PLAGUE: ITS SYMPTOMS AND SPREAD.*

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The Outbreak.—When plague is first announced as having broken out in any city or district a scare is inevitable. The news affects different individuals in different ways. Some accept the inevitable, some leave the city, others content themselves with abuse of the authorities, but most regard the medical man who reported the first case as anything but a public benefactor. "Had the doctors not made such a fuss and the newspapers not written the subject up, there would have been no necessity for all the excitement," is a remark constantly heard. The diagnosis is doubted, and if the outbreak proves abortive or of small dimensions, the occurrence is afterwards referred to as "the so-called outbreak of plague," or as the disease which "stood for plague." These are all part and parcel of a plague outbreak, and as surely constitute a feature in plague as do the buboes or plague bacilli. The medical officer of health must be prepared for all this, and treat it with such consideration as it deserves.

Plague seldom, if ever, commences suddenly. We have in almost every city it has visited accounts of ailments of a bubonic nature unlike anything met with in ordinary experience. In 1893 I read a paper on some thirty cases of non-venereal bubonic trouble in the groin amongst Europeans before the Hong Kong Branch of the British Medical Association; that was the year before the initial outbreak of plague in Hong Kong in 1894. In Singapore and the Straits Settlements the medical men in practice there described a similar ailment. Surgeon Godding, R.N., communicated a paper on the same subject to the *British Medical Journal*, and Dr. Begg, of Hankow, operated upon seventeen cases of non-venereal buboes occurring in seamen of the British Royal Navy. These accounts are by no means exceptional. In 1877-79, during the occurrence of plague on the Volga, in one city near the mouth of the river bubonic fever of a non-fatal form was observed, whilst 150 miles higher up the river an outbreak of true plague in a virulent and fatal form raged.

Pestis Ambulans and Pestis Minor.—Here it may be well to discuss these two varieties of plague before proceeding further. I regard *Pestis ambulans* as a mild form of the disease occurring

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during an outbreak of true plague. Just as in scarlet fever some persons escape with but a slight tonsillar affection, so may some individuals during plague have the disease in so mild a form that they are not confined to bed, but may go about their ordinary avocations, or be at least but temporarily inconvenienced. *Pestis minor*, on the other hand, is possibly a distinct disease. It may precede, run concurrently with, or prevail after true plague has come and gone. That it is due to the plague bacillus has not been quite conclusively proved, as most observers have confused *Pestis ambulans* with *Pestis minor*. The plague bacillus, no doubt, will be found, or is at least present, in the bodies of those suffering from *Pestis ambulans*; but investigations concerning *Pestis minor* as to the presence of the plague bacillus require to be further extended. Not that there is a total absence of evidence. The researches of Dr. Cobb and Professor Simpson in Calcutta have contributed valuable information on this point. Their experience is worth relating. In 1894, whilst Hong Kong was in the first throes of an epidemic of plague, the soldiers in the Shropshire Regiment stationed there volunteered for plague duty. A number of them developed buboes of a non-venereal character, which perhaps was *Pestis ambulans*, or they may have been due to *Pestis minor*. The regiment left Hong Kong and went to Calcutta, but buboes of a non-venereal character still continued amongst them, and in the fluids extracted from their buboes Drs. Cobb and Simpson stated they had found the plague bacillus. The subject was investigated by Professor Cunningham and others, and the conclusion arrived at was that Drs. Cobb and Simpson had made a mistake, and that the plague bacillus was not present. It is needless to enter into the discussion now, but it may be at once stated that the subject is by no means settled, and it opens up a field for profitable investigation which it would be well to settle.

I will describe shortly the signs and symptoms of this non-venereal bubonic attack, which I have ventured to describe as *Pestis minor*, as distinct from *Pestis ambulans*. All my cases occurred in Europeans, and mostly amongst seafaring men. The patient, feeling out of sorts, comes for advice, and draws attention to a swelling in the groin. To eliminate a venereal origin is, of course, the first step. In a day or two the patient becomes feverish, disinclined for work, and seeks his bed. The gland in the groin increases in size, the skin over it becomes discoloured, and during the second week of illness pus finds its way to the surface at one, two, or more points. A probe passed into one of the openings goes deep into the part, and may be made to protrude through one of

the neighbouring openings in the skin, showing that the skin is undermined. On cutting down upon the gland, it will be found detached wholly, or except at one part; the surface is covered with pus and lymph, and when the gland is incised and inspected, it is seen to present three or four or more purulent foci, and the tissue of the gland is soft and easily broken down with the finger. The further treatment consists in removing the gland and perhaps one or two of its inflamed or suppurating neighbours, scraping out the bed in which it lies, and treating the wound by iodoform, packing with gauze, or in some such approved surgical method. During the third week the fever subsides, the wound begins to heal, and the patient by the end of the fourth week is usually fit to resume work. This is the disease I designate *Pestis minor*, and I am anxious that this view should be the standpoint from which in future *Pestis minor* should be discussed.

Before giving an account of the signs and symptoms of plague, I will relate my first introduction to plague. When the disease first appeared in Hong Kong I was travelling in Corea, and hastened back to Hong Kong immediately. On reaching the harbour, I was struck with the lifelessness of the place. This, the largest harbour in the world, in which more registered tonnage comes and goes than in any other port in the world, seemed deserted; the busy quay was untrodden, and the streets of the city were empty. On arrival at one of the plague hospitals, I found a ward of twenty-five beds at my disposal. It is needless to say every bed was full. I walked round with the house-surgeon—a Chinaman—and had my first lesson in plague. The patients seemed wonderfully well; some sat up in bed, some lay apparently asleep, some were eating, some smoking, and, after my twenty minutes' perambulation, I remarked that the patients seemed all going on very well. The house-surgeon looked round the ward, and said four of the men had died since I had come into the ward. The suddenness of death in plague was thus brought home to me in a striking manner, and it is a feature of the disease which must never be lost sight of. I may say here all the twenty-five men in that ward died, and the succeeding twenty-five all died, for of my first fifty cases none recovered.

Incubation.—The usual period of incubation is three to five days, but it is believed that a person may be attacked in forty-eight hours after exposure, or that the invasion of the disease may not occur until after ten or even fifteen days. The maximum, however, may be justly and reliably regarded as ten days, however, so that by the eleventh day the patient, if a contact, may be regarded as free to take his departure from the bar imposed upon his movements by quarantine regulations.

Invasion.—Plague may commence in one of three ways :

1. A sudden rigor or chill may usher in the disease, accompanied or followed by high fever, headache, giddiness, thirst, vomiting, epigastric pain, extreme prostration, and aching in the back and limbs, and considerable mental disturbance.

2. In a certain number of cases no rigor occurs, but fever, headache, loss of appetite, and pains in the limbs obtain, with but little mental disturbance.

3. In children convulsions at times usher in the attack, and may be the first indication that the child is ill.

Varieties of Plague.—There are three principal types of plague, which, although they present many features in common, are each characterized by a special clinical feature which serves to stamp the type.

1. *Bubonic Plague* is characterized by the development of a bubo or buboes during some period of the attack. It is by far the most common variety, buboes seldom occurring in less than 70 per cent. of the cases met with during an epidemic.

2. *Septicæmic Plague.*—No bubo occurs in this variety of the disease. During life the glands may be felt enlarged to a small extent in exposed parts, but post-mortem examination shows every gland to be swollen to some extent. Septicæmic plague is very fatal.

3. *Pneumonic Plague.*—As the name implies, the lungs are primarily affected, and so far as can be elicited by clinical examination, they are the only organs which develop definite lesions. The glands are not enlarged, nor are they found swollen after death. In some epidemics the pneumonic type of the disease is more prevalent than in others. Patients with plague pneumonia seldom recover.

Besides these, the more special and definite types of plague, we find such terms as, "The nervous type," "toxic and fulminant plague," "the puerperal type," "the typhoid type," each indicative of some predominant sign or symptom which serves to stamp the variety.

BUBONIC PLAGUE.

Signs and Symptoms.—The initial signs and symptoms of plague at the period the patient is usually seen by the medical practitioner are as follow :

The patient may be found in a state of excitement, delirium, or partial apathy, and unable to answer questions put to him ; the features are pain-drawn and haggard, or they may appear expressionless, as if the patient were intoxicated. The eyes look sunken,

the conjunctival vessels are injected, the face pale, and a dusky congestion prevails round the eyes, extending to the forehead and cheeks. The pulse will be found to be full and not readily compressed. The breathing is hastened from the beginning of the illness, and not infrequently hiccough or a short dry cough is noticeable. The temperature of the body in the majority of cases will, during the first day of illness, be between 101° and 103° , but it may suddenly rise to 104° or 107° within a few hours of invasion. In some cases, even in the early stages of the disease, the temperature will be found normal or subnormal, but in such apyretic cases no doubt a temporary initial rise has preceded.

The tongue appears swollen, and the dorsum is coated with a general white fur, leaving the sides and tip red and uncovered; sore throat may be complained of; one or both tonsils may be enlarged; and vomiting and nausea are often distressing, any food or drink swallowed being immediately ejected with considerable force. The abdomen is frequently tender and tense, and, if the patient is sensible, epigastric tenderness is complained of, or elicited on pressure. Constipation is the rule at first, but diarrhoea is not uncommon; the urine is unaltered during the onset, except that it is scanty in amount. The patient may be found lying flat on the back, or if a bubo pains he may be sitting up in bed with the knees almost at the chin, or may lie on one side with the lower limb on which the buboes exist in the position of flexion. The glands in the groin, the axilla, or the neck may be found swollen and tender, or tenderness alone may exist, elicited only when deep pressure is made in the region of the glands.

Such are the signs and symptoms usually presented to the doctor when first he is brought to see a case of bubonic plague. There is nothing specific in their character, nor anything to point to the illness being of a peculiar nature unless buboes are present. Buboes are, however, seldom an initial sign, and in their absence there is nothing to suggest a specific ailment. The further history of a case of plague will be best considered by an analysis of the different organs and functions as they are severally affected.

The Digestive System.—The white fur on the tongue present from the beginning of the illness speedily acquires a mahogany colour, and finally changes to a brownish-black hue. At first the tongue is swollen, and the edges indented by the teeth, but after two or three days the dorsum is cracked and fissured, and the whole organ seems contracted in size.

The tonsils are usually reddened, and may be swollen with mucous puncta on their surfaces, or they may be actually inflamed.

Vomiting and nausea, frequently present from the onset, may continue for a day or two, or occasionally, in unfavourable cases, persist to the end. The vomited matters appear of a bilious character at first, but later on consist merely of the food and drink that has been taken, combined with an inordinate amount of clear fluid. Occasionally the vomit presents a coffee-ground appearance, but this is not due to ordinary hæmatemesis.

Constipation obtains for the most part during the first day or two; it may persist or give place to a profuse intestinal flux. On the other hand, diarrhœa may be present from the onset. Blood occasionally appears in the stool.

The *abdomen* may be swollen or retracted. The *liver* is somewhat enlarged, and tender to percussion. The *spleen* is always swollen and tender; the enlargement may be such that the spleen occupies three or four times its normal size.

The Circulatory System.—The pulse, increased in frequency from the first, gains in rapidity as the disease progresses. At first full and tense, it fails after a day or two and becomes soft and compressible, and finally dicrotic or running in fatal cases.

The *heart* beat at the apex is more diffuse than normal, and a præcordial thrill may be occasionally felt. The right side of the heart shows evidence of dilatation; the first sound of the heart is short, and the second feeble; a systolic murmur is occasionally present. Pulsation of the carotids is frequently apparent.

The Respiratory System.—In bubonic plague it is the exception to find any lesion of the organs of respiration. Should bronchial or pulmonary symptoms develop, they seldom occur before the fourth or fifth day, and usually immediately before death. The lung affections peculiar to the pneumonic type of the disease are discussed under "pneumonic plague."

The Urinary System.—In some epidemics it is the rule to find a trace of albumen from almost the onset of the disease; in other outbreaks, however, few urinary derangements occur. The urine is always scanty, especially at the onset of plague; the specific gravity is high, and the reaction intensely acid. Urea, uric acid and chlorides are deficient in amount; granular casts are not infrequent, and blood in some quantity is occasionally met with. Retention of urine may obtain, but actual suppression may complicate the illness in fatal cases.

The Nervous System.—From the onset of plague the mental faculties are affected. The pain-drawn, haggard expression of countenance would seem to indicate that the patient is suffering from pain, probably arising from the glandular swellings. This

speedily gives way to, or may be wholly supplanted by, a peculiar listlessness and apathy of feature well-nigh characteristic of the disease. Delirium may, on the other hand, usher in the disease, accompanied by what would appear to be a suicidal tendency, inasmuch as the patient may rush to the verandah or window, to the staircase, or out into the street. The outburst is, however, unattended with any fixed idea or purpose. If gently restrained, the patient is soon turned from his apparent purpose, and his aimless intention may assume the form of wandering in the street, or taking passage by train to an uncertain destination. It would appear by the answers to questions that the patient is sensible, but his statements are frequently untrue, the memory being at fault. Deafness, thickness of speech, laryngeal paralysis, muscular tremor, loss of co-ordination in almost any group of muscles, are common features in the disease.

Sleeplessness is a distressing symptom, and of so constant an occurrence as to constitute one of the most trying conditions to deal with. In fatal cases, picking at the bedclothes, busy delirium and coma prevail, and usually herald death.

The Cutaneous System.—Petechiæ occasionally appear, especially in fatal cases, over the seat of the bubo, or on the limb affected by the bubo, or still more rarely on other parts of the body or limbs.

Subcutaneous hæmorrhage of an extensive character may occur around a bubo, or smaller hæmorrhages may develop elsewhere. Small patches of skin may slough, buboes suppurate, leaving foul, deep, ulcerated surfaces with ragged edges. Boils and so-called carbuncles are exceptional, and a distinctive rash is very uncommon; when a rash occurs it closely resembles the rash of typhus.

The Lymphatic System.—The toxic agency in plague seems to expend its virulence largely on the glands. Although a bubo may be apparent in only one region of the body, post-mortem examination reveals the fact that almost every gland in the body is swollen. Buboes occur most frequently in the groin, and the order of frequency with which buboes appear in the groin, axilla, and neck, stands as fifty, thirty, and fifteen in every hundred cases which show buboes. The bubo may appear at the onset, and may be present even with the initial rigor; more usually, however, it does not develop until the second day, when it will be found as a large, smooth, bun-shaped swelling. On palpation it feels resilient and rather elastic and resistant. The bubo may disappear, but suppuration is the rule at the seventh to the ninth day of the illness. The glands in the neighbourhood of the bubo are obscured and incorporated in the swelling. Œdema may extend over a wide

area around the bubo, and a subcutaneous hæmorrhage may in the case of the groin buboes extend down the thigh, backwards to the gluteal region, and upwards on the abdominal wall. When the axillary glands are involved the swelling and œdema may extend over the chest, down the side to the ilium, and backwards to the scapular region. In the neck the effusion is at times sufficient to press upon the trachea and larynx.

The pain caused by the adenitis and bubo may be so great as to be excruciating, and causes the affected limb to be placed in a position calculated to best relieve tension; the lower limb is flexed on the abdomen; the upper limb placed away from the trunk, the patient lying on the back, or inclined towards, or altogether turned on, the affected side.

SEPTICÆMIC PLAGUE.

Although the term "bubonic" is usually associated with what is called true plague, it is now known that glands may enlarge and toxic symptoms develop without the formation of a bubo. The dose of poison seems so large that a general infection of the blood ensues, and the patient is struck down suddenly without much chance of recovery. There is but little reaction after the onset; the pulse fails from the first; the temperature rises suddenly, it may be to a hyperpyrexia height; the prostration is extreme; delirium or coma may suddenly set in and continue to the end. The glands never attain a large size, although every gland in the body may be swollen. Deep and firm pressure may elicit pain over the groin, iliac, axillary, or cervical group of glands, but usually this is obscured by the mental condition of the patient. The septicæmic type is a very fatal variety of plague.

PNEUMONIC PLAGUE.

During the epidemic of plague in Bombay in 1896 attention was drawn by Childe to the abnormal number of deaths returned as "pneumonia." A bacteriological investigation of such cases showed that the plague bacillus was present in the sputum in almost a pure culture, and since that time the pneumonic variety of plague has been recognised as a distinct and very fatal form of the disease. The symptoms are: expectoration of a quantity of watery sputum, frequently tinged with blood, and occasionally some frothy mucus; hurried or laboured breathing, cardiac discomfort, restlessness, sleeplessness and early delirium. The local signs are patchy, irregular, pneumonic consolidation of the lungs, congestion of the bases, and intermittent evidences of bronchial

catarrh. Buboes do not occur, nor are the glands found swollen either during life or after death.

Temperature.—The temperature chart in plague, although presenting many variations, has in the majority of cases a more or less typical character. In bubonic plague the initial temperature during the first day may be 102° or more; on the second day it may attain a height of 104° or 105° , or more; on the third day (if it is a typical case) it falls; and on the fourth day may become almost normal. During the fifth and sixth days the temperature again runs up, to fall, subsequently, on the seventh or eighth day. This double rise is fairly common, and it is the most favourable feature as regards the indications afforded by the body heat. In contradistinction to this course, the temperature during the first twenty-four hours may be 105° or more, and may continue high until just before death, when a sudden drop may occur. After death the temperature in the rectum rises considerably.

Duration of the Disease.—Plague usually proves fatal on the fifth or sixth day, but cases have succumbed in twenty-four hours. It is but seldom these rapidly fatal cases are brought to hospital, and in private practice the patient is frequently moribund before the doctor arrives. Until the tenth or twelfth day has passed, however, death is probable; but after that period recovery may be expected. Although the patient may be possibly out of danger, the illness may continue more or less acute for a month or more. Wounds left by suppurating buboes heal very slowly, and convalescence may be prolonged indefinitely.

Diagnosis.—The plague appearing in a locality where contamination is unlooked for is a disease difficult of recognition. In such places as Oporto and Glasgow, in both of which plague developed without warning, the recognition of initial cases is not to be expected. Two or three persons may die of pneumonia running a rapid course within a few days of each other, yet plague need not be "dragged into" the argument to account for the calamity. A woman in the pregnant state may abort and die, a child may be suddenly convulsed, glandular fever may occur amongst children, a patient may develop abdominal symptoms of a typhoid type, without plague being the cause occurring to one's mind. It is only when a number of sudden deaths, arising from some undetermined cause, occur that alarm is raised; and at the present day, seeing that plague is pandemic, the idea that the plague is the cause should suggest itself to everyone. When plague exists in a locality the diagnosis of a typical case is easy. The sudden incidence of the disease, the headache, vomiting, hot dry skin, rise in temperature, giddiness,

congested conjunctivæ, thickness of speech, intoxication appearance, and the extreme prostration all point to infection by plague. Assistance in coming to a conclusion is afforded later by the appearance of the tongue, the glandular enlargements, hæmorrhages, mental aberration, sleeplessness, and the course of the temperature. The pneumonic type of the disease is still more difficult to diagnose if plague is not present to one's mind as a cause. Assistance in suspecting plague as a cause is afforded by a study of the rapid onset of the lung lesion without any previous bronchial symptoms, by the sudden attack of prostration, fever, and general symptoms, and inspection of the sputum, when it will be found watery and profuse, and tinged by or mixed with blood. It is only, however, by microscopic examination of the sputum that the pneumonic form of the disease can be actually diagnosed.

In tropical countries the medical practitioner has to eliminate malarial fever, filarial fever, and relapsing fever from the list of possibilities in coming to a conclusion. The writer once sent a patient suffering from filarial fever to the plague hospital. The man, a Parsee, was dwelling in a house in which a case of plague had occurred. He had high fever, severe lumbar pain, vomiting, restlessness, a full bounding pulse, and a mass of enlarged and tender glands in the left groin. Yet he had not plague, for he passed within a few hours after being sent to hospital chylous urine, and the *Filaria nocturna* was found in his blood.

The diagnosis of plague from the signs and symptoms can be safely made in the majority of cases when once the cause is suspected; but in many cases—in fact, in every case—the diagnosis can only be positively made when the *Bacillus pestis* is proved to exist in the blood, in the excreta, or in the fluid drawn off from a gland or from the peri-glandular swelling.

Prognosis.—In the Hong Kong epidemic of 1894 the death-rate in the Chinese hospital amounted to over 95 per cent. of those attacked by plague—a truly appalling figure. In subsequent epidemics, and in cases (Chinese) treated in European hospitals, the mortality was some 10 per cent less. In India the death-rate amongst natives from plague has amounted to between 60 and 70 per cent. Europeans recover with much more frequency than do natives. In India the proportion of deaths to cases among Europeans varies between 30 and 40 per cent., and the same held good in Sydney, where of 303 Europeans attacked only 103 died. This mortality is not taking into account any of the prophylactic or curative treatments by inoculation.

In regard to individual cases, prognosis is well-nigh impossible. In many apparently hopeless cases recoveries result, and in many

seemingly mild cases the patients die. Unfavourable signs and symptoms are sleeplessness, delirium, coma, persistent vomiting and hiccough, renal and intestinal hæmorrhage, early diarrhœa, multiple buboes, and extensive hæmorrhages or petechiæ. The septicæmic and pneumonic forms of the disease are much more fatal than the bubonic type. Cervical buboes are more to be dreaded than either inguinal or axillary. When the patient survives the first febrile stage, or is fairly well on the fifth or sixth day, a hope of recovery may be entertained. When the tenth day is reached, and the bubo has suppurated, or the glandular swellings have disappeared and the intellect is clear, the chances of the patient's recovery are fair. Should fever reappear after the tenth day, as it very occasionally does, pyæmia is probably the cause, and a fatal issue is probable. The suppuration of the bubo is not in itself a sign of certainty of recovery; it only indicates, or occurs synchronously with, the end of the first (febrile) stage.

FIXITY OF TENURE.—If any further evidence were needed to emphasize the importance of permanency of appointment of medical officers of health being made law without delay, it is amply afforded by the recent action of the Penzance Town Council. It has been usual to elect their medical officer of health for a period of three years, but at a recent meeting of that body, when his re-appointment came up for consideration, a resolution was passed that he should be appointed for one year only, instead of three years, as on previous occasions.

The member who proposed this new arrangement calmly said "that medical officers of health throughout the country were very much disposed to set aside the authority appointing them, and to look to the Local Government Board and county councils as the authority to whom they were responsible." This, he remarked, "was very wrong"; and he further added that "if they appointed any officer for a permanent tenure they were appointing not a servant but a master, and this was strongly to be objected to."

Unconsciously, and without intending to do so, this gentleman, whilst objecting to it, proved the case for fixity of tenure up to the hilt out of his own mouth. The very points to which he took exception only go to show the necessity of the appointment being permanent. He, of course, did not desire to have any officer who would be in a position to compel his council to do their duty whether they would or not, and whom, if he were too pertinacious in the performance of his own duties, they could not dismiss at the end of the year. There are hundreds of similar instances in the kingdom where district and urban councils hold their health officer under their thumb, and where he is practically powerless for any real good, because if he really acts up to the full as regards his duties as prescribed by the Local Government Board he is quietly shelved when his yearly re-appointment comes on, and a man more amenable, who will agree to do nothing, is elected.

Surely the Local Government Board and the new Parliament will, at no distant date, alter this anomalous state of things, and give medical officers of health a chance of doing their duty without the risk of losing their appointments.—*The Therapist*.