PLAGUE : ITS SYMPTOMATOLOGY, PATHOLOGY, TREATMENT AND PROPHYLAXIS.

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INTRODUCTION.

Two features are specially characteristic of plague. They are, first, the slow, irregular, and gradual manner in which the disease acquires a hold over a locality into which it is imported, and which may later on become the scene of an epidemic; and secondly, the obscurity which often surrounds the earlier cases. The first is apt to raise false hopes of the disease dying out, to cause the procrastination of effective measures, and to favour the postponement of careful inquiries into the disease at a stage when its movements and mode of spread are more easily followed than later on. The other gives rise to disputes as to the nature of the disease, and consequently to the loss of valuable time. Much of the obscurity which formerly involved the early cases in a locality is beginning to be cleared away since the discovery of Kitasato's bacillus. When everyone is on the alert as to the probability of plague being one of the diseases which may be met with, the bacillary test is all-important in its usefulness, but when there is no suspicion, there are two varieties which may escape attention for some time, and so permit the germs of the disease to be extensively spread. These are the pneumonic and ambulant varieties.

THE PNEUMONIC FORM OF PLAGUE.

The pneumonic variety, which is very infective, has been demonstrated by Surgeon-Major Childe, I.M.S., to owe its infectivity to the fact that the sputum frequently contains almost a pure culture of plague bacilli, which get on to handkerchiefs, clothing, bedding, and other articles of furniture, as well as on to the floor of the patient's room. This form is particularly dangerous because the clinical symptoms are not typical of ordinary plague, and it is more likely to be mistaken for bronchitis, broncho-pneumonia, or pneumonia. Pain, tenderness, and enlargement of the lymphatic glands in the inguinal, femoral, axillary, and cervical regions, which are the most prominent external signs of bubonic plague, are absent; and beyond cough and fever, and a prostration which is exceptionally severe, and far exceeding that which ought to be expected from the small amount of lung mischief discernible, there are few signs to raise suspicion that the disease is plague. The illness commences with a rigor, and symptoms of general *malaise*, intense headache, nausea, vomiting, and pain in the limbs and body, followed by fever varying in range from 102° to 105°. Cough more or less pronounced with dyspnoea sets in, and a quantity of watery sputum tinged with blood, and becoming profuse as the disease advances, is coughed up as a rule without effort. The sputum is not the glairy, viscid, rusty character of acute pneumonia, though on the clothes it may be readily mistaken for this. Moist sounds are heard at the base of the lungs and over the pneumonic patches; but however hurried the breathing and quick the rate of the pulse, there is not that disproportion between the pulse and respiration ratio which obtains in acute pneumonia. The symptoms become rapidly worse, the patient becomes delirious, there is gradual failure of the heart action with or without coma, and death occurs on the fourth or fifth day, or earlier. This form of plague, besides being the most infectious, is also the most fatal.

THE BACILLARY TEST.

The only certain means of diagnosis during life is to examine the sputum by spreading a small quantity on a cover-glass or slide, drying, fixing, and staining with gentian violet, methylene blue, carbol fuchsin, or any of the ordinary aniline dyes. An examination with one-twelfth oil immersion will decide whether the characteristic cocco-bacilli or diplobacteria, more deeply stained at the ends than in the centre, are present. Should these be found at a time when there is only suspicion of plague existing in a locality, the confirmatory test of cultivating the bacillus should be immediately applied; and, as this cannot be done without a laboratory,

the suspected sputum should be placed in a stoppered phial, properly sealed, and taken or sent to the nearest bacteriological laboratory for examination and report.

The most reliable diagnostic test as to whether the diplobacteria are plague microbes is Haffkine's stalactite test. This consists in cultivating the microbe in broth to which drops of clarified butter or cocoa-nut oil have been added. From the drops of oil suspended on the surface of the nutrient medium the bacilli grow down into the depths of the liquid in the form of long threads, producing the appearance of stalactites. When disturbed the threads fall in snow-like flakes to the bottom. This stalactite formation is, under these conditions, peculiar to the growth of the plague microbe, no other microbe having hitherto been found to possess the same property.

THE AMBULANT OR MILD FORM OF PLAGUE.

The ambulant or mild variety of plague, which is a non-fatal form, is even more likely to escape attention than the pneumonic, because of the slight constitutional disturbance which it may produce, and because it is often taken for some other disease. *Pestis minor* or *pestis ambulans* is, if anything, more insidious and dangerous to the community at large than the pneumonic, for its mildness produces no sense of danger. Further, it is not discernibly infectious, the cases appearing to crop up unconnected with one another, and it is generally mistaken for mumps, syphilis, the result of a strain, scrofulous glandular affections, and malarial disease. The clinical symptoms are ill-defined or well-defined fever; pain, tenderness, and enlargement of the lymphatic glands, in the groin, armpit, or neck; weakness, a tongue which is coated with a creamy white fur in the centre, and is angry and red at the tip and edges; the eyes may be slightly congested and the speech may be a little thick. This is the acute form, which may only last a week, the bubo resolving rapidly or quickly suppurating. In the more chronic form, which may last two or more months, the bubo or buboes are indolent, and they undergo a slow process of suppuration and sloughing, constituting a serious drain on the general health of the patient, producing anæmia and debility. These mild or benign forms of plague have been observed in nearly all plague epidemics; they are described by Sydenham in his observations on the plague of London 1665 and 1666; also by Fodéré in his account of the plague of Marseilles in 1720, and by Forbes in his description of the Pali plague. Again they are noticed in the records of the comparatively recent plagues of Benghazi on the North African coast, of Mesopotamia and of Persia. The most recent example of this form of plague, unmixed with other varieties, was the glandular sickness, as it was called in Astrakhan in 1877. In this city an outbreak which affected more than 200 persons occurred without a single death, and without being followed by the virulent form. Those affected suffered from fever more or less acute, with swellings and inflammation of the lymphatic glands, which in most cases ended in abscesses. Beyond the inconvenience and discomfort caused by the buboes, sometimes in the neck, sometimes in the armpit, and at other times in the groin, the general symptoms were not such as to prevent the patient from moving about. About the same time there prevailed at Resht in Asia Minor, and with which Astrakhan has more or less communication, the same type of glandular sickness along with a severe type of plague. In the next year—in 1878—the glandular sickness of Astrakhan appeared at Vetlianha, a village on the banks of the Volga, and some distance from Astrakhan; but in a short time it was succeeded by a most virulent type of plague, which assumed the pneumonic form, and was of an extremely infectious and fatal character. The mortality at the height of the epidemic was 100 per cent. Mild cases of plague were observed in Calcutta, Bombay, and Alexandria long before the fatal cases attracted attention, and apparently these mild cases have also occurred in Oporto, for a peculiar type of fever with swellings is reported to have been noticed in that city for some time. This mild form is only distinguished by a careful inquiry into the history of the case, and by a process of elimination. In Calcutta examination of the blood from the affected gland showed in some cases the characteristic bacillus, but in others none could be detected.

It is evident that this form of the disease requires special and further investigation. The elucidation of *pestis ambulans* is of the greatest importance from an epidemiological point of view. The fatal forms of plague cause alarm, and are likely to be met by stringent effective measures of control; but the milder forms are almost certain to be overlooked or considered to be unimportant, and in the meantime the disease gains a firmer hold on the locality, and may later develop into a more virulent type.

It is too frequently assumed that the milder forms are not communicable. This is an assumption which has gained ground of late owing to the supposed imprisonment of the bacilli within the infected glands, strengthened by the difficulty in connecting one mild case of plague with another. It is a pretty theory, but against this is the fact that mild cases continue to spread, and that no systematic inquiry has ever been made into their mode of spread.

THE BUBONIC FORM OF PLAGUE.

The bubonic variety of plague, as its name implies, is always accompanied by buboes, which usually appear at the commencement of the illness in the groin, armpit, or neck, and occasionally in the supratrochlear or popliteal space. The most common site is the groin, and the next is the armpit; but more than one region may be affected, and often groups of neighbouring glands on the same course of lymphatics become infected. The bubo varies in size, and is, as a rule, extremely tender and exquisitely painful. In cases which prove fatal early the glands may remain hard and painful, but in the majority, owing to the matting together of glands by a serous and sanguinolent infiltration, and by a mass of extravasated blood, the bubo enlarges and forms a doughy and bulky swelling. At times, owing to pressure on veins, a considerable amount of oedema of the tissues in the neighbourhood of the bubo occurs. The size of the bubo is not of so much importance as its position. When situated in the axilla or in the cervical region it is particularly dangerous when the exudation is extensive, because the effusion is apt to become organised and converted into a hard mass, which may press on some vital part, or may form a large slough. If the patient lives for seven or eight days the bubo either begins to resolve, or shows signs of softening and goes on to suppuration or to suppuration and sloughing. Examination of the lymph and blood of the glands and buboes show large numbers of the plague bacilli. A gland or bubo may be punctured, and a small quantity of the contents drawn off by suction with a sterilised pipette, closed at one end to protect the operator against accidental infection.

There are certain symptoms common to all forms of plague of the severer type: these are the peculiar expression of the face, the halting speech, and the appearance of the tongue. The countenance generally portrays in the early stages anxiety and distress, later resignation and apathy; the eyes are red and congested, and the patient has the appearance of being under the influence of a hypnotic, and yet unable to sleep, the eyes remaining wide open. Unless delirious when the face is flushed and the physiognomy wild, the expression in advanced cases is apathetic or vacant, masking the approaching dissolution. The speech is peculiarly hesitating and broken, being more or less staccato in character, each syllable being pronounced by itself in a thick and husky tone like that of a drunken man, or only half the sentence may be spoken, the rest being forgotten. The tongue is early coated with a creamy white fur, except the tip and edges, which are clean and red; later it is dry, covered with a yellowish or whitish-brown fur, the tips and edges remaining red and irritable.

The characteristic physiognomy, speech, and tongue with the presence of a bubo are unmistakable signs of plague. The general symptoms of a typical case are shivering, high fever, nausea, vomiting, intense general or frontal headache, painful and tender bubo, staggering gait, suffused and congested eyes, anxious expression, coated tongue except on tip and edges, restlessness with uncontrollable desire to wander aimless to some distant locality, dyspnoea, increasing disturbance of the nervous and circulatory systems, manifesting itself in high and noisy delirium or coma, and in gradual or sudden failure of the heart's action. The pulse, which is quite soft and easily compressible at the onset, becomes

intermittent and dicrotic and often difficult to count, and there is a tendency to collapse, the patient's extremities becoming cold and clammy. After the sixth or seventh day the patient's chances of recovery are much increased, and the temperature usually reaches the normal about the tenth day.

THE SEPTIC VARIETY OF PLAGUE.

The septic variety of plague is a virulent type in which the lymphatic glands show no special enlargement during life, and consequently the bubo is absent, but after death the glands are found to be generally affected, being somewhat enlarged and much congested. In this form of plague the bacilli early invade the blood in large numbers, and are easily detected. The chief characteristic is its rapidity. The patient is profoundly affected by the amount and strength of the poison received. Usually ushered in with high fever, there is at times no power in the patient for reaction, and the temperature does not reach 100° F. The countenance is pale, and the expression apathetic. Extreme nervous prostration, muscular weakness, delirium, picking of the bedclothes, stupor, and coma follow quickly on one another, and the patient dies on the first, second, or third day. In these cases there may be bleeding from the nose, kidneys, and bowels.

POST-MORTEM APPEARANCES.

The characteristic appearance in a necropsy of plague is that of engorgement and hæmorrhage, nearly every organ of the body participating more or less; there is also parenchymatous degeneration and change in the heart, liver, spleen, and kidneys. The bubo consists of a number of congested glands embedded in a mass of extravasated blood, with extensive exudation into the adjoining areolar tissue, the larger blood vessels being often involved. The glands in the bubo are swollen, vary in size from a bean to a walnut, and when cut into are found to be much congested and of a dark-purplish colour. In the septicæmic and pneumonic form, in which the bubo is absent, nearly all the lymphatic glands are slightly enlarged, pink or dark-red in colour, and some may be engorged. In the pneumonic there is, in addition to the general engorgement of the lungs, several pneumonic patches. Plague bacilli are to be found in the different varieties in the lymphatic glands, and the serous or sanguinolent exudation around them, in the blood, spleen, lungs, liver, bile, urine, peritoneal fluid, and fluid of the brain. It is obvious that, with so general a distribution in the corpse, the danger of some of these bacilli escaping and finding a lodgment in a favourable medium for their multiplication is not inconsiderable, and that the greatest care is needed to prevent this.

TREATMENT.

Curative treatment has but a small share in lessening the general mortality of plague, which ranges between 60 and 90 per cent. The antitoxin treatment has hitherto practically failed. The hopes that were raised by the success following the employment of Yersin's serum in a few cases in China have not been borne out when applied on a larger scale in India, nor has any greater success attended the employment of Lustig's or Roux's serum. In the treatment of plague all that can be done is to secure the best conditions in order that the patient may make a good fight against the disease, and these consist of good nursing, early confinement to bed, the maintenance of the recumbent position to prevent syncope, careful feeding, and general treatment to keep up the patient's strength and prevent complications if possible. To control the febrile symptoms and check delirium, ice bags to the head and sponging of the body and the use of hypnotics and sedatives which are not depressants have been found to be beneficial. To sustain the action of the heart alcoholic stimulants, ammonia, strychnine, and digitalis have been freely employed. Complications may be treated on general principles as they arise. The pain and tenderness of buboes are much relieved by the application of the ice bag, which has also a good effect on the infiltration. Other applications, such as glycerine and belladonna and poultices have been practised. The bubo is opened when pus forms, but nothing is gained by too early incisions.

PRECAUTIONS.

As soon as plague is suspected or diagnosed, the case should be notified to the local authorities, with whom rests the

responsibility for carrying out the necessary measures to prevent the spread of the disease; but medical men and nurses can materially assist the authorities in this respect, and prevent the disease from spreading in the family or infecting themselves. For this purpose, until the local authorities can take action, or if the circumstances of the patient do not permit of removal, the patient should be strictly isolated in the most secluded and best ventilated room in the house. An acid solution of perchloride of mercury, of the strength of 1 in 500, should be obtained at once. Sputum, urine, and excreta should be received in vessels containing perchloride of mercury of this strength, while a solution of half this strength may be used in vessels for soaking soiled clothes, disinfecting cups and spoons, etc., or washing the doctors' and nurses' hands after handling the patient.

Nothing from the patient should be discharged down the drain without being thoroughly mixed with an abundant quantity of this disinfectant, otherwise rats in the sewers may become infected and carry the disease elsewhere. In the event of death a sheet soaked in the strong perchloride solution should be wrapped around the body and carbolised sawdust should be put into the coffin. Nurses, doctor, and the inmates of the house should be inoculated with Haffkine's prophylactic. Under ordinary hygienic condition and with ordinary precautions there is no danger to a doctor or nurse attending a plague patient. I have not entered into the precautions which the local authority are likely to take, for these do not come within the scope of this paper.

MOSQUITOS IN RELATION TO MALARIA.

By IAN MACDONALD, M.D.,
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THE most recent advances in our knowledge of the parasite of malaria prove clearly that part of its life-circle can be passed in the body of certain mosquitos of the genus *Anopheles*. It becomes, then, of immense importance to investigate whether in fever-stricken localities the distribution of this mosquito is associated with the presence of fever.

Working under the direction of Dr. Thin I have begun an inquiry with reference to the presence or absence of mosquitos in certain localities. The district, as a whole, over which my observations extend embraces an area of 60 miles, reaching from the southern part of the Spanish Sierra to the Atlantic. I have examined, in all, twelve districts; of these nine have endemic malaria, the remaining three may be considered free from fever. Isolated cases do occur in two of them, but I have always been able to trace the infection to a night or more passed in the fever zone beyond them. The remaining one on the sea coast is quite free from malaria.

The subjoined table shows the mosquitos I have identified up to the present, and their distribution in the different localities:

Three Healthy Districts.	
<i>Culex elegans</i>	From larvæ and found as adults.
<i>Culex phytophagus</i>	
<i>Culex pipiens</i>	
<i>Culex spathipalpis</i>	
<i>Culex penicillaris</i> ...	Adult specimen only. Sea coast (pines).

Nine Malarial Localities.

The first four already mentioned; with also
Anopheles claviger in all nine, *Anopheles pictus* in three; and
Anopheles bifurcatus in one (one adult).

Most of the malarial villages are situated on the face of a hill, with small ravines or partially dried up streams at its foot. In small pools in these ravines I have always found *Anopheles* larvæ without difficulty, and in one district notoriously malarial the larvæ of *Anopheles pictus* were present in great abundance. It will be seen that here, as in Italy, up to the present *Anopheles claviger* is the predominating *Anopheles*.

I could cite circumstances where apparently the use of curtains has warded off fever, but I shall only mention two. During four years' residence in a fever-stricken locality, the only Englishman who has avoided fever has invariably slept under curtains. Further, he has always made it a custom, in order to avoid being bitten, when sitting outside his house in the evening to cover his feet with towels, protecting his

hands with gloves, and his neck with a muffler. His servant has suffered severely from fever. The only mosquito present in his house is *Anopheles claviger*. They are found in numbers in the rooms of the house and adjoining shed.

The healthiest area, as I mentioned, is on the coast, where the company has its sanatorium on a sandy shore. Malaria does not occur there. Mosquitos exist, but are hardly noticeable. I have found *Culex penicillaris* biting sometimes at night, and have obtained here *Culex spathipalpis* from larvæ. Six miles further along the coast I visited a fishing colony of 100 people, all of whom were suffering from fever at the time of my visit, for those who were not actually ill said they awaited their attack next day. Three deaths had occurred amongst them in a week from pernicious attacks. The only difference between those two coast areas consists in the latter having behind it a small lagoon, some stagnant pools, and disused surface wells. In all those places I found *Anopheles* larvæ. The people said they were bitten furiously at night by a large mosquito. Their "patron" alone slept under curtains and had not had fever. Adult specimens sent me from their huts were *A. claviger* and one *A. bifurcatus*.

Can it be said that these facts are only coincidences? That might be possible, but looked at in connection with recent researches on the life cycle of the parasite in *Anopheles*, it will be probably considered that they have a direct bearing on the all-important problem of malarial infection.

In conclusion I thank Mr. C. E. Rowcroft, M.P.S., for much help in the search for, and collection of, the different larvæ.

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SECTION OF PSYCHOLOGY.

DAVID NICOLSON, C.B., M.D., President.

CAN THE REPROACHFUL DIFFERENCES OF MEDICAL OPINION IN LUNACY CASES BE OBTIATED?

By DAVID NICOLSON, C.B., M.D.,
Lord Chancellor's Visitor in Lunacy.

ONE of the first cases that I had to deal with in my present appointment was that of a lady, a native of the Principality, who had been left some money. A question arose as to her capacity for managing her affairs. Two medical men swore in their affidavits to the effect that the lady was perfectly sane and capable of managing herself and her affairs; while two other medical men swore to the effect that she was an absolute imbecile, and had been so from birth, and that she was totally unfit to look after her affairs. The Lord Justice before whom the case was being argued, finding himself unable to arrive at a decision upon these affidavits, called for a special report from the Chancery Visitors' Department; and, as the case happened to be in my district at the time, I had to go and inquire into the state of her mind. This was a duty for which I was not specially well qualified, as the lady could not talk a word of English, and I could not speak a word of Welsh. However, with the aid of an interpreter, I was able to arrive at the only possible conclusion in the case, and to find that all the doctors were wrong, and that truth lay, as it so often does, somewhere between the two extremes.

This incident will form a fitting text for the few remarks I propose to make on the question: "Can the reproachful differences of medical opinion in lunacy cases be obviated?"—a question which deeply concerns us and which is of considerable public interest.

In ordinary plain-sailing cases of insanity the adult lay mind, by reason of its common sense and experience, has no