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ROLE OF RODENTS AS RESERVOIRS OF EPIDEMIC INFECTIONS

[A Digest]

This article, by N. I. Kalabukhov of the Chair of Experimental Ecology, Khar'kov State University, is not a report of original research but a report on the correlation of a considerable amount of data compiled from various other reports, both foreign and domestic. Kalabukhov states, early in the article, that the best method for controlling rodent-borne epidemics is a comprehensive study of the regularities of the biocenotic cycle of any one disease of rodents. He further suggests that ecologists as well as veterinarians should make this study because the effect of rodent-borne epidemics is directly related to the numerical strength of rodents.

In this article, the author deals primarily with the epizootology of plague. He notes that recently much new material has appeared on the role of rodens in spreading various bacterial, virus, rickettsial and protozoal diseases. Studies have shown that rodents have been responsible for rickettsial epidemics in many regions of Asia and Southern Europe (tsutsuga mushi, Marseilles typhus), rats have caused typhus epidemics in many large European and US cities, and rats have been responsible for rickettsial epidemics in the Rocky Mountain states. Recently Pavlovskiy and Sergeyev proved that the Dermacentor nuttalli, parasitic to some steppe rodents, has been responsible for typhus-type fever in certain localities in the USSR. Two of these hosts, the Stenocranius gregalis and Citellus parryi, were most infected during the summer. Other research showed that many Rattus norvegicus Erxl are hosts to two different types of typhus, and that the rickettsial virus remains virulent for as long as 2 months. Kuzyakina, Pavlovskiy and Solov'yev were able to show that rodents play a most important role in spreading some neuro-virus diseases like tick-borne encephalitis. These conclusions were reached after research in areas where there were recent widespread epidemics of spring-summer tick encephalitis (also tularemia and leptospirosis) which were attributed to a large numerical increase in rodents.

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The author and other scientists conducted periodic research in an area where there had never been any case of human encephalitis and continued the research because there was an abundance of rodents. Eventually, they were able to determine the existence of the tick encephalitis virus in Ixodes persulcatus living on its host, the Apodemus sylvaticus. Further studies revealed the existence of a neurotropic virus on Mus musculus which was very similar to the tick encephalitis virus identified by A. K. Shubladze.

It was possible to establish that the encephalitis virus is found not only in the rodent's brain but also in the liver and lacrymal glands. On the strength of these findings, it is possible to conclude that the so-called poly-seasonal encephalitis, which was prevalent during World War II, was not caused by ticks.

Kalabukhov and Shubladze, among others, were able to establish that fleas found on brown field mice were responsible for spreading many neurotropic diseases, particularly poliomyelitis and choriomeningitis. Soviet scientists also determined that rabbits as well as rodents may be carriers of ticks harboring hemmorhagic fever virus.

In the past few years some very interesting data have been obtained relative to the spread of leptospirosis by rodents. These rodents were thought to be infected only with Leptospira icterohaemorrhagiae, but research conducted near Oxford proved that mice also can be infected with a form of leptospira which is completely different and which did not prove lethal when inoculated into white mice. This bacteria generally causes the so-called "mud" or "swamp" fever. In 1944 I. I. Nikolayev determined the existence of swamp fever virus in Soviet rodents. Studies in one of the western regions revealed the existence of this leptospira in Evotomys glareolus.

Several Soviet scientists, among them Pavlovskiy, Latyshev and Kryukova, found some Rhombomys opimus and Pallasiomys erythrourus afflicted with leishmaniasis.

Rodents also play an important role in the spread of various intestinal infections. Soviet scientists have determined the existence of salmonella in household rodents and also in field mice. In August 1945 Soviet scientists studying in a specific locality investigated 70 rodents and isolated six types of salmonella; four of these were S. typhimurium and two S. enteritidis.

The author stresses the importance of the spreading of the disease within the rodent population before it is transmitted to humans. Some studies already conducted along this line proved that Salmonella typhimurium was transmitted by the Dermacentor andersoni, not through water and food as was believed previously. The author presents results of his studies to ascertain the transmission cycle of such diseases as leptospirosa, tick-borne rickettsia, tularemia, etc. The latter has the most complicated transmission cycle and can be transmitted to man through fleas, ticks, and mosquitoes.

One of the most unique features of rodent-transmitted epidemics is their seasonal nature. It has been determined that diseases which are transmitted from rodent to rodent, or from rodent to human, are usually most prevalent in summer and fall. Diseases which are transmitted by field mice are most evident after the filling of hayricks and haystacks. Basically, however, the number of incidences is directly related to the life cycle of the rodents. Thus the change in the susceptibility of rodents must be taken into consideration because it is in turn related to seasonal physiological changes and changes in the degree of contact with the source of infection, the latter being dependent primarily on the number of rodents. Another factor affected by seasons is changes in the ability of external factors to support sources of infection. Factors relative to the human are most important in determining the possible morbidity rate in human populations. For example, if a farmer comes in frequent contact with haystacks, etc., he is apt to be more easily infected than an office worker.

It has been noticed in some cases that most warm-blooded animals are less susceptible to plague tularemia or other pasturellasis in winter, and in some instances they completely recover from the disease which they contracted during an epidemic. However, it appears that in many regions (Japan, Buenos Aires) rodents are more actively infected in winter than in summer. Much of this is attributed to the unfavorable living conditions of rodents during the winter season, e.g., greater concentration of rodents in a single site (nests, burrows, etc.). Thus, it can be stated safely that the danger of epidemics in any locality is directly related to the degree of concentration of rodents during the winter period.

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