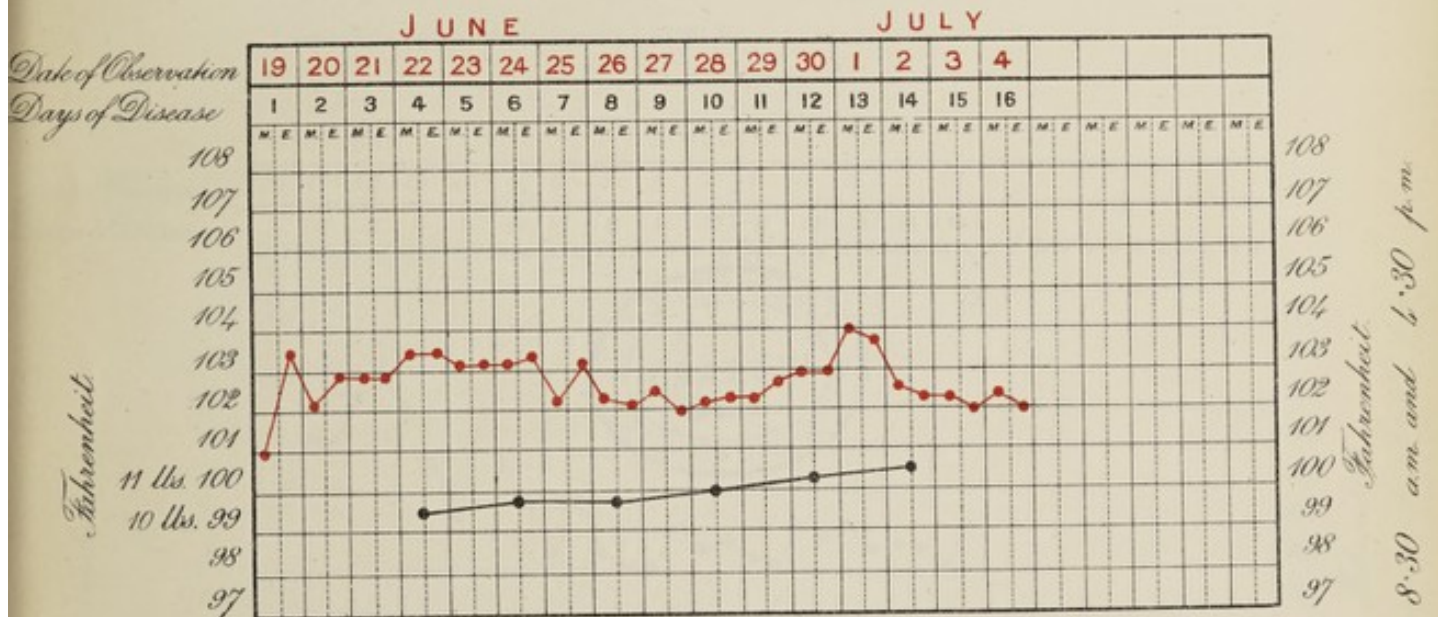
Date:—19th June, 1908.

Time —9.30 a.m.

Method of infection:—Large area on abdomen shaved and surface freely scarified Lung juice and lung substance of Dainsua (18/6/08), then rubbed well in.

Temperature before administration:—101° F.

Evening:—103.6° F.



	A.M. Temp.	P.M. Temp.	
20/6/08	102.2° F.	103° F.	Condition unaffected.
21/6/08	103° F.	103° F.	Glands in right groin like small peas.
22/6/08	103.6° F.	103.6° F.	Gland in left groin like bean, glands in right groin like pea. Is emaciating. Nose dry. Weight, 10½ lbs.
23/6/08	103.2° F.	103.2° F.	Glands as before. Constipated motions. Eyes not red. Stands a little unsteadily, but is evidently less affected than pigs 1, 2 and 3. Eats well.
24/6/08	103.2° F.	103.4° F.	As before. Weight, 10¾ lbs.
25/6/08	102.4° F.	103.2° F.	Glands in groins smaller and softer.
26/6/08	102.4° F.	102.2° F.	Weight, 10¾ lbs. No infiltration at seat of inoculation. Animal looks little affected.
27/6/08	102.6° F.	102° F.	As before.
28/6/08	102.2° F.	102.4° F.	Weight, 11 lbs. Glands in groins impalpable.
29/6/08	102.4° F.	102.8° F.	Animal apparently quite well again.
30/6/08	103° F.	103° F.	Weight, 11¼ lbs.
1/7/08	104° F.	103.8° F.	Nothing noteworthy observed.
2/7/08	102.6° F.	102.4° F.	Weight, 11½ lbs.
3/7/08	102.4° F.	102° F.	As before.
4/7/08	102.4° F.	102° F.	Animal quite well.



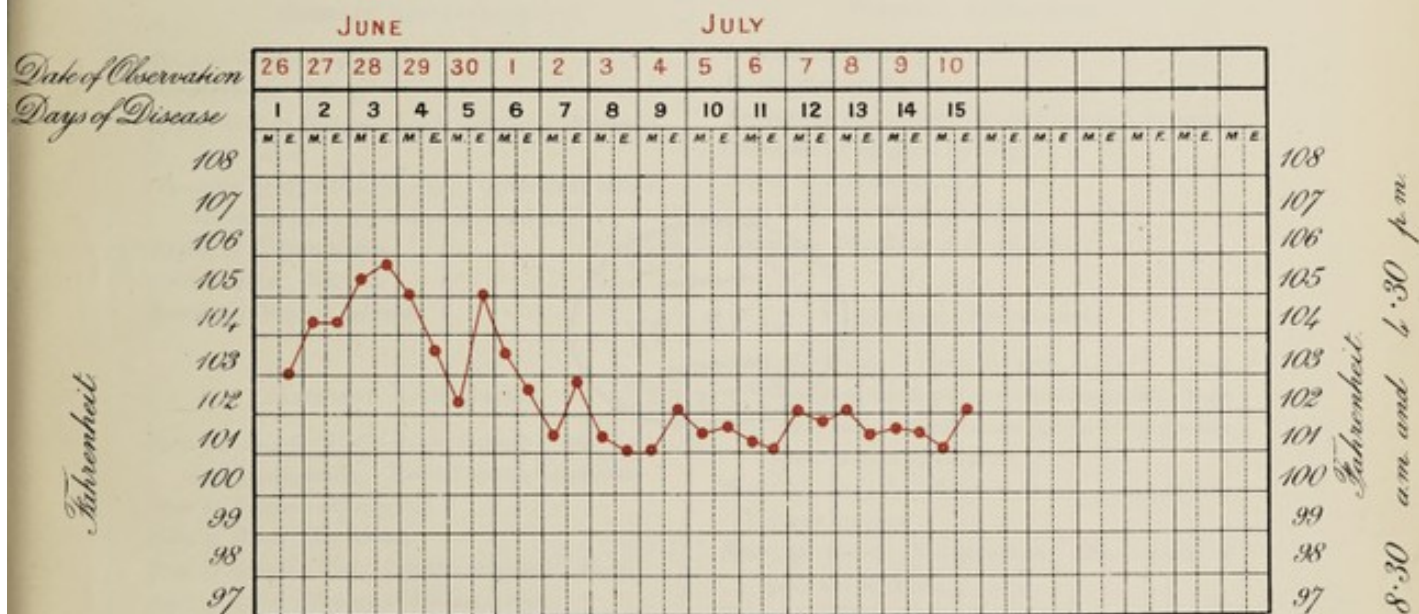
PIG (5). Female. All black. Unmarked.

Date :—26th June, 1908.

Time :—6 p.m.

Method of Inspection :—Drank $\frac{3}{16}$ heart-blood and ate spleen and bronchial glands of Mrs. Addoo (26/6/08). Weight, 14 lbs.

Temperature before administration :—103° F.



	A.M. Temp.	P.M. Temp.	
27/6/08	104.2° F.	104.2° F.	Appears ill at ease but no physical signs.
28/6/08	105.4° F.	105.8° F.	Looks thinner, but weight is 14 $\frac{3}{4}$ lbs. Very irritable. Rapid respirations.
29/6/08	105° F.	103.8° F.	No enlarged glands. Eyes not red. Walks a little unsteadily. Nose dry. No congestion of rectum.
30/6/08	102.4° F.	105° F.	Still very bad tempered and wants to bite. 14 $\frac{3}{4}$ lbs.
1/7/08	103.4° F.	102.6° F.	Quieter. Walks more steadily. Eats well.
2/7/08	101.4° F.	102.8° F.	Appears well again. Nose moist. Weight, 14 $\frac{1}{2}$ lbs.
3/7/08	101.2° F.	101° F.	Nothing abnormal observed.
4/7/08	101° F.	102° F.	As before. Stools rather pale coloured and loose.
5/7/08	101.4° F.	101.6° F.	Weight, 14 $\frac{3}{4}$ lbs.
6/7/08	101.2° F.	101° F.	Is fattening.
7/7/08	102° F.	101.8° F.	Irritability gone.
8/7/08	102° F.	101.4° F.	Weight, 15 lbs.
9/7/08	101.6° F.	101.4° F.	Stools normal. Eyes clear. Nose moist.
10/7/08	101° F.	102° F.	Weight, 15 lbs. Animal looks quite well.



5.—RESULTS OF DETAILED POST-MORTEM EXAMINATION OF PNEUMONIC CASES OF PLAGUE.

No. I.

Name : Tchotcho.
Age : 16 years.
Sex : F.
Tribe : Gã.
Occupation : —
Residence : Charter's House, Jamestown.
Date of Death : 29/7/08.
Date of Post-Mortem : 29/7/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles. Oozing of dark blood.
Character of Effusion (if any) : Opalescent yellow serous in left pleura and pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Well nourished.

INTERNAL APPEARANCES.

State of Lungs : Right lung normal ; left, dark red hepatisation. Recent sparse adhesions.
State of Larynx : Congested.
State of Heart : Petechial.
State of Spleen : Very slightly enlarged. Firm.
State of Liver : Enlarged and dark red.
State of Kidneys : Intensely congested.
State of Oesophagus : Normal.
State of Stomach : Extensive mild submucous hæmorrhage.
Pancreas : Head much congested.
State of Intestines : —
 1. *Small* : Intensely hyperæmic in whole extent.
 2. *Large* : Little affected.
State of Mesenteric Glands : Unaffected.
State of Retroperitoneal Glands : —
State of Bronchial Glands : Enlarged and deeply congested.
State of Chyle Duct : —

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	" Negative.
<i>Spleen</i> : Negative.	" Negative.
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

No. II.

Name : Ashierey.
Age : 30 years.
Sex : F.
Tribe : Gã.
Occupation : Kenki Seller.
Residence : Isolation Camp.
Date of Death : 11/8/08.
Date of Post-Mortem : 12/8/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : General venous congestion.
Character of Effusion (if any) : —
Degree of Extravasation : —
State of Skin : Well-nourished.
Remarks : Daughter of Korkodai.

INTERNAL APPEARANCES.

State of Lungs : Reddish grey colour. Great oozing of sanguined purulent material. Both bases early consolidation not involving whole lobe. Recent adhesions.
State of Larynx : Trachea much congested in lower portion.
State of Heart : No petechiæ. No excess of pericardial fluid.
State of Spleen : Not enlarged ; dark red.
State of Liver : Enlarged and red.
State of Kidneys : Much congested.
State of Oesophagus : Normal.
State of Stomach : Slight injection at pyloric end.
Pancreas : Unaffected.
State of Intestines : —
 1. *Small* : Slight general congestion.
 2. *Large* : —
State of Mesenteric Glands : Duodenal glands distinctly congested.
State of Retroperitoneal Glands : —
State of Bronchial Glands : Much enlarged and red.
State of Chyle Duct : —

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	" Negative.
<i>Spleen</i> : Positive.	" Positive.
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

No. III.

Name : Adua Bettesh.
 Age : 23 years.
 Sex : F.
 Tribe : Gã.
 Occupation : Trader.
 Residence : Isolation Camp.
 Date of Death : 17/8/08.
 Date of Post-Mortem : 17/8/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance on Section : Dark venous congestion.
 Character of Effusion (if any) : Sero-fibrinous in left pleura.
 Degree of Extravasation : —
 State of Skin : Healthy.
 Remarks : Well nourished.

INTERNAL APPEARANCES.

State of Lungs : Left apex reddish brown consolidation. Recent lymph or pleura.
 State of Larynx : Trachea congested.
 State of Heart : Petechial.
 State of Spleen : Not enlarged. Dark red.
 State of Liver : Enlarged. Yellowish brown.
 State of Kidneys and Bladder : Petechial and congestion.
 State of Oesophagus : —
 State of Stomach : Submucous hæmorrhagic congestion.
 Pancreas : Head congested.
 State of Intestines : —
 1. Small : Extensive intense congestion.
 2. Large : Less intense.
 State of Mesenteric Glands : Unaffected, except duodenal, which inflamed.
 State of Retroperitoneal Glands : —
 State of Bronchial Glands : Much inflamed.
 State of Chyle Duct : —

SMears.

Lungs : Positive.	Culture : Positive.
Heart Blood : Negative.	" Negative.
Spleen : Negative.	" "
Liver : —	
Kidney : —	
Mesenteric Glands : —	

No. IV.

Name : Okotur.
 Age : 60 years.
 Sex : F.
 Tribe : Gã.
 Occupation : Kenki cook.
 Residence : New Settlement, Korly Gono.
 Date of Death : 3/8/08.
 Date of Post-Mortem : 5/8/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance on Section : General venous congestion.
 Character of Effusion (if any) : Sero fibrinous in right pleura.
 Degree of Extravasation : —
 State of Skin : Bullous. Decomposition begun.
 Remarks : Had evidently been disinterred. Earth in hair, etc.

INTERNAL APPEARANCES.

State of Lungs : Rt. base greyish red consolidation.
 State of Larynx : —
 State of Heart : Petechial.
 State of Spleen : Not enlarged.
 State of Liver : —
 State of Kidneys and Bladder : Very soft.
 State of Oesophagus : —
 State of Stomach : Submucous hæmorrhagic congestion.
 Pancreas : Head congested.
 State of Intestines : —
 1. Small : Numerous congested areas.
 2. Large : —
 State of Mesenteric Glands : Not enlarged.
 State of Retroperitoneal Glands : —
 State of Bronchial Glands : Much congested.
 State of Chyle Duct : —

SMEARS.

Lungs : Positive.	Culture, Positive.
Heart Blood : Negative.	" Negative.
Spleen : Negative.	" Positive.
Liver : —	
Kidney : —	
Mesenteric Glands : —	

No. V.

Name : Korkodai.
 Age : 50 years.
 Sex : F.
 Tribe : Gã.
 Occupation : —
 Residence : Korby Gono (Isolation Camp).
 Date of Death : 6/8/08.
 Date of Post-Mortem : 6/8/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance on Section : Dark venous congestion.
 Character of Effusion (if any) : Yellow serous
 right pleura and pericardium.
 Degree of Extravasation : —
 State of Skin : Normal.
 Remarks : Well nourished.

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions right pleura ;
 old adhesions left. Right base, reddish-grey
 solid. Rest of lungs intensely congested.
 State of Larynx : Injected slightly. Trachea con-
 gested inferiorly.
 State of Heart : Petechiæ.
 State of Spleen : Slightly enlarged. Soft. Dark
 red.
 State of Liver : Enlarged ; very red.
 State of Kidneys : Intensely congested.
 State of Oesophagus : Normal.
 State of Stomach : Mild submucous congestion.
 Pancreas : Not congested.
 State of Intestines :—
 1. Small : Patchy areas of slight hyperæmia.
 2. Large : Patchy areas of slight hyperæmia.
 State of Mesenteric Glands : Unaffected.
 State of Retroperitoneal Glands : Unaffected.
 State of Bronchial Glands : Much enlarged and
 congested.
 State of Chyle Duct : —

SMEARS.

Lungs : Positive.	Culture : Positive.
Heart Blood : Negative.	" Negative.
Spleen : Positive.	" Positive.
Liver : —	
Kidney : —	
Mesenteric Glands : —	

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No. VI.

Name : Mrs. Addoo.
 Age : 40 years.
 Sex : F.
 Tribe : Gã.
 Occupation : Housewife.
 Residence : 17, Block VI., Ottoo St., Accra.
 Date of Death : 26/6/08.
 Date of Post-Mortem : 26/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance on Section : Dark muscles. Much
 oozing of dark blood.
 Character of Effusion (if any) : Yellow serous in
 right pleura, pericardium and peritoneum
 Degree of Extravasation : —
 State of Skin : Normal.
 Remarks : Well nourished.

INTERNAL APPEARANCES.

State of Lungs : Petechiæ on pleura. Right
 base early congestion.
 State of Larynx : Congested right down trachea.
 Tonsils ulcerated.
 State of Heart : Fine petechiæ numerous.
 State of Spleen : Slightly enlarged. Firm and red.
 State of Liver : Darkly congested.
 State of Kidneys : Intensely congested.
 State of Oesophagus : Normal.
 State of Stomach : Numerous small hæmorrhagic
 areas, especially near pylorus.
 Pancreas : Congested.
 State of Intestines :—
 1. Small : Very numerous and extensive
 hæmorrhagic areas, especially in duodenum.
 2. Large : Similar areas, especially in cæcum.
 Numerous ascarides.
 State of Mesenteric Glands : Slightly enlarged.
 Pink.
 State of Retroperitoneal Glands : Slightly enlarged.
 Pink.
 State of Bronchial Glands : Markedly enlarged
 and intensely congested.
 State of Chyle Duct : Normal.

SMEARS.

Lungs : Positive.	Culture : Positive.
Heart Blood : Positive.	" "
Spleen : Positive.	" "
Liver : —	
Kidney : —	
Mesenteric Glands : Negative.	" Negative.

No. VII.

Name : Achera (or Atchorye).
Age : 48 years.
Sex : F.
Tribe : Gã
Occupation : Kenki-seller.
Residence : 20, Block VI., Accra.
Date of Death : 21/6/08.
Date of Post-Mortem : 21/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes :
Appearance on Section : Dark Muscles. Oozing of dark blood.
Character of Effusion (if any) : Plastic in right pleura, yellow serous in pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Fairly well nourished.

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions, right pleura. Numerous sub-pleural petechiae. Right base grey-brown consolidation. Left lung early red consolidation.
State of Larynx : Not affected. Lower part of trachea inflamed.
State of Heart : Numerous petechiae.
State of Spleen : Not enlarged. Firm, red.
State of Liver : Reddish-brown, and large.
State of Kidneys : Much congested.
State of Oesophagus : Not affected.
State of Stomach : Slight submucous hæmorrhage along lesser curvature.
Pancreas : Head congested.
State of Intestines :—
 1. *Small* : Sparse patchy hæmorrhagic areas.
 2. *Large* : Congested areas in transverse colon.
State of Mesenteric Glands : Slightly enlarged, but pale.
State Retroperitoneal Glands : Slightly enlarged, but pale.
State of Bronchial Glands : Enlarged and congested.
State of Chyle Duct : Normal.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	„ Negative.
<i>Spleen</i> : Negative.	„ „
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

No. VIII.

Name : Apokua (or Opokua).
Age : 40 years.
Sex : F.
Tribe : Gã.
Occupation : Kenki-seller.
Residence : 82, Ashanti Quarters, Christiansborg.
Date of Death : 20/6/08.
Date of Post-Mortem : 20/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles. Considerable oozing of venous blood.
Character of Effusion (if any) : Yellow gelatinous left pleura, yellow serous right pleura and pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Well nourished.

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions, both pleuræ and numerous petechiae. Left lung grey consolidation, right lung red consolidation.
State of Larynx : Larynx and trachea much congested.
State of Heart : No petechiae.
State of Spleen : Slightly enlarged. Brownish-red, firm.
State of Liver : Yellowish brown and large.
State of Kidneys : Much congested.
State of Oesophagus : Normal.
State of Stomach : General hæmorrhagic congestion especially at cardiac end.
Pancreas : Head much congested.
State of Intestines :—
 1. *Small* : Duodenum inflamed ; sparse patchy congestion elsewhere. Ascarides.
 2. *Large* : Ascending and transverse colon much congested.
State of Mesenteric Glands : Slightly enlarged, pale.
State Retroperitoneal Glands : Slightly enlarged, pale.
State of Bronchial Glands : Much enlarged and red.
State of Chyle Duct : Normal.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive
<i>Heart Blood</i> : Positive.	„ „
<i>Spleen</i> : Positive.	„ „
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

No. IX.

Name : Ahmah Odey (or Ablanah) (or Ablah).
 Age : 30 years or 56 years.
 Sex : F.
 Tribe : Gã.
 Occupation : Kenki-seller.
 Residence : 24, Block VI., Accra.
 Date of Death : 20/6/08.
 Date of Post-Mortem : 20/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance on Section : Dark muscles. Oozing of dark blood.
 Character of Effusion (if any) : Plastic, left pleura, yellow serous in pericardium.
 Degree of Extravasation : —
 State of Skin : Normal.
 Remarks : Well nourished. (Sister of Dainsua.)

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions left pleura. Numerous petechiae. Left base brownish red. Right lung intensely congested.
 State of Larynx : Little affected, but great congestion at bifurcation of trachea.
 State of Heart : Petechiae.
 State of Spleen : Much enlarged. Red. Fairly firm.
 State of Liver : Reddish-brown.
 State of Kidneys : Much congested.
 State of Oesophagus : Congested entire length. Fauces congested. Tonsils ulcerated.
 State of Stomach : Patchy hæmorrhagic areas and numerous fine petechiae.
 Pancreas : Head much congested.
 State of Intestines :—
 1. Small : Sparse patchy congestion.
 2. Large : " " "
 State of Mesenteric Glands : Slightly enlarged, but pale.
 State of Retroperitoneal Glands : —
 State of Bronchial Glands : Enlarged and congested.
 State of Chyle Duct : Normal.

SMEARS.

Lungs : Positive.	Culture : Positive.
Heart Blood : Positive.	" "
Spleen : Positive.	" "
Liver : —	
Kidney : —	
Mesenteric Glands : —	

No. X.

Name : Kumbiah (or Ambah).
 Age : 50 years.
 Sex : F.
 Tribe : Gã.
 Occupation : Kenki-seller.
 Residence : 24, Block XI., Accra.
 Date of Death : 20/6/08.
 Date of Post-Mortem : 20/6/08.

EXTERNAL APPEARANCE.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance on Section : Dark muscles. Oozing of dark blood.
 Character of Effusion (if any) : Yellow plastic, left pleura, yellow serous in pericardium.
 Degree of Extravasation : —
 State of Skin : Normal.
 Remarks : Well nourished. (Contact of Parkwoo.)

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions, both pleurae, and many petechiae. Upper left lobe grey-brown solid. Right lung intensely congested.
 State of Larynx : Congested right down trachea.
 State of Heart : Numerous petechiae.
 State of Spleen : Not enlarged. Firm. Red.
 State of Liver : Yellowish-brown. Large.
 State of Kidneys : Much congested. Cortex swollen.
 State of Oesophagus : Unaffected.
 State of Stomach : Much hæmorrhagic congestion, especially at cardiac end.
 Pancreas : Head much congested.
 State of Intestines :—
 1. Small : Patchy congestion. Duodenum only slightly congested.
 2. Large : Patchy congestion, transverse and descending colon. Ascarides.
 State of Mesenteric Glands : Slightly enlarged, pale.
 State of Retroperitoneal Glands : Slightly enlarged, pale.
 State of Bronchial Glands : Enlarged and congested.
 State of Chyle Duct : Normal.

SMEARS.

Lungs : Positive.	Culture : Positive.
Heart Blood : Negative.	" Negative.
Spleen : Negative.	" "
Liver : —	
Kidney : —	
Mesenteric Glands : —	

No. XI.

Name : Tchotcho Ashong (or Chocho).
Age : 50 years or 75 years.
Sex : F.
Tribe : Gã.
Occupation : Hawker.
Residence : Labadi.
Date of Death : 19/6/08.
Date of Post-Mortem : 19/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles. Much oozing of dark blood.
Character of Effusion (if any) : Plastic on pleuræ, yellow serous in pericardium.
Degree of Extravasation : —
State of Skin : Shrunken.
Remarks : Somewhat emaciated. (Aunt of Quao.)

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions right and old adhesions left pleuræ. Petechiæ right apex, grey consolidation. Left lung slightly congested.
State of Larynx : Congestion only at bifurcation of trachea.
State of Heart : No petechiæ.
State of Spleen : Not enlarged. Soft and red.
State of Liver : Reddish-brown.
State of Kidneys : Much congested.
State of Oesophagus : Normal.
State of Stomach : Numerous large hæmorrhagic areas.
Pancreas : Head intensely congested.
State of Intestines :—
 1. *Small* : Very intensely congested at duodenum, diminishing towards ileum, not patchy.
 2. *Large* : Transverse and descending colon much congested. Ascarides.
State of Mesenteric Glands : Slightly enlarged. Not inflamed.
State of Retroperitoneal Glands : Slightly enlarged. Not inflamed.
State of Bronchial Glands : Enlarged.
State of Chyle Duct : Normal appearance.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	" Negative.
<i>Spleen</i> : Positive.	" Positive.
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

No. XII.

Name : Moie.
Age : 40 years.
Sex : M.
Tribe : Gã.
Occupation : Bricklayer.
Residence : 73, Block XI., Sempey Lane, 75, Accra.
Date of Death : 19/6/08.
Date of Post-Mortem : 19/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark-coloured muscles. Much oozing of dark blood.
Character of Effusion (if any) : Plastic on pleuræ, yellow serous in pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Well nourished. (Brother of Parkwoo.)

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions, both pleuræ and many petechiæ. Right base, grey-brown consolidation. Left lung intensely congested.
State of Larynx : Whole fauces and trachea intensely congested.
State of Heart : Numerous petechiæ.
State of Spleen : Not enlarged. Firm. Red.
State of Liver : Yellowish-brown. Large.
State of Kidneys : Much congested.
State of Oesophagus : Not congested.
State of Stomach : Patchy hæmorrhagic congestion, especially at pylorus.
Pancreas : Head markedly congested.
State of Intestines :—
 1. *Small* : Very intense congestion in duodenum, more patchy towards deum.
 2. *Large* : Slight congestion at cæcum.
State of Mesenteric Glands : Slightly enlarged but pale.
State of Retroperitoneal Glands : Slightly enlarged but pale.
State of Bronchial Glands : Enlarged.
State of Chyle Duct : Normal.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	" Negative.
<i>Spleen</i> : Negative.	" Positive.
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

No. XIII.

Name : Dainsua (or Densua).
Age : 45 years.
Sex : F.
Tribe : Gã.
Occupation : Hawker.
Residence : 24, Block XI., Ottoo St., Accra.
Date of Death : 18/6/08.
Date of Post-Mortem : 18/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles. Much oozing of venous blood.
Character of Effusion (if any) : Plastic in pleuræ, yellow serous in pericardium.
Degree of Extravasation : —
State of Skin : Scars on legs. Lipoma at umbilicus.
Remarks : Fairly well-nourished (Mother of Parkwoo).

INTERNAL APPEARANCES.

State of Lungs : Recent pleural adhesions. Many petechiæ. Right base brownish consolidation. Left lung much congested.
State of Larynx : Very much congested right down trachea.
State of Heart : Few petechiæ.
State of Spleen : Not enlarged. Red. Firm.
State of Liver : Brownish yellow. Cirrhotic.
State of Kidneys : Much congested. Vortex swollen.
State of Oesophagus : Not affected, but fauces inflamed.
State of Stomach : Slight hæmorrhagic congestion at cardiac end.
State of Intestines : —
Pancreas : Head markedly congested.
 1. *Small* : Slight congestion in lower portion and in duodenum.
 2. *Large* : Congestion in cæcum. Two tenise. Six ascarides.
State of Mesenteric Glands : Not evidently affected.
State Retroperitoneal Glands : Not evidently affected.
State of Bronchial Glands : Enlarged and congested.
State of Chyle Duct : Normal.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	„ Negative.
<i>Spleen</i> : Positive.	„ Positive.
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

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No. XIV.

Name : Ahiney (or Ahine) (or Ayienay).
Age : 50 years. 65 years.
Sex : F.
Tribe : Gã.
Occupation : Fish seller.
Residence : 41 Block V., Accra.
Date of Death : 17/6/08.
Date of Post-Mortem : 17/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Muscles dark. Oozing of dark blood.
Character of Effusion (if any) : Gelatinous right pleuræ, yellow serous in pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Vaginal discharge. Well nourished. (Contact of Sacki Okoh.)

INTERNAL APPEARANCES.

State of Lungs : Right pleura adherent (recent). Numerous petechiæ. Right base brown consolidation. Left lung intensely congested.
State of Larynx : Trachea at bifurcation much congested. Thyroid gland swollen.
State of Heart : Numerous petechiæ.
State of Spleen : Slightly enlarged; firm, red.
State of Liver : Yellowish brown; large.
State of Kidneys : Vortex swollen; whole organ congested.
State of Oesophagus : Slightly congested at lower end.
State of Stomach : Hæmorrhagic congestion most marked at cardiac end.
State of Intestines : —
Pancreas : Head much congested.
 1. *Small* : Intense congestion at duodenum, diminishing towards ileum.
 2. *Large* : Transverse colour uniformly and sigmoid patchily congested.
State of Mesenteric Glands : Congested near duodenum, not elsewhere.
State Retroperitoneal Glands : —
State of Bronchial Glands : Enlarged and congested.
State of Chyle Duct : Normal.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	„ Negative.
<i>Spleen</i> : Negative.	„
<i>Pancreas</i> : Negative.	„
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : Negative.	„

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No. XV.

Name : Mensah.
Age : 29 years.
Sex : M.
Tribe : Gã.
Occupation : Bricklayer.
Residence : 20 Block VI., Ottoo Street, Accra.
Date of Death : 16/6/08.
Date of Post-Mortem : 16/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles. Oozing of venous blood.
Character of Effusion (if any) : Gelatinous right pleura, yellow serous in pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Well nourished. Inoculated 5 days ago. (Son of Quaqualey.)

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions right pleura. Innumerable sub-pleural petechiae. Right base brownish consolidation. Left lung intensely congested.
State of Larynx : —
State of Heart : Numerous petechiae.
State of Spleen : Slightly enlarged. Firm and red.
State of Liver : Yellowish brown. Large.
State of Kidneys : Intensely congested.
State of Oesophagus : —
State of Stomach : Extensive sub-mucous hæmorrhage.
Pancreas : Head much congested.
State of Intestines :—
 1. *Small* : Whole entent congested, & numerous hæmorrhagic areas.
 2. *Large* : Whole entent congested & numerous hæmorrhagic areas.
State of Mesenteric Glands : Unaffected.
State Retroperitoneal Glands : Unaffected.
State of Bronchial Glands : Enlarged and congested.
State of Chyle Duct : Normal.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	" Negative.
<i>Spleen</i> : Negative.	" "
<i>Pancreas</i> : Negative.	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : Negative.	"

No. XVI.

Name : Parkwoo (Allotay Pappoo).
Age : 30 years.
Sex : M.
Tribe : Gã.
Occupation : Bricklayer.
Residence : 24, Block XI., Asere St., Accra.
Date of Death : 14/6/08.
Date of Post-Mortem : 14/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles. Oozing of dark blood.
Character of Effusion (if any) : Yellow plastic left pleura. Serous in pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Well nourished. (Husband of Akua: Fana.)

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions both pleura. Numerous petechiae. Left base brownish consolidation. Rt. lung congested.
State of Larynx : —
State of Heart : Pale & numerous petechiae.
State of Spleen : Slightly enlarged. Firm. Dark red.
State of Liver : Yellowish brown and large.
State of Kidneys : Markedly congested.
State of Oesophagus : —
State of Stomach : Extensive hæmorrhages especially lesser curvature at pyloric end.
Pancreas : Head much congested.
State of Intestines :—
 1. *Small* : Duodenum congested.
 2. *Large* : Unaffected.
State of Mesenteric Glands : Not congested.
State Retroperitoneal Glands : Not congested.
State of Bronchial Glands : Enlarged and red.
State of Chyle Duct : Normal.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative	" Negative.
<i>Spleen</i> :	" "
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : Negative.	"

No. XVII

Name : Fio (Abbah Fio).
 Age : 45 years.
 Sex : F.
 Tribe : Gã.
 Occupation : Fish-seller.
 Residence : 26, Block VII., Accra.
 Date of Death : 13/6/08.
 Date of Post-Mortem : 13/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance on Section : Dark muscles. Oozing of dark blood.
 Character of Effusion (if any) : Yellow plastic left pleura, yellow serous in pericardium.
 Degree of Extravasation : —
 State of Skin : Normal.
 Remarks : Fairly well-nourished. (Contact of Quaqualey).

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions left pleura. Numerous petechiæ. Left lung brownish-red consolidation. Right lung congested.
 State of Larynx : —
 State of Heart : Pale. Petechiæ
 State of Spleen : Congested.
 State of Liver : Nutmeg appearance.
 State of Kidneys : Intensely congested.
 State of Oesophagus : Normal.
 State of Stomach : Numerous small sharply demarcated submucous hæmorrhage.
 Pancreas : Head much congested.
 State of Intestines :—
 1. Small : Numerous inflamed areas, especially duodenum.
 2. Large : —
 State of Mesenteric Glands : Enlarged but pale.
 State of Retroperitoneal Glands : Enlarged but pale.
 State of Bronchial Glands : Enlarged. Congested.
 State of Chyle Duct : Normal.

SMEARS.

Lungs : Positive.	Culture : Positive.
Heart Blood : Negative.	" Negative.
Spleen : "	" "
Liver : "	" "
Kidney : —	" "
Mesenteric Glands : "	" "

No. XVIII.

Name : Mary Bruce.
 Age : 65 years.
 Sex : F.
 Tribe : Gã.
 Occupation : Housewife.
 Residence : 4 Block XIV., Accra.
 Date of Death : 9/6/08.
 Date of Post-Mortem : 9/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance of Section : Dark muscles. Dark blood oozing.
 Character of Effusion (if any) : Yellow plastic right pleura. Yellow serous, pericardium.
 Degree of Extravasation : —
 State of Skin : Normal.
 Remarks : Well nourished.

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions right pleura. Sub-pleural petechiæ. Early consolidation right base, intense congestion, both lungs.
 State of Larynx : —
 State of Heart : Pale. Petechiæ.
 State of Spleen : Firm. Swollen. Darkly congested.
 State of Liver : Brownish red.
 State of Kidneys : Intensely congested.
 State of Oesophagus : —
 State of Stomach : —
 State of Intestines :—
 1. Small : —
 2. Large : —
 State of Mesenteric Glands : Slightly enlarged. Pale.
 State of Retroperitoneal Glands : " " Pale.
 State of Bronchial Glands : Much enlarged and red.
 State of Chyle Duct : Normal.

SMEARS.

Lungs : Positive.	Culture : Positive.
Heart Blood : Negative.	" Negative.
Spleen : Positive.	" Positive.
Liver : —	" "
Kidney : —	" "
Mesenteric Glands : —	" "

No. XIX.

Name : Chardley (or Chardi).
Age : 48 years.
Sex : F.
Tribe : Gã.
Occupation : Petty trader.
Residence : 41, Block V., Accra.
Date of Death : 8/6/08.
Date of Post-Mortem : 8/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles ; oozing of dark blood.
Character of Effusion (if any) : Plastic right pleura, yellow serus pericardium
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Rather emaciated (Contact of Sacki Okoi).

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions right pleura ;
 & numerous petechiæ. Early consolidation
 right base ; intense congestion both lungs.
State of Larynx : —
State of Heart : Pale ; numerous petechiæ.
State of Spleen : Not enlarged ; firm ; red.
State of Liver : Yellowish red.
State of Kidneys : Congested.
State of Oesophagus : —
State of Stomach : —
State of Intestines : —
 1. *Small* : —
 2. *Large* : —
State of Mesenteric Glands : Not enlarged.
State Retroperitoneal Glands : Not enlarged.
State of Bronchial Glands : Much enlarged and red.
State of Chyle Duct : Normal.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	„ Negative.
<i>Spleen</i> : Positive.	„ Positive.
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

No. XX.

Name : Kwartekei, Mansah.
Age : 58 years.
Sex : F.
Tribe : Gã.
Occupation : Kenki-seller.
Residence : 32, Block IX., Accra.
Date of Death : 8/6/08.
Date of Post-Mortem : 8/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles. Oozing of dark blood.
Character of Effusion (if any) : Yellow plastic both pleura. Yellow serous in pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Well nourished. (Contact of Kwofi Fana.)

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions both pleura,
 Numerous petechiæ. Early consolidation
 both bases.
State of Larynx : —
State of Heart : Pale, and & petechiæ.
State of Spleen : Not enlarged. Firm. Congested.
State of Liver : Yellowish brown.
State of Kidneys : Much congested.
State of Oesophagus : —
State of Stomach : —
State of Intestines : —
 1. *Small* : —
 2. *Large* : —
State of Mesenteric Glands : Not congested.
State Retroperitoneal Glands : Not congested.
State of Bronchial Glands : Enlarged and red.
State of Chyle Duct : —

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	„ Negative.
<i>Spleen</i> : Positive.	„ Positive.
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

No. XXI.

Name : Kwakwaley (or Quaquailey).
Age : 60 years.
Sex : F.
Tribe : Ga.
Occupation : Petty trader.
Residence : 26, Block VIII., Accra.
Date of Death : 7/6/08.
Date of Post-Mortem : 7/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles, dark blood, oozing.
Character of Effusion (if any) : Plastic right pleura, serous pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Well nourished. (Contact of Kwofi: Fana.)

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions, right pleura. Numerous petechiae. Right base grey-brown, solid. Left lung intensely congested.
State of Larynx : —
State of Heart : Petechiae.
State of Spleen : Enlarged. Nearly diffuent.
State of Liver : Yellowish brown.
State of Kidneys : Congested. Capsules adherent.
State of Oesophagus : —
State of Stomach : —
State of Intestines : —
 1. *Small* : —
 2. *Large* : —
State of Mesenteric Glands : Unaffected.
State Retroperitoneal Glands : Unaffected.
State of Bronchial Glands : Enlarged and congested.
State of Chyle Duct : —

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	" Negative.
<i>Spleen</i> : Negative.	" "
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

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No. XXII.

Name : Amah Codjoe (Ammah Kudjo).
Age : 1 year.
Sex : M.
Tribe : Ga.
Occupation : —
Residence : 72, Block VIII., Ogle St., Ussher-town.
Date of Death : 6/6/08.
Date of Post-Mortem : 6/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
Description of Buboes : —
Appearance on Section : Dark muscles. Much oozing dark blood.
Character of Effusion (if any) : Plastic, left pleura. Serous in pericardium.
Degree of Extravasation : —
State of Skin : Normal.
Remarks : Well nourished. (Fana contact.)

INTERNAL APPEARANCES.

State of Lungs : Recent adhesions, both pleurae. Numerous petechiae. Early consolidation left base. Intense congestion both lungs.
State of Larynx : —
State of Heart : Sparse petechiae.
State of Spleen : Enlarged, firm and congested.
State of Liver : Reddish brown, large.
State of Kidneys : Intensely congested.
State of Oesophagus : —
State of Stomach : —
State of Intestines : —
 1. *Small* : —
 2. *Large* : —
State of Mesenteric Glands : Unaffected.
State Retroperitoneal Glands : Unaffected.
State of Bronchial Glands : Enlarged and red.
State of Chyle Duct : Normal.

SMEARS.

<i>Lungs</i> : Positive.	<i>Culture</i> : Positive.
<i>Heart Blood</i> : Negative.	" Negative.
<i>Spleen</i> : Negative.	" "
<i>Liver</i> : —	
<i>Kidney</i> : —	
<i>Mesenteric Glands</i> : —	

No. XXIII.

Name : Kokoi (or Korkoi).
 Age : 30 years.
 Sex : F.
 Tribe : Gã.
 Occupation : Seller.
 Residence : 41, Block V., Accra.
 Date of Death : 3/6/08.
 Date of Post-Mortem : 4/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance on Section : Dark muscles; oozing of dark blood.
 Character of Effusion (if any) : Plastic both pleuræ; serous in pericardium.
 Degree of Extravasation : —
 State of Skin : Normal.
 Remarks : Well nourished. (Fana contact.)

INTERNAL APPEARANCES.

State of Lungs : Recent pleural adhesions. Numerous petechiæ. Early consolidation both bases.
 State of Larynx : —
 State of Heart : Spare petechiæ.
 State of Spleen : Decidedly enlarged.
 State of Liver : Yellowish-brown; large.
 State of Kidneys : Much congested.
 State of Oesophagus : —
 State of Stomach : —
 State of Intestines : —
 1. Small : —
 2. Large : —
 State of Mesenteric Glands : Unaffected.
 State of Retroperitoneal Glands : Unaffected.
 State of Bronchial Glands : Enlarged and red.
 State of Chyle Duct : —

SMEARS.

Lungs : Positive.	Culture : Positive.
Heart Blood : Negative.	" Negative.
Spleen : Negative.	" "
Liver : —	
Kidney : —	
Mesenteric Glands :	

No. XXIV.

Name : Mensah.
 Age : 40 years.
 Sex : M.
 Tribe : Gã.
 Occupation : Carpenter.
 Residence : 41, Block V., Accra.
 Date of Death : 3/6/08.
 Date of Post-Mortem : 4/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —
 Description of Buboes : —
 Appearance on Section : Dark flesh, dark blood oozing.
 Character of Effusion (if any) : Plastic both pleuræ, serous in pericardium.
 Degree of Extravasation : —
 State of Skin : Normal.
 Remarks : Well-nourished. (Fana contact.)

INTERNAL APPEARANCES.

State of Lungs : Sub-pleural petechiæ and recent adhesions. Early hæmorrhagic consolidation, both bases.
 State of Larynx : —
 State of Heart : Numerous petechiæ.
 State of Spleen : Not enlarged.
 State of Liver : Reddish-brown, large.
 State of Kidneys : Congested.
 State of Oesophagus : —
 State of Stomach : —
 State of Intestines : —
 1. Small : —
 2. Large : —
 State of Mesenteric Glands : Unaffected.
 State of Retroperitoneal Glands : Unaffected.
 State of Bronchial Glands : Enlarged and congested.
 State of Chyle Duct : —

SMEARS.

Lungs : Positive.	Culture : Positive.
Heart Blood : Negative	" Negative.
Spleen : Positive	" Positive.
Liver : —	
Kidney : —	
Mesenteric Glands :	

No. XXV.

Name : Sacki Okoh (Sacki Okoi) (Sackiokor).

Age : 45 years. 60 years.

Sex : F.

Tribe : Gã.

Occupation : Seller.

Residence : 41, Block V., Accra.

Date of Death : 3/6/08.

Date of Post-Mortem : 3/6/08.

EXTERNAL APPEARANCES.

Position of Bubo (if any) : —

Description of Buboes : —

Appearance on Section : Dark muscles. Much oozing of venous blood.

Character of Effusion (if any) : Plastic both pleuræ. Serous pericardium.

Degree of Extravasation : —

State of Skin : Normal.

Remarks : Well nourished. (Came from Fana.)

INTERNAL APPEARANCES.

State of Lungs : Numerous petechiæ and recent adhesions. Right base grey-brown consolidation. Left lung intensely congested.

No. XXV—continued.

INTERNAL APPEARANCES—continued.

State of Larynx : —

State of Heart : Numerous petechiæ.

State of Spleen : Not enlarged ; firm.

State of Liver : Yellowish-brown ; large.

State of Kidneys : Much congested.

State of Oesophagus : —

State of Stomach : —

State of Intestines :—

1. *Small* : —

2. *Large* : —

State of Mesenteric Glands : Unaffected.

State Retroperitoneal Glands : Unaffected.

State of Bronchial Glands : Much enlarged and red.

State of Chyle Duct : —

SMEARS.

Lungs : Positive. *Culture* : Positive.

Heart Blood : Negative. " Negative.

Spleen : Negative. " "

Liver : Negative. " "

Kidney : —

Mesenteric Glands : Negative. " "

CONDENSED REPORT
ON
ATTEMPT TO INCREASE THE VIRULENCE OF THE DANYSZ VIRUS.

ONE TUBE OF ORIGINAL DANYSZ VIRUS USED.

BY DR. ARTHUR PICKELS.

1.—*Cultures made on Agar and mixed up in Bouillon.*

RAT 1. Injected with 3 c.c. at 1 p.m., 21/7/08. Died during night. Cultures made from fluids and organs of body show a mixture of virus and putrefactive organisms.

RAT 2. Injected with 3 c.c. at same time as above. Died during the night. Results of examination similar to Rat 1.

RAT 3. Fed on evening of 21/7/08. Died during night of 22/7/08 (2nd day). Examination of fluids and organs, and of cultures made from them, gave no indication of cause of death.

RAT 4. Fed on evening of 21/7/08. Died during night of 22/7/08 (2nd day). Examination gave no indication of cause of death.

RAT 5. Fed on evening of 21/7/08. Died during night of 22/7/08 (2nd day). Examination gave no indication as to cause of death.

2.—*Cultures made from Original tube of Virus infused in Bouillon and incubated for six hours.*

RAT 6. Injected with 3 c.c. at 7 p.m., July 22nd. Died during the night. Organisms (virus) found in fluids and organs of the body and in cultures made from them.

RAT 7. Injected with 3 c.c. at 7 p.m., July 22nd. Died next morning (16 hours). Examination gave results as in Rat 6.

RAT 8. Fed on evening of 22nd. Died next day (15 hours). Result of examination was *nil*.

RAT 9. Fed on evening of July 22nd. Escaped during the night.

RAT 10. Fed on evening of July 22nd. Fed again on the evening of the 23rd. Died during night of 24th (3rd day). The hind legs had been injured and had come away.

3.—*Cultures made from original tube of Virus, infused in Bouillon and incubated 10 hours.*

RAT 11. Injected with 2 c.c. at 7.30 p.m., July 24th, 1908. Died on night of 25th (2nd day). Examination of fluids and organs, and cultures made from them, showed the virus, but the cultures were not quite pure.

RAT 12. Fed on evening of July 24th. Killed by mistake next day.

RAT 13. Fed on evening of July 24th. Alive and well August 23 (30 days).

4.—*Cultures made from Peritoneal Fluid of Rat 6, infused in Bouillon and incubated 9 hours.*

RAT 14. Injected with 2 c.c. at 7.30, July 24th. Died during the night. Examination of cultures from fluids and organs showed impure cultures of the virus.

RAT 15. Fed on evening of July 24th. Alive and well August 23rd (30 days).

RAT 17. Fed on evening of July 24th. Alive and well August 23rd (30 days).

5.—*Cultures made from Peritoneal Fluid of Rat 7, infused in Bouillon and incubated 9 hours.*

RAT 16. Injected with 2 c.c. at 7.30 p.m. on July 24th. Killed with chloroform in 24 hours. Examination of fluids and organs, and cultures made from them, showed the virus and the cultures were quite pure.

RAT 18. Fed on evening of July 24th. Alive and well on August 23rd (30 days).

RAT 19. Fed on evening of July 24th. Alive and well on August 23rd (30 days).

6.—*Cultures made from Peritoneal Fluid of Rat 16, infused in Bouillon and incubated 9 hours.*

RAT 42. Injected with 3 c.c. at 7 p.m. on July 28th. Killed in 24 hours. Examination of cultures from peritoneal fluid and heart blood showed a pure growth of virus.

RAT 34. Injected with 3 c.c. at 7 p.m. on July 28th. Killed at 6.30 p.m. on 29th. Examination of cultures from peritoneal fluid and heart blood shows pure cultures of the virus.

RAT 40. Fed on evening July 28th and again on July 29th. Died on night of August 3rd (6 days). Examination proved death to be due to the virus.

RAT 41. Fed on evening July 28th and again on July 29th. Died on night of August 3rd (6 days). Examination proved death to be due to the virus.

RAT 47. Fed on evening July 28th and again on July 29th. Died on July 31st (3 days). Not examined.

RAT 45. Fed on evening July 28th and again on July 29th. Died on July 30th (2 days). Heart blood culture *nil*. Spleen and liver cultures show a few cocci.

7.—*Cultures made from Heart Blood of Rat 34, infused in Bouillon and incubated 10 hours.*

RAT 25. Injected with 3 c.c. at 6 p.m., August 6th. Died during night of August 6th. Examination of fluids and organs, and cultures made from them, showed growth of virus, but not quite pure.

RAT 26. Injected with 3 c.c. at 6 p.m., August 6th. Killed 5 p.m., August 8th (2 days). Culture from peritoneal fluid after standing 24 hours gives a pure culture of the virus.

RAT 57. Fed on evening August 6th and again on evening of August 7th. Died on morning August 8th (36 hours). Examination gave no indication as to cause of death.

RAT 36. Fed on evening August 6th and again on evening of August 7th. Died August 14th (8th day). Examination showed that death was due to virus.

RAT 49. Fed on evening August 6th and again on evening August 7th. Died on night of August 13th (8th day). Examination showed that death was caused by the virus.

RAT 54. Fed on evening August 6th and again on evening August 7th. Died on night of August 11th (6th day). Examination showed that death was due to the virus.

8.—*Cultures made from Heart Blood of Rat 42, infused in Bouillon and incubated 10 hours.*

RAT 60. Injected with 3 c.c. at 6 p.m., August 6th. Died August 8th (2nd day). Cultures made from peritoneal fluid and heart blood show pure cultures of the virus.

RAT 61. Injected with 3 c.c. at 6 p.m., August 6th. Killed in 20 hours. Cultures made from peritoneal fluid and heart blood show slightly impure cultures of the virus.

RAT 20. Fed on evening of August 6th and again on evening of August 7th. Died August 16th (10th day). Culture from heart blood shows a culture of the virus with a few long rods.

RAT 53. Fed on evening of August 6th and again on evening of August 7th. Died during night of 11th (6th day). Culture from heart blood shows a culture of the virus with a few long rods.

RAT. 28. Fed on evening of August 6th and again on evening of August 7th. Died August 16th (10th day). Culture from heart blood shows a pure culture of the virus.

RAT 51. Fed on evening of August 6th and again on evening of August 7th. Killed on August 30th (24th day). It had been ill for ten days and was very thin and emaciated. One colony obtained from heart blood and one colony from spleen. Both were pure cultures just like virus.

9.—*Cultures made from Rat 60, infused in Bouillon and incubated 8 hours.*

RAT 65. Injected with 3 c.c. at 6.30 p.m., August 19th. Died 4 p.m. next day. (22 hours). Cultures from fluids and organs showed almost pure growths of the virus.

RAT 66. Injected with 3 c.c. at 6.30 p.m., August 19th. Killed in 23 hours. Examination of cultures from fluids and organs of the body showed almost pure growths of the virus.

RAT 64. Fed on evening of August 19th and again on evening of August 20th. Died during night of August 24th (6th day). Examination of cultures from heart blood and spleen showed almost pure growths of virus.

RAT 67. Fed on evening of August 19th and again on evening of August 20th. Died on August 26th (7th day). Cultures from heart blood and spleen showed almost pure growths of virus.

RAT 70. Fed on evening of August 19th and again on evening of August 20th. Died during night of August 24th (6th day). Cultures give growths of the virus.

RAT 63. Fed on evening of August 19th and again on evening of August 20th. Died on August 30th (11th day). Cultures from heart blood showed pure growth of virus.

10.—*Cultures made from Peritoneal Fluid of Rat 26, infused in Bouillon and incubated for 8 hours.*

RAT 71. Injected with 3 c.c. at 6.30 p.m. August 19th. Died during the night of August 19th. Examination of cultures from fluids and organs showed a pure culture of virus from heart blood, and not quite pure from spleen and peritoneal fluid.

RAT 72. Injected with 3 c.c. at 6.30 p.m., August 19th. Died August 20th (20 hours). Examination of cultures gave slightly impure growths of the virus.

RAT 68. Fed on evening of August 19th and again on evening of August 20th. Died August 25th (6th day). Culture from heart blood showed pure growth of virus.

RAT 69. Fed on evening of August 19th, and again on evening of August 20th. Died during night of August 26th (8th day). Cultures showed slightly impure growths of virus.

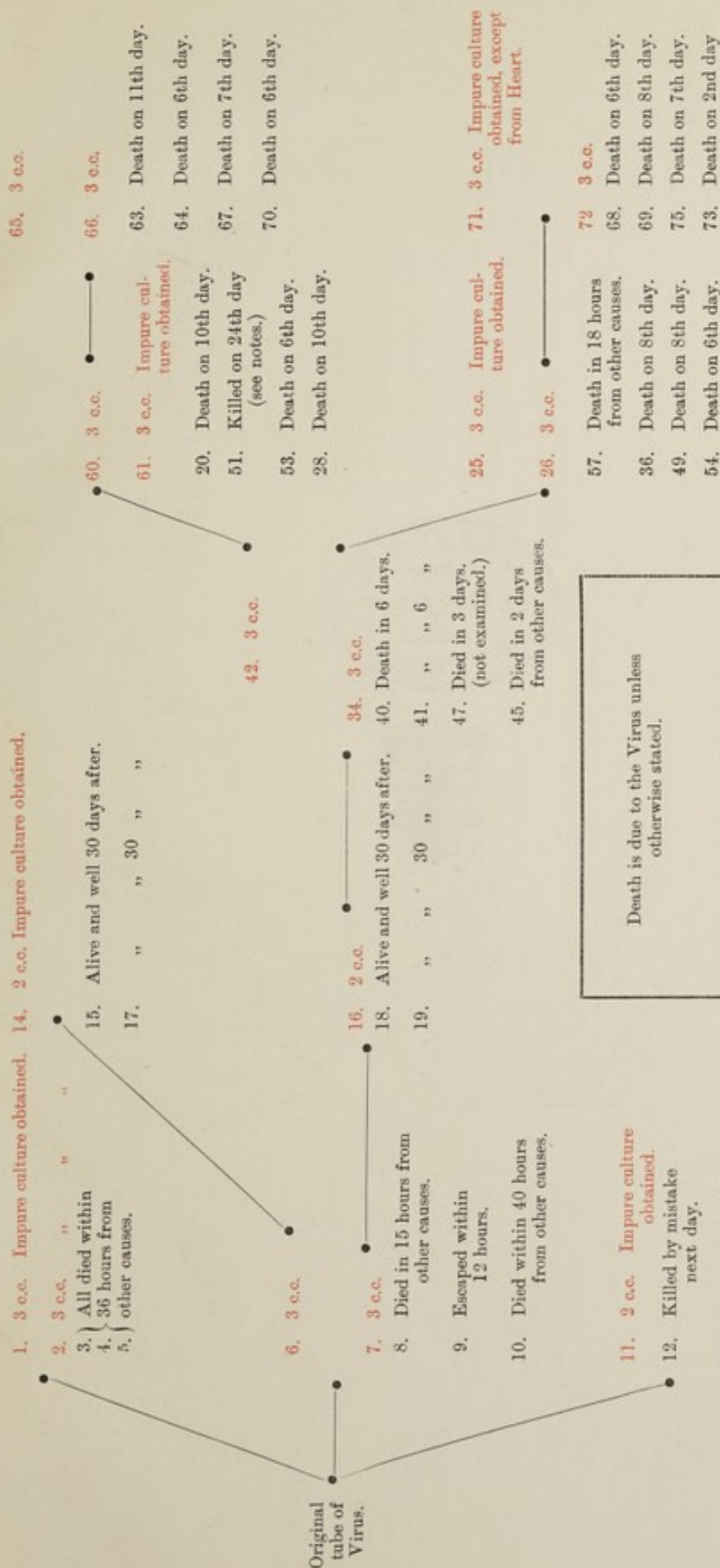
RAT 75. Fed on evening of August 19th and again on evening of August 20th. Died during night of August 25th (7th day). Cultures showed almost pure growths of the virus.

RAT 73. Fed on evening of August 19th, and again on evening of August 20th. Died August 21st (36 hours). Culture from heart blood gives no result. Culture from peritoneal fluid shows a culture of the virus together with two colonies of a lemon yellow colour (cocci).

LAGOS, Aug. 31st, 1908.

DR. ARTHUR PICKELS.



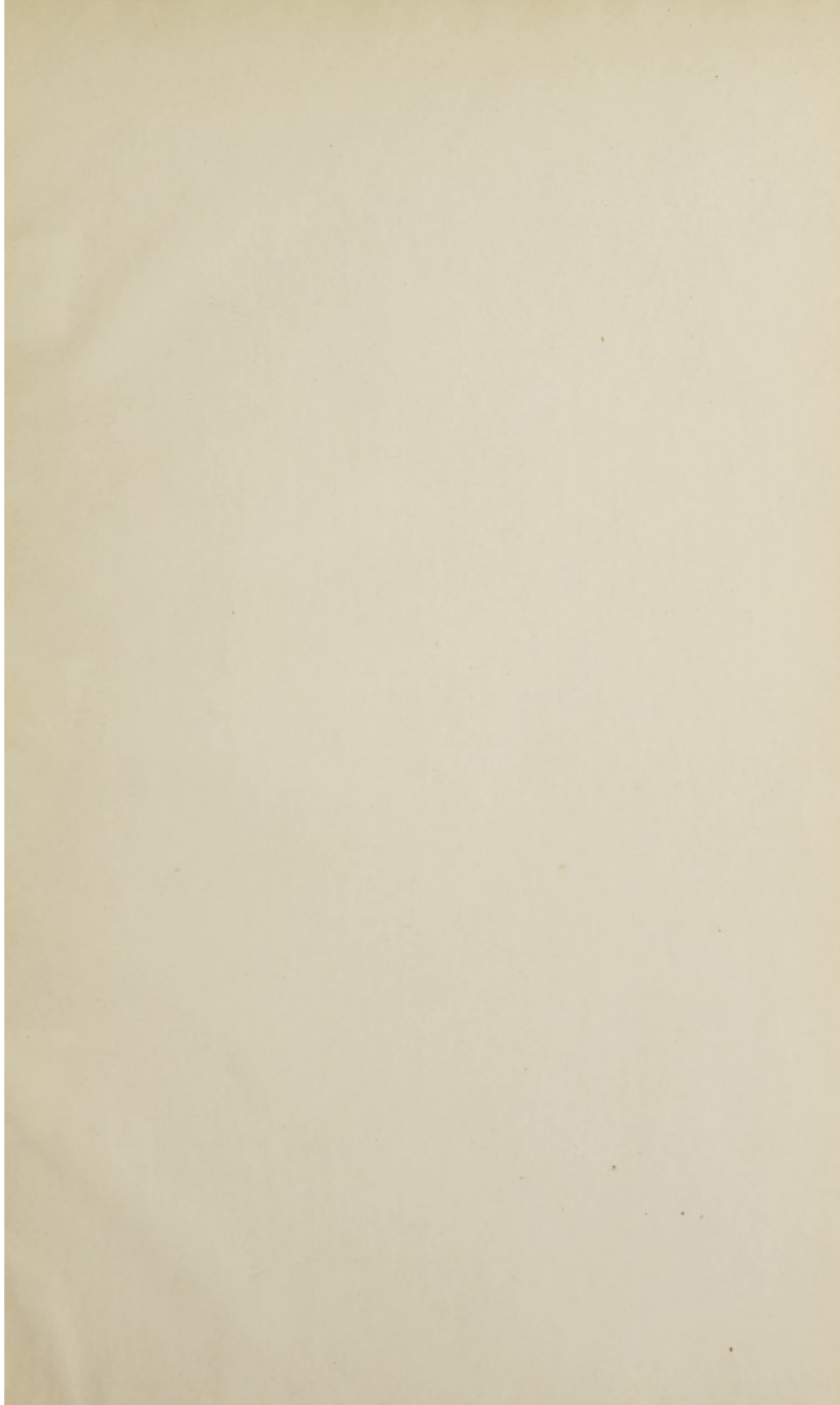


Death is due to the Virus unless otherwise stated.

Rats numbered in red were injected.

Rats numbered in black were fed.





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