

## ORIENTAL OR BUBONIC PLAGUE.

**P**LAGUE is an acute infective disease, an infectious fever, attacking man and some of the lower animals, and attended with a considerable mortality. The symptoms in man develop within a few days of infection, and consist of fever, headache, giddiness, weakness, with staggering gait, great prostration, and delirium. In 75 per cent. of the cases the lymphatic glands in the groin, armpit, and other regions are inflamed, infiltrated, and much enlarged, constituting the "buboes," hence the name "bubonic plague" frequently given to the disease.<sup>1</sup> In the remaining cases, the lungs may be primarily attacked, the "pneumonic" form, or a severe blood infection may develop, the "septicæmic" variety; in both of these buboes are absent, or are a late development if the patient lives. Occasionally an eruption of pustules or carbuncles appears on the skin, a phenomenon frequently mentioned by the older writers, and abscesses may form in the buboes. The bubonic form is hardly infectious or even contagious, but the pneumonic variety is highly infectious, owing to the presence of large numbers of the infective agent, the plague bacillus, in the expectoration from which it is readily disseminated in the air. In some instances the patients do not appear particularly ill, and are able to go about, though such cases are liable to sudden death from heart failure.

The micro-organism of plague was discovered independently by Kitasato and by Yersin in 1894. It is a stumpy, rod-shaped organism or "bacillus," having rounded ends, and measuring as a rule about  $1/8000$  inch in length, and  $1/16000$  inch in breadth, but longer forms occur. In smears made at an early stage of the disease from the buboes, expectoration or blood respectively in the three varieties, the bacillus is present in enormous numbers, and if the films are stained with an aniline dye, such as fuchsia, it tends to stain deeply at the ends ("polar staining"), the centre being hardly stained at all (see Figs. 1 and 2); this is a very characteristic appearance. In older lesions peculiar, large, rounded or ovoid "involution" forms of the bacillus are met with. The organism can be readily cultivated in various media in the laboratory; it is non-motile, and does not spore, and is readily destroyed by heat ( $60^{\circ}$  to  $65^{\circ}$  C. for ten to fifteen minutes), and by disinfectants. The plague bacillus is pathogenic for a number of animals, in addition to man—the rat, mouse, guinea-pig, rabbit, hare, ferret, cat, monkey, &c. In the United States the ground squirrels are attacked.

A remarkable feature which has characterised plague from the earliest times is the alternation of periods of widespread prevalence, "pandemics," with periods of quiescence and complete intermission. Thus, in the fourteenth century, in the course of three years, plague decimated the whole of Europe, with an estimated destruction of one-fourth of the population, appearing in England as the black death.<sup>2</sup> In the fifteenth, sixteenth, and seventeenth centuries there were frequent outbreaks in Europe, Asia, and Africa, more or less limited in extent, culminating in England in the great plague of London, with 97,306 burials in 1665, of which 68,596 were attributed to plague, whereas in the five years preceding and succeeding this terrible visitation the normal number of burials in London ranged from about 15,000 to 20,000. Plague then rapidly disappeared from western Europe, so that by the end of the seventeenth century it was practically extinct, and save for isolated outbreaks (e.g. at Marseilles and Toulon in 1720) occurred only

in Turkey, the Levant, Egypt, and Asia Minor. Thus plague was practically unknown to the present generation until 1894, when it reappeared in epidemic form, this time in Hong Kong. There have always been localities in which plague has been "endemic," i.e. continuously prevalent, for example, on the Persian Gulf, in Asia Minor, and in Yunnan, a province of China bordering on Burmah and Tibet. According to Prof. Simpson, plague travelled from Yunnan by the overland trade routes to Canton, thence by river to Hong Kong; from Hong Kong the disease was sea-

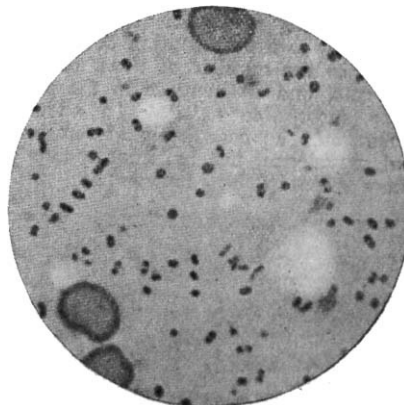


FIG. 1.—Smear from bubo showing large numbers of plague bacilli.  $\times 1200$ .

borne to India, where it certainly appeared in 1896, and since then has similarly been carried all over the world. The agent by which the disease has been so widely disseminated is the rat, infection from man to man being almost negligible, the rat fleas being the intermediaries between the rat and man, and mechanically conveying the infection—the plague bacilli—from rat to rat, and from rat to man (*vide* an article by Dr. Petrie in NATURE, November 3, p. 15). For combating the spread of plague, the destruction

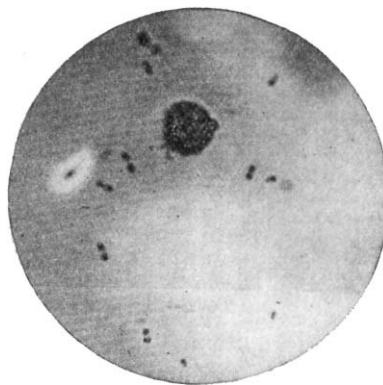


FIG. 2.—Smear from spleen of infected Ferret (from Suffolk), showing typical bi-polar staining plague bacilli.  $\times 1200$ .

of rats is therefore an important measure. While it seems hopeless to effect complete destruction of these rodents, a great deal can be done to lessen their numbers, and the survivors will probably be less likely to be infected. The destruction of rats may be carried out by systematic trapping, ferreting, and poisoning, but anyone who has had to deal with rats is aware how "cute" they are, and the most tempting morsels will often fail to attract them to trap or poison. Handling the material or trap is sufficient to rouse their suspicion, and the "taint" of man, if present, must be destroyed by flaming or disguised by the use of

<sup>1</sup> Although this is the rule, Prof. Simpson points out that in Accra, West Africa, 50 per cent. of the cases were of the pneumonic variety.

<sup>2</sup> I am indebted to Prof. Simpson's "Treatise on Plague" for these and other historical details.

some strong-smelling substance, such as aniseed. Moreover, after a few rats have been caught or poisoned in a locality, the survivors will frequently migrate elsewhere, hence the need for concerted and systematic action in and around a district in which plague has occurred.

Although plague cases may occur at any time of the year, the disease usually exhibits a marked seasonal prevalence. In Poona plague is epidemic only from July to February, August, September, and October being the months of maximum prevalence. This period corresponds closely with the extent of flea prevalence on the rats. An epidemic terminates naturally, owing to a combination of adverse factors, *e.g.* decrease in the number of fleas, decrease in the number of rats, and an increase in the proportion of immune to susceptible rats.<sup>1</sup> In some instances plague cases may be completely absent between the seasons of prevalence, but by what means the infection is kept alive in the intervals has not yet been

lead to scattered outbreaks of human plague, probably not in themselves very serious, but possibly causing great injury to commerce. Thus, if, say, half a dozen cases of plague occurred in the neighbourhood of the docks, the Port of London would be placed in quarantine,<sup>1</sup> and the home and foreign trade of the port amounts nearly to *one million pounds per day!* It behoves the authorities therefore to prosecute a vigorous, concerted, and systematic campaign against the rats with a view to the detection and the limitation of infected areas; now is the time for action, for when infection becomes widespread it is too late.

For the photo-micrographs I am indebted to Mr. J. E. Barnard. R. T. HEWLETT.

#### EXPLORATION IN THE NEARER EAST.

IN his latest book,<sup>2</sup> Mr. Hogarth has given us a series of brilliant sketches, each of which centres round some episode in a life of very varied archæo-



FIG. 1.—Kidding the great Pump at Ephesus. From "Accidents of an Antiquary's Life."

determined. Rats are occasionally met with suffering from what has been regarded as chronic plague, but the latest investigations of the Indian Plague Committee indicate that the condition is one of recovery from plague infection, and the condition is stated to possess no significance in the seasonal recurrence of the disease among the rats.<sup>2</sup>

The recent outbreak of plague in Suffolk, though in itself insignificant, is disquieting owing to the fact that plague-infected animals—rats, rabbits, hares, a ferret (see Fig. 2), and a cat—have been met with in five districts in Suffolk, in one district in Essex, and in the London Docks, indicating a somewhat wide distribution of infected localities. This may be of no moment, but, on the other hand, it may in the future

<sup>1</sup> See "Reports on Plague Investigation in India," Nos. xxxvi and xxxvii, *Journal of Hygiene*, x. No. 3.

<sup>2</sup> *Ibid.*, Report No. xxxiv.

logical adventure. It is a delightful form of autobiography, for we find no dull pages to skip, no laboured accounts of worthy but uninteresting achievement. Each chapter is a separate picture in itself, and, as we read, we find ourselves transported, with somewhat startling rapidity, throughout the lands of the Nearer East. We see the author at work as an archæologist on the coasts of Asia Minor, in Crete, among the Nile fens of the Delta, in Upper Egypt, on the North African coast at Cyrene, and by the banks of the Euphrates and Sajur, to say nothing of the time when he served as the *Times* correspondent in Thessaly during the Græco-Turkish war. Few archæologists, if any, have accomplished work of so

<sup>1</sup> Plague and cholera are the two diseases now quarantinable under the Paris Convention.

<sup>2</sup> "Accidents of an Antiquary's Life," By D. G. Hogarth. Pp. x+176. (London: Macmillan and Co., Ltd., 1910.) Price 7s. 6d. net.