

A COMMENTARY ON RECENT PLAGUE INVESTIGATIONS IN TRANSBAIKALIA AND SOUTHERN RUSSIA.

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ALTHOUGH much work on the epidemiology of plague has been done in many parts of the world since the discovery of the *Bacillus pestis* in 1894, the origin of the outbreaks in Eastern and Southern Russia has, until a short time ago, remained obscure. Transbaikalia, together with extensive areas of Northern Manchuria and North-east Mongolia that are conterminous with it, and, again, the region in Southern Russia which includes the Kirghese and Kalmuck steppes and especially that portion of it which lies between the lower reaches of the rivers Volga and Ural have long been known to contain endemic foci of plague, and have been the source of considerable outbreaks of pneumonic plague. Thus, in the winter of 1878-79, an outbreak of this type at Vetlianka, a Cossack village on the right bank of the Volga, caused alarm in Western Europe. Competent epidemiologists—British, French and German—visited the village after the event, and examined the circumstances that favoured the spread of the infection. Their observations were brought together and analysed by Netten Radcliffe (1881) in his memorandum on plague, which gives the first adequate description of a pneumonic plague epidemic. The more recent epidemics of pneumonic plague, namely, those of Manchuria in 1910-11 with 50,000 deaths, Middle China in 1917-18 with 15,000 deaths, and Manchuria in 1920-21 with 9000 deaths, owed their origin to ill-defined centres of infection in the immense tract of land which includes Transbaikalia and which is contiguous to the north-west boundary of China.

ENDEMIC PLAGUE IN TRANSBAIKALIA.

China has lain under the menace of serious outbreaks of pneumonic plague ever since the great epidemic that lasted throughout the winter of 1910-11 in Manchuria. When this epidemic was at its height, the Chinese Government invited the eleven foreign powers represented at Peking to send to the seat of the outbreak investigators who possessed experience of plague so that they might devise measures for the prevention or control of future epidemics. The delegates to the International Plague Conference held at Mukden in April, 1911, and the witnesses who gave evidence before it did valuable service by providing a carefully documented report of all the aspects of the epidemic. The recommendations drawn up for the guidance of the Chinese Government have doubtless been useful in helping to limit the later outbreaks.

The opinions of the delegates to the Conference upon the source of the outbreak of 1910–11, as expressed in their report, are as follows:

(1) The past epidemic arose in a region which has been associated for years with outbreaks of pneumonic and bubonic plague, but sufficient evidence is not forthcoming with regard to its precise origin.

(2) From Russian medical sources it has been reported that an epizootic disease exists among tarbagans and that it is not unlikely that this disease is plague, but that it is plague has never yet been proved bacteriologically.

(3) There is no definite evidence to show that the first cases of this epidemic were caused by infection from sick tarbagans. Nevertheless, there is strong presumption for believing that tarbagan disease is closely associated with pneumonic plague in Manchuria, Transbaikalia, and north-east Mongolia, and, therefore, with the recent outbreak.

During the proceedings of the Conference two communications were read (on April 16, 1911) which came near, as events have shown, to the heart of the problem. In one of them Strong, the chief delegate of America, brought forward experimental proof of the susceptibility of tarbagans to acute plague. The other, by the present writer, gave a brief account of the flea infestation of twelve tarbagans he had the opportunity of examining; discussed its bearing upon the spread of plague amongst tarbagans and the transference of the infection from them to man; and noted that, if a secondary pneumonia should supervene in a patient who was thus infected, the contacts would be exposed to the risk of contracting primary pneumonic plague. The contributions of Strong and of myself give, in effect, a forecast of the direction in which investigations have proceeded and of knowledge that has been gained. Recent work, of which a summary follows, makes it clear that bubonic and pneumonic plague in Transbaikalia and the adjoining regions is traceable to epizootic plague in tarbagans.

In June, 1911, soon after the Conference came to an end, Zabolotny and Tchurilina demonstrated for the first time spontaneous plague-infection in a tarbagan which was found by Issaew near Borsja station in Transbaikalia, 80 miles west of the Manchurian frontier. Later, Pissemsky ascertained that bubonic plague was prevalent amongst tarbagans near Araboulak and Lake Tschaborda in the same district. Wu Lien Teh (1913, 1922) thought that the tarbagan was not an important distributor of the infection, but while visiting in June, 1923, the Russian Plague Laboratory at Suktui¹, a village in Transbaikalia about 30 miles from the Manchurian frontier, he had an opportunity of observing plague in tarbagans found in the neighbourhood, and now recognises that tarbagan plague is the origin of the epidemics in China.

¹ Bieliavski (1895) gave an account of an outbreak of plague in September 1894 in Suktui. "The origin of this outbreak of plague was easily traced. The first patient had just before his illness gone to attend a court at Tzagan-Olui. On the way there his dog caught and killed, in a very brief time, six tarbagans, which the man carried some versts, and then hid in some straw by the roadside, to pick them up on his return. He returned on August 31, and was taken ill on September 2. The rapidity with which the animals were caught seemed to show that they must have been suffering from disease." (Quoted from Clemow, "Plague in Siberia and Mongolia, and the Tarbagan," *Journ. of Trop. Med.* 1900, p. 170.)

A recent paper by Jettmar (1923), whose headquarters are at Chita, a town in Transbaikalia not far from a tarbagan-infected area, gives useful information on the subject. He states that in this area the tarbagan is the only steppe-rodent in which plague infection exists. Rats (*R. norvegicus*) frequent only a few of the houses in the Cossack villages; they do not come into close contact with the tarbagan; and they play no part at all in the origin of human plague in Transbaikalia. Although other species of steppe-rodents are more or less susceptible to plague, a natural infection has not been discovered in them. The first human cases in the tarbagan-infected districts are met with almost invariably in the late summer and in the autumn; they are always of the bubonic form. Primary pneumonic plague has its starting-point in one of the contacts of a patient who is suffering from bubonic plague and in whom a secondary pneumonia has supervened. These statements are confirmed by the assertion of Zabolotny (1923) that during the last epidemic of pneumonic plague in Manchuria (1920–21) plague was epizootic amongst tarbagans in Transbaikalia; that pathological and bacteriological proof of the nature of the infection was obtained; and that the epizootic preceded the human cases: tarbagan hunters were the first to be attacked.

Jettmar notes that the tarbagan flea (*Ceratophyllus silantievi* Wagner) can imbibe human blood; its ability to bite man seems to be widely recognised by the hunters and the steppe dwellers. Young tarbagans harbour considerable numbers of fleas, up to nearly a hundred on one animal. His observation that the favourite situation of the fleas is the fur of the neck, and the fact that cervical buboes are commoner than axillary and inguinal buboes give support to the belief that flea transmission is the normal mode of infection amongst tarbagans; they recall similar observations in India by the Plague Research Commission on naturally infected rats and on rats and guinea-pigs that were experimentally infected by means of fleas. In the human bubonic cases in Transbaikalia axillary buboes are seen nearly as often as inguinal buboes; a proportion which is higher than that found in plague derived from rats and which is comparable with the preponderance of axillary buboes in the persons who were infected from the ground-squirrel in California, an animal which, like the tarbagan, is hunted and used as food. Jettmar furnishes a detailed list of the ecto-parasites of the various steppe-rodents in Transbaikalia.

The literature dealing with the tarbagan and its relation to human plague has an added interest in view of the knowledge we now possess; the earliest reference is to the observations of Tscherkassow in the year 1857 in Eastern Siberia. The following sources of information cover most of the ground: (1) Sticker's monograph on plague (1908, 1910), (2) Clemow's useful abstract (1900) of the first important papers on the subject, which were published in 1895 by Bieliavski and Rieshetnikof respectively, and (3) a paper by Dudchenko (1909)¹.

¹ I was able to obtain a translation of Dudchenko's paper through the courtesy of Prof. Zabolotny and Dr Paul Haffkine.

In reviewing these publications one is impressed by the consistency of the narratives and by the exactitude with which the details fit in with newly acquired knowledge. The inhabitants of the steppes—the Buriats, Mongols and Russian Cossacks—have long been acquainted with the danger of handling diseased tarbagans; and indeed their appreciation of the risk gives point in an interesting and unmistakeable fashion to the tarbagan legends that have been recorded—the one in the year 1856 by the naturalist Radde, who was the first to study the habits of the tarbagan, and the other in 1902 by Smolieff (cited by Sticker and Dudchenko). There has been no tendency on the part of the medical authorities to doubt the essential conjunction. Sticker, for example, who has an unequalled familiarity with the history of plague throughout the world, accepted on epidemiological grounds alone the tarbagan disease as plague and was convinced that it was the source of the human outbreaks. The circumstance that tarbagans constitute a natural reservoir of the infection cannot be regarded as singular, for it is paralleled by observations made in widely scattered localities where epizootic plague in a variety of field rodents has given rise to outbreaks of bubonic and pneumonic plague in man (California, Orange Free State, Suffolk in England, Persia, and Southern Russia).

ENDEMIC PLAGUE IN SOUTHERN RUSSIA.

It is good to learn that Professor Zabolotny, the chief delegate of Russia to the Mukden Conference, has been able during the past three years to organise and direct extensive investigations into the problem of the endemic focus in Southern Russia. A summary of his observations is given in the June number (1923) of the *Annales de l'Institut Pasteur*. He and his co-workers have obtained proof that the endemicity of plague in the steppes of south-west Russia is due to spontaneous epizootics amongst spermophiles (*S. musicus* and *S. rufescens*). Aristarkowa, Denisowa and others have shown that the spermophile flea can bite man. The epizootic lasts from May to August, with a maximum in June. The first human cases in the bubonic outbreaks were *gardes champêtres* (rural policemen) who had been in contact with spermophiles.

The autumn and winter epidemics of pneumonic plague in the Don and Ural districts bear no *direct* relation to the epizootic, because the spermophile begins to hibernate in August. Winter epidemics of plague in the Ural district originate from epizootics of plague in field mice, which make their way into the houses.

Zabolotny believes that the fleas of the steppe-rodents are the agents which spread the infection in the epidemics of bubonic plague; and that the evolution of mixed epidemics (bubonic and pneumonic) depends upon contact infection from bubonic cases that are complicated by a secondary pneumonia. His conclusions are in virtual agreement—so far as they are comparable—with those which the writer and Major Ronald E. Todd, R.A.M.C., have set forth in a comprehensive review of the epidemiology of pneumonic plague that

forms part of a report of work carried out on behalf of the Egyptian Government and that has recently been published in Cairo. In the course of this work it became apparent that certain of the southern provinces of Upper Egypt offered unusually favourable opportunities for the study of the epidemic relations of pneumonic plague.

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