PNEUMONIC PLAGUE CASES IN CALCUTTA AND GAYA

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PLAGUE re-appeared in Calcutta in April 1948 after a lapse of about 25 years. An interim note on this outbreak up to 10th May, 1948, was published last year (Lal and Seal, 1948). Altogether 276 cases were reported; of these 173 were clinically diagnosed as plague and at least 35 cases were confirmed bacteriologically. Twenty-three cases died giving a fatality rate of 13.3 per cent. The remaining 103 cases were not considered as plague. Human cases were removed from practically all the wards of the city except wards 1, 16 and 21 and also from the suburban areas in Howrah, Hooghly and 24-Parganas. The peak of the outbreak was in the last week of April, which tailed off by the middle of May. The peculiarity of this outbreak was that the cases were generally mild except at the onset when 8 out of 11 cases died. A few turned out to be septicæmic, the rest being of bubonic type. In most instances, the organisms were scanty. Even the rats did not exhibit enormous number of organisms which one usually associates with spleen smears. This peculiarity has been observed during the present phase of plague in other places also, like Lucknow. Thus the mildness of disease was interspread with a few severe cases, a common feature also noted in the early phases of the last pandemic, and the origin of cases, their distribution and seasonal incidence were very similar. In the later phases of the last Calcutta and Bengal epidemic pneumonic cases were also reported but the instances were few and far between, as will be seen from the following records collected by Wu Lien-Teh (1926) :—

Pneumonic plague cases in Calcutta (1898-1907)

Year	Pneumonic cases	Percentage of total cases	REMARKS
1898	9*	4.7	11* other cases occurred at Backerganj among contacts.
1899	116†	13.4	Proportion too high.
1903	235	3.01	
1904	101	2.1	
1905	?	3.7–7.5	In District I only.
1906	190	6.5	
1907	219	5.5	

* The cases were all connected with one house.

† 7 cases occurred in connection with one house at Kalighat.

During this pandemic, besides the instances stated above, small outbreaks of pneumonic plague cases were occasionally reported from other areas in India, *viz*, Bombay, Baroda, Cutch, Karachi, Kankhal, Jaswalpur, Madras, Punjab, N.-W.F.P. and Kashmir. Barring a few exceptions the pneumonic type caused little havoc in India in the last pandemic. In the summary of the work by the Indian Plague Commission (1908), it was considered that pneumonic plague was rare (less than 3 per cent of all cases) and that it played very small part in the spread of the disease. In the evolution of a plague epidemic, therefore, the character of the parasite particularly with reference to its occasional changes into virulent and pneumonic form is of great importance. The mechanism of this sudden change has still remained a mystery.

During this year plague cases began to appear a little earlier than last year, involving newer areas. One of these areas was the Orphanganj-Kalibazar market at Kidderpore, from which the first case of pneumonic plague, reported here, was introduced into a village called Bankul, about 14 miles away from Howrah. Altogether 130 cases have been reported till the 25th April,

Pneumonic plague cases in Eastern Bengal

Year	Month	Locality	Cases	Deaths	REMARKS
1898	September	Backerganj	11	11	Introduced from Calcutta.
1899	(*i*) Feb.-March	Pania village	42	38	Do.
	(*ii*) March	Faridpur	30	29	2 bubonic cases preceded the pneumonic cases.
1906	(*i*) March-April	Serajganj	27	24	Introduced from Calcutta.
	(*ii*) June	Mymensingh	5	5	Do.
	(*iii*) August	,,	50	45	Do.
1907	January	Malda	4	4	Introduced from Balia.
1910	June	Noakhali	51	45	Introduced from Calcutta.
1911	?	Faridpur	17	17	Do.
		TOTAL ..	237	218	

The records of pneumonic plague cases, all fatal, in Calcutta, as collected by Crake (1908), are given below. Except in two instances the authenticity was not, however, mentioned.

1949. Of these 14 are now considered to be of pneumonic type occurring among the contacts of the case mentioned above. The history of this incident is described below :

History of the Calcutta outbreak

The sons of Sannyasi Charit (Modak), aged 82 years, namely, Kishori, Hrishikesh, Kanai and Balai, belonging to the village Bankul in the District of Howrah, were running 3 shops*—2 at Kalibazar (1 grocer and 1 modak contiguous to each other), and 1 at Orphanganj market, in Kidderpore (Calcutta). They had also engaged several shop assistants for running their business. Kishorimohan lives with his family in a room on the first floor of 96, Diamond Harbour Road. The other brothers with their nephew Bishnupada, the shop assistants and one co-villager, Tinkori Bhattacharya, were staying in one room tenement on the first floor of Kalibazar at 106, Diamond Harbour Road, Kidderpore. Another room of the same building was occupied by Haricharan, son-in-law of Sannyasi. They had their families at Bankul, which they used to visit weekly and by turn; their old parents—Sannyasi Charit and Nagendrabala—were also living in that village home.

On the 25th March, 1949, Bishnupada, aged 20 years, along with his uncle Kanai, went home (Bankul) and was attacked with fever late that evening. Next morning, Kanai came back to Kidderpore with his mother who wished to have a bath in the Ganges on the occasion of the 'Baruni' festival. The same day (26th March), Balai, another uncle, went from Kidderpore to Bankul and nursed Bishnupada for 2 days. The local doctors were treating him as a case of malignant malaria with no effect. Balai, therefore, returned to Kidderpore on 28th March to obtain help. So Kishori and Hrishikesh rushed to Bankul with their mother. The former returned to Kidderpore in the evening and went back to the village next morning with ice only to find, to his misfortune, that Bishnupada had died the previous night (28th March). He returned to Kidderpore the same day (29th March).

Shanti, aged 4, daughter of Hrishikesh, took ill on Tuesday night (29th March) with similar symptoms and died on 31st March, in spite of treatment by the local doctors as a case of malignant malaria. Kanai returned to Bankul from Kidderpore in the evening of 29th March and remained there since then. While Shanti fell ill at Bankul, Balai was attacked with fever at Kidderpore on the same day. The local doctors treated him as a pneumonia case with penicillin, etc., but he expired at 11-30 p.m. on 2nd April in the residence of Kishori at 96, Diamond Harbour Road. In the meantime, Tustapada, son of Kishori, who was at Bankul fell ill with the same symptoms on 31st March and was removed to Kidderpore the next day. One of the local doctors (Dr. Ajit Mukherjee) who had treated Balai, finding the same symptoms appearing in Tustapada, referred the case to the Medical College Hospitals on 2nd April (midnight) for diagnosis and treatment. It is said that he was given some sulphadiazine, as penicillin had no effect in the other case. This was the first case in the chain to be admitted into a hospital. Unfortunately, this boy died a few hours later on 3rd April, before a complete investigation was carried out. He had rigidity of neck muscles and positive Kernig; a lumbar puncture was done with negative results.

Three other cases occurred before Tusta got ill. One, Purnachandra Ghosh, the compounder of a local doctor who attended Bishnupada the first case during the whole of Sunday (27th March), got fever on the night of 30th March at his father-in-law's place at Baharya where he had gone for a visit, and died on 4th April. Nandarani, the mother of Bishnupada, who attended the latter all throughout, was attacked on 30th March and died within 48 hours on 1st April without any treatment. She developed a few hæmorrhagic spots on her body and this led to a suspicion that the cases at Bankul were of suppressed smallpox, and accordingly the inmates were vaccinated against smallpox by the health staff on 5th April. Pannabala, widowed daughter of Sannyasi Charit, fell ill on 31st March and died on 3rd April. This was the first case at Bankul in which the probability of plague infection of pulmonary type was thought of by a local doctor (Dr. A. Dutt) and thus the inmates and some neighbours were vaccinated against plague by the health staff on 7th March, 1949.

The other victims at Bankul who followed suit were Sannyasi Charit and Nagendrabala, the grand-parents of Bishnupada, and Radharani, a woman from the neighbouring house, who came to nurse Panna and Nandarani, the dates of onset of their illness being 1st, 6th and 1st April, 1949, and of their death 3rd, 9th and 3rd April, 1949, respectively; thus the last case in the series to occur at Bankul was Nagendrabala, who fell ill on 6th April, 1949.

While this tragedy was being enacted at Bankul before the final curtain fell there, another series of misfortunes which was going on at Kidderpore (Calcutta) in the meantime may now be narrated. Hrishikesh, having lost his child, Shanti, and himself feeling unwell, thought that he could probably save himself and his family by leaving Bankul immediately, and so he left with his family consisting of the remaining five

* Selling sweets, puffed and fried rice and groceries. Obviously the stock of groceries, rice and paddy attracted a lot of rats.

members for Kidderpore on 1st April to stay at 106, Diamond Harbour Road. The same evening he was attacked with fever followed by symptoms of lung involvement as in other cases On 3rd April, he was removed to Medical College Hospital, where he died the next day (4th April), practically undiagnosed. He was followed by his son Ratan and wife Champabala, both of whom were removed to the same hospital on 6th April, where Ratan died on 11th April but Champabala gradually recovered; treatment with streptomycin was started on suspicion from 7th April. All of them were sent to hospital by the same doctor who sent Tustapada, the first hospital admission.

Ratan was the first case whose blood was collected for culture and found on 11th April, 1949, by Dr. S. C. Ghosal, Professor of Bacteriology, School of Tropical Medicine, to yield *P. pestis*, later confirmed by mouse inoculation test and serology, the mono-specific serum being supplied by the author.

The last case to be admitted into this hospital was Haricharan Rana, son-in-law of Sannyasi Charit, who attended funerals of Panna and Sannyasi at Bankul and cases in Hrishikesh's family at Kidderpore. On 6th April, 1949, he went to Bankul for the last time. He fell ill on 7th April and the same day went to Khantora, his native village near Domjur on the Howrah-Amta Railway. He was removed straight from there to the Medical College Hospital on 9th April, where he developed the pulmonary symptoms like other cases and died on 12th April, 1949. *P. pestis* was isolated by Dr. Ghosal both from his blood and lung puncture material. Blood culture of Champabala taken after some doses of streptomycin proved negative but she was perhaps the only case in which sputum was found coloured and blood-stained. These cases were admitted into the wards of Drs. Das, Nandy and Sinha respectively.

The chronological order of cases with main signs and symptoms which could be elicited through investigation has been given in figure 1 and chart I and the familial and extra-familial relations of the cases in chart II.

The common symptoms from which all cases had suffered were :

(1) Fever starting low and gradually rising high and going down again towards the end.

(2) Easy mild cough without noticeable expectoration and pain in the chest and abdomen.

(3) Respiratory difficulties beginning from the 2nd day, hurried respiration (rates varied between 30 and 60 per minute), dyspnœa and catarrhal signs all over the lung (œdema lungs ?) towards the end; other signs of lung involvement were also detected in many of the cases.

(4) Signs of toxæmia and restlessness, and in a few cases congestion of the eyes; soft, rapid pulse becoming imperceptible towards the end.

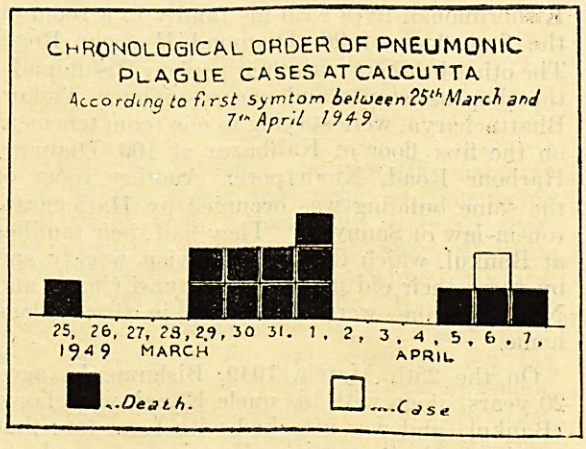
(5) Mental symptoms like delirium and incoherence (mania in some cases), but consciousness was not lost in most of the cases till the end.

(6) Diarrhœic stools.

(7) Appearing seriously ill without sufficient local signs to account for it. Deaths were generally sudden probably from heart failure.

Other signs and symptoms.—Patients 3 and 7 (both children) showed rigidity of neck muscles, tremors and twitchings; no. 3 also had

Fig. 1.



convulsion and no. 7 Kernig positive. Nausea and vomiting were present in a few cases. Spleen was found enlarged in some. Jaundice was noticed in patient 14; hæmorrhagic spots were seen on the chest and armpits of patient 5 and some diffuse subcutaneous hæmorrhage in the left forearm of patient 12. Sputum of patient 13 was found coloured and blood-stained. No glandular swelling was reported by any of the attending physicians except in patient 14 in which neck glands were palpable.

There were altogether 14 cases with 13 deaths. All the eight cases which occurred in the village (including one at Baharya) died, while 5 died out of 6 cases at Calcutta. From charts I and II it will be seen that the cases occurred only among the very close contacts and family relations. Cases 2 to 8 were very close contacts of case 1, cases 6 to 8 being also contacts of case 3; the rest of the cases were contacts of the patients 3, 6 or 9, while cases 11 and 13 at Kidderpore were contacts of case 8. Similarly, the two extra-familial cases, the compounder and a neighbouring woman, were both engaged in nursing the patients. According to this contact history the incubation period was short, generally about 2 days, particularly considering the time of death of the patients. All cases except one who is alive became rapidly fatal, the death occurring generally between 2 and 3 days. In two cases death occurred within 5 days. Four cases received no medical treatment at all. None of

CHART I

Chronological order of pneumonic plague cases (with main symptoms)

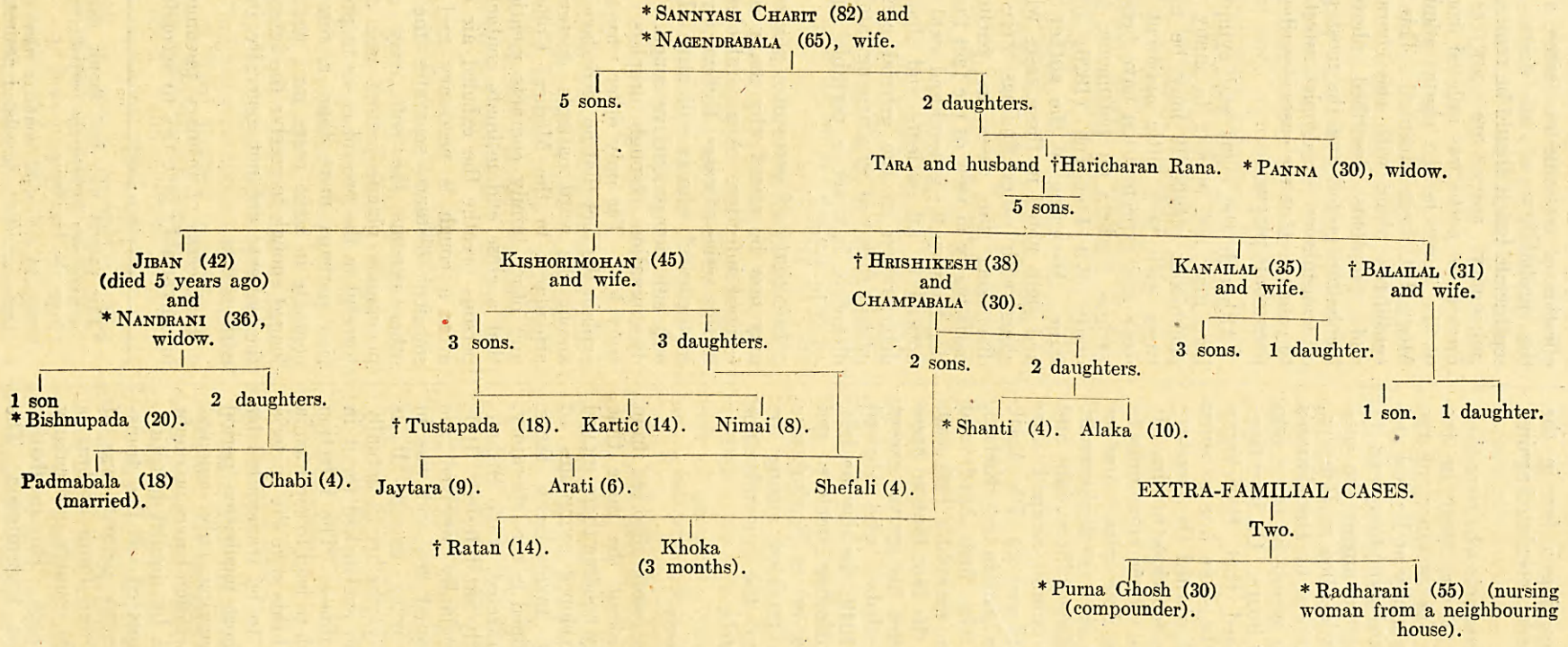
Number	Name, age and sex	Direct contact of case number	Date and place of attack	Date and place of death	Main signs and symptoms	REMARKS
1	Bishnupada Charit, 20, M.	?	25-3-49, 9 p.m., Bankul.	28-3-49, 11 p.m., Bankul.	High fever, palpable spleen, congested eyes, restlessness, maniacal symptoms, delirium, toxæmia, soft easy cough without much expectoration, hurried respiration, dyspnœa, and diarrhœic stools. Treated as malignant malaria by local doctors. Death in 3 days.	Treated privately.
2	Balai Charit, 31, M.	1	29-3-49, 6 p.m., Kidderpore.	2-4-49, 11-30 p.m., Kidderpore.	High fever, pneumonic symptoms, toxæmia and diarrhœa —later œdema of lungs, air hunger, dyspnœa, no temperature towards the end. Treated as pneumonia with penicillin. Death in 4 days.	Do.
3	Shantibala Charit, 4, F.	1	29-3-49, 10 p.m., Bankul.	31-3-49, 10 p.m., Bankul.	High fever, with convulsion, rigidity of neck muscle, muscular tremor and twitchings, rapid pulse, hurried and difficult respiration, short cough, no spleen. Treated as malignant malaria by the local doctors. Death in 2 days.	Do.
4	Purna Ch. Ghosh, 30, M.	1	30-3-49, 8 p.m., Baharya.	4-4-49 (morning), Baharya.	Full history not yet available. Treated as malignant malaria. Death within 4 days.	Do.
5	Nandarani Charit, 36, F.	1	30-3-49, 12 midnight, Bankul.	1-4-49, 8 p.m., Bankul.	High fever, toxæmia, restlessness, cough, pain in chest and abdomen, dyspnœa. Some bleb-like eruption on chest and armpits (? subcutaneous hæmorrhage), diarrhœic stools. Death in less than 2 days.	Untreated.
6	Pannabala Charit, 30, F.	1 and 3	31-3-49, 10 p.m., Bankul.	3-4-49, 8 p.m., Bankul.	High fever, restlessness, delirium, diarrhœa, cough, moist sounds in both lungs, no spleen, rapid and later imperceptible pulse, dyspnœa (possibility of plague infection considered). Death in 2½ days.	Treated privately.
7	Tustapada Charit, 18, M.	1 and 3	31-3-49, Bankul.	3-4-49, in Medical College Hospital, Calcutta.	High fever, toxæmia, semiconscious, vomiting (once), spleen +, liver palpable, moist sounds in both lungs, neck rigid, Kernig +, abdomen tense; later patient became extremely dyspnœic, hurried respiration, imperceptible pulse, and lungs full of catarrhal râles. Total leucocytes 18,000; polymorphs 80 per cent; was treated with sulphadiazine and quinine before removal to hospital. Death in 3 days.	Removed to Medical College Hospital, Calcutta, on 2-4-49, at 12 midnight.

CHART I—*concld.*

Number	Name, age and sex	Direct contact of case number	Date and place of attack	Date and place of death	Main signs and symptoms	REMARKS
8	Hrishikesh Charit, 38, M.	1 and 3	1-4-49, Bankul, came to Kidderpore on 1-4-49.	4-4-49, in Medical College Hospital, Calcutta.	Continuous fever, toxæmic, restless, nausea and vomiting, spleen 1 finger, hurried respiration, passing stool and urine in linen; right middle lobe of lung—dull on percussion, breath sounds harsh with a few crepitations in the right, middle and lower zone (diagnosed as bronchopneumonia), dyspnœic and delirium towards the end. Total leucocytes 9,050; polymorphs 80 per cent. Death in 3 days.	Removed to Medical College Hospital, Calcutta, on 3-4-49, at 11-45 a.m.
9	Sannyasi Charit, 82, M.	3 and 6	1-4-49, 4 p.m., Bankul.	3-4-49, 10 a.m., Bankul.	Symptoms similar to patient 6. Death in 2½ days.	Untreated.
10	Radharani, 55, F.	5 and 6	1-4-49, 6 p.m., Bankul.	3-4-49, 10 p.m., Bankul.	Symptoms similar to patient 6. Death in 3 days.	Do.
11	Ratan Charit, 12, M.	8	5-4-49, Kidderpore.	11-4-49, in Medical College Hospital, Calcutta.	High fever, headache, pain in the chest, harsh breath sounds with a few rhonchi—both lungs. No spleen, very hurried respiration. Total leucocytes 10,800; polymorphs 72 per cent. Blood culture positive for *P. pestis* on 11-4-49. Death in 5 days.	Removed to Medical College Hospital, Calcutta, on 6-4-49, at 7-30 a.m.
12	Nagendrabala Charit, 65, F.	6 and 9	6-4-49, Bankul.	9-4-49, 12 a.m., Bankul.	Symptoms similar to patient 6. Death in 2½ days. Additional sign—subcutaneous œdema with hæmorrhage on the left forearm noticed after death.	Untreated.
13	Champabala Charit, 30, F.	8 and 11	6-4-49, Kidderpore.	Still alive	High fever, cough, pain in chest and limbs, worse on cough, headache, coloured blood-stained sputum. Streptomycin administered, patient still alive. Blood culture taken after streptomycin was negative.	Removed to Medical College Hospital, Calcutta, on 6-4-49, at 9 a.m.
14	Haricharan Rana, 34, M.	6 and 9 11 and 13	7-4-49, 6 p.m., Kidderpore. Left Khantora the same evening.	12-4-49, in Medical College Hospital, Calcutta.	High fever, pain in chest, dyspnœa, headache, occasional hiccough, semiconscious, neck glands palpable, spleen +, jaundice +, eyes congested, hurried respiration, dullness over right infra-axillary region from 3rd space downwards to the base, diminished breath sounds and tubular breathing, increased V.R. and crepitations, later scattered moist râles all over, patient dyspnœic, death in 4½ days. Blood culture and lung puncture positive of *P. pestis*. Confirmed by animal and serological tests.	Removed to Medical College Hospital, Calcutta, on 9-4-49, at 2-40 p.m.

CHART II

Family relationship of the pneumonic plague cases



*Died of pneumonic plague at Bankul.
†Died of pneumonic plague at Calcutta.

The figures in brackets indicate ages in years.

the cases or contacts excepting a few in the Medical College Hospital were inoculated against plague.

Strangely, many of the contacts who were close enough to the patients at one stage or the other escaped infection. For instance, of the 31 members of Sannyasi's family at Bankul and Kidderpore, only 12 showed symptoms and 11 died. No cases were reported among the contacts of the compounder who died at Baharya, nor amongst the six members of Haricharan's family at Khantora, with whom he came into contact, at least for a few hours. On investigation it however transpired that Haricharan intuitively apprehending the same fate as some of his relatives at Bankul warned the members of his family not to come too close to him. It is said that he went to his village home only to have a last look at his dear ones. Another close contact, Padmabala, sister of Bishnupada, who came from another village (Jhapardah) and nursed her mother (Nandarani) escaped. She was inoculated against plague on 7th April, 1949. Another visitor, a cousin of Kishori, who arrived there on the 3rd April and remained for 3 days also escaped. This can, however, be explained by the fact that no cases occurred in the family after his arrival except the old lady (Nagendrabala) who showed symptoms on 6th April, 1949, the day he left. All other attendants including doctors and nurses either at Calcutta or at Bankul also escaped. No cases were reported among the neighbours who attended the funerals nor amongst the distant contacts.

Comments

Bubonic cases of plague were reported from an area at Kidderpore about the same time when Bishnupada, normally residing there, moved out to Bankul and developed symptoms of plague with pulmonary involvement there. Rats in the locality, examined in the laboratory, were also found plague infected, while Bishnupada's shop was apparently rat infested. It is very likely that he originally received the infection through an infected flea and was in the incubation period during transit. It is difficult at this stage to say whether he actually developed any bubo, as no one looked for it in apprehension during his illness. The infection was probably severe enough to lead to septicæmia with lung involvement and this gave the bacteria the necessary momentum to be transmitted by droplet infection. The short incubation period in subsequent cases occurring only amongst close contacts in quick succession leaves no doubt that the transmission was by droplet infection. The possibility of an imported rat flea transmitting infection to so many patients was, if at all, extremely remote and *Pulex irritans* is not seen in this part of the country particularly among the local inhabitants. The incubation period is also against flea transmission. The question of transmission factor, again, excludes the probability of all cases being purely septicæmic but it should be remembered that all pulmonary cases are *per se* septicæmic. *Pasteurella pestis* was isolated from at least two of the cases in the chain admitted into the Medical College Hospital. This finding when considered along with the characteristic signs and symptoms described above, the short incubation period and the most probable mode of transmission by droplet infection, leads one to conclude that the cases described here were of pneumonic plague.

Although the signs and symptoms observed here may not appear to many as typical of pneumonic plague it may be mentioned that cases with very little apparent lung involvement and expectoration have been described by various workers on pneumonic plague, particularly Wu Lien-Teh (1926) of Manchurian fame. According to the author the symptoms and signs noted in these cases when considered along with other findings were sufficient for diagnosing the cases as pneumonic plague, particularly in view of the fact that a disproportion between the general and local symptoms was noticed in all patients and that there was a deterioration of the general condition of the patient rather at an alarming rate. For a quick diagnosis, however, a portable *x*-ray equipment could be helpful.

Infectivity of pneumonic plague.—A question may now be raised why many of the contacts escaped infection. A general observation made in this series of cases, however, was that except in the case* who is still alive all patients had only soft non-productive cough. The chance of dissemination through droplets was therefore truly low. The only other way the author can explain the fact that no secondary cases occurred among the ward patients, doctors, nurses, and attendants in the Medical College Hospitals† and other family contacts mentioned above is that a close and intimate contact whereby the persons breathe the exhaled air of the patient after a cough is necessary and that when a sufficient distance separates the patient from other persons the soft easy cough of the pneumonic plague patient was not sufficiently forceful in the present cases to propel the infection perhaps more than a few inches. The contacts in some cases were not probably prolonged enough to receive the infection. Besides, the patients are not generally infective at the early stages.

That cases of primary pneumonic plague do not invariably give rise to secondary cases even

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* This patient who had shown some blood-stained sputum was fortunately partially segregated almost from the beginning.

† Only 14 out of 61 contacts were reported to have been previously inoculated against plague.

though there is a complete failure to quarantine or segregate contacts has been mentioned by the members of the International Plague Conference at Mukden in 1912 and by Strong (1942): and reported by Wu Lien-Teh (1926) in his treatise on pneumonic plague, and many others. Thus many close contacts in the Suffolk outbreaks escaped infection (Bulstrode, 1911). Wu Lien-Teh *et al.* (1923) record how on four occasions about 160 persons were exposed to infection by travelling in the crowded railway carriages with sick and dying patients with pneumonic plague without any of them contracting the disease. The latter authors (Wu Lien-Teh *et al.*, 1936) collected numerous other instances, from both literature and their own experience, of intimate contacts escaping infection. Among the recent records, Murdock (1940) described 3 outbreaks of pneumonic plague in Ecuador in 1939 in which the ward patients, nurses and doctors had escaped infection. Gale (1941) recounted an analogous instance. In another instance (Clark and Goldberg, 1943), 3 children slept in the same bed with a patient with pneumonic plague and yet escaped. Townsend (1944) stated that during an outbreak of pneumonic plague at Port Said 100 contacts were isolated, only 3 developed the disease. Munter (1945) reported a single case of proved pneumonic plague without a secondary case. Also Wynne-Griffith (1948) described an outbreak in Rangoon causing 16 deaths but showing low infectivity of the individual patients. In this outbreak, according to the author, the more or less intimate contacts of cases must have numbered over a hundred; seven doctors examined and attended several of these cases with impunity as cases of ordinary pneumonia and four nurses slept three nights in the same small room as their sick colleague but all of them escaped.

An incident analogous to that of Calcutta took place at Gaya (Bihar) only a few months ago, a short note on which is given below. It should, however, be understood that a complete investigation of this case has not been made.

Pneumonic plague at Gaya (Bihar)

Seven pilgrims came to Gaya town on or about 20th December, 1948, from Sail, a village in Sadarmandi (Kangra). Six of them died of pneumonic plague on successive days between the 23rd and 29th December, 1948. Another member of the party was also reported to have died on their way to Gaya. Most probably, the infection was originally contracted at Kangra (East Punjab). A local medical practitioner (Homœopath) who attended on them at Gaya got infected and died. Following him 10 other members of his family of 18 contracted the disease and died in quick succession. The common symptoms observed in these cases were sudden high fever and headache with air hunger, breathlessness, extreme exhaustion and collapse. In most instances, mind was clear till towards the end. On examination the patients showed catarrhal signs in the lungs but no definite consolidation.

The disease was practically confined to contacts of three houses and all the attacks excepting one ended fatally within two and a maximum of four days. The total number of deaths was 19. Some contacts escaped, although 4 or 5 of them had intimate contact with the patient during nursing. A provisional diagnosis of pneumonic plague was made but no further cases were reported since 3rd January, 1949.

Summary

Bubonic plague had been occurring in the Kidderpore area of Calcutta at the time when the present series of cases was reported. From this area a young man, apparently in the incubation stage, travelled up to his native village at Bankul, 14 miles away from Howrah, and there developed symptoms of septicæmic plague with pulmonary involvement. Thirteen other cases followed, all amongst close contacts—11 belonging to the family of 31 and 2 extra-familial. All except one out of 14 cases died. *Pasteurella pestis* was isolated from two cases in the chain admitted into the Medical College Hospitals, Calcutta. All cases more or less showed signs of lung involvement with soft cough mostly non-productive. The incubation period was short and fatality rapid. The most probable method of transmission was by droplets. The balance of evidence therefore was in favour of the diagnosis of pneumonic plague. Although most of the cases are now diagnosed retrospectively there is a strong presumption that the earlier cases were also of the same nature as the later proved cases of pneumonic plague. It is not, however, known whether this is the first time that such cases have been confirmed bacteriologically in the eastern part of India.

A large number of contacts including the attending doctors and nurses escaped infection. Similar experiences were previously described in the literature and one was recently narrated in an outbreak of pneumonic plague at Gaya in which the total number of deaths was 19 and a doctor's family, including the doctor himself, was the worst victim. As in Calcutta only one patient survived.

The following *precautionary measures* are suggested :

Doctors and health workers in an outbreak of plague, like the one now raging in Calcutta, should be on their guard and be suspicious of all patients with pneumonic symptoms and specially those who die in less than 4 days. They should also remember that the patients with pneumonic plague may cough very little and that the cough is soft and easy and the expectoration may be entirely absent in the early stages and very little or practically absent in the later stages.

No health worker or doctor should visit a suspected case of plague showing even slight evidence of lung involvement, without previously being inoculated and without a mask.

Immediate segregation of the patient by removing him to the hospital should be arranged and, if possible, at least one gramme of streptomycin be administered before hospitalization.

While the health organization should be informed to take other preventive measures such as preventive inoculation, disinfestation and deratization, etc., all the inmates of the house and probable contacts should be given 2 to 4 grammes of sulphadiazine daily for about 4 to 6 days and kept under strict quarantine and vigilance. Some antiseptic gargles and nasal douches may also be prescribed for them.

With these precautions it should be rather easier to control pneumonic plague than the bubonic in which large rat and flea populations are involved besides the human factor.

My best thanks are due to Dr. K. P. Bhattacharya, Plague Epidemic Control Officer, Government of West Bengal, for initiating the investigation of the Calcutta outbreak and for kindly offering his active assistance throughout. The co-operation and help received from the doctors, villagers, hospital authorities and health staff connected with this incident are thankfully acknowledged.

The information about the Gaya outbreak was collected through the courtesy of Colonel Duggal, the Director of Health Services, Bihar, to whom also my thanks are due.

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Postscript: I. Since this note was sent to the press, another case, Prafulla Kumar Das of Jorabagan area, Calcutta, died of plague with lung involvement on 10th May, 1949. He started with a bubo and turned septicæmic (*P. pestis* was present in his blood smear and positive in culture), ultimately involving lung (his sputum showed *P. pestis*). He was removed to the hospital a few hours before death. Fortunately, no secondary case was reported (till 14th May, 1949). Sulphadiazine was administered personally by Dr. K. P. Bhattacharya, the Plague Epidemic Control Officer, to all contacts immediately after diagnosis. Two rats collected from the house also proved positive on 13th May, 1949.

II. 1949 *outbreak* (records made up to 7th May).

The cases began to appear towards the end of February, *i.e.* earlier according to the last year's record.

The total number of suspected cases up to 7th May, 1949 (reported in this delayed issue of April), including the 14 cases of pneumonic plague, are 189. Of these, 179 are considered to be clinically plague and 9 only non-plague. At least 47 cases have been proved bacteriologically positive including two of the pneumonic cases. The total number of deaths so far, including 13 of the pneumonic cases, is 34. Taking the mortality rate separately it was 12 per cent (21 deaths out of 175 cases) amongst the bubonic and about 93 per cent among the pneumonic.

Out of the places from which cases were reported special mention may be made of Howrah and 24-Parganas, the total number of cases so far being 42 and 13. The first case of plague to be bacteriologically diagnosed this year was from Ward 1 of Howrah where rat falls were previously reported and found bacteriologically positive. From the municipal area of Calcutta cases have been removed to hospital from as many as 25 out of the 32 wards. Besides above, 3 cases were removed from the Hooghly area, the new area involved being Baranagar and Alambazar, north of Cossipur area (Ward 32).

The total number of rats examined this year up to 7th May is 7,250 including 201 dead rats (*i.e.* 11,845 since the beginning of the outbreak). In 29 instances rats have been found infected.

The special feature of this year's outbreak is the occurrence of pneumonic cases and the continuance of the cases till now (23rd May, 1949). Probably the weather is chiefly responsible for it. The rat epizootic also seems to be extending.

The Indian Medical Gazette Fifty Years Ago

PROGRESS OF THE PLAGUE

(From the *Indian Medical Gazette*, Vol. **34**, 1899, p. 130)

THE onset of the hot weather has unfortunately not yet been attended by any considerable abatement of the epidemic as in the previous years. For the week ending the 11th March, 1899, the official summary shows that there was a continued increase of plague in Bombay City, the rise in reported plague-deaths being from 978 to 1,109 and in the total mortality from 2,309 to 2,444. There was a rise in the number of cases in Thana District, but no other important change occurred in the Bombay Presidency. Fifty-eight plague-deaths are reported from Karachi. There was a slight general improvement in the Madras Presidency. In Calcutta, there were 78 reported plague seizures with 66