OBSERVATIONS ON THE ROLE OF THE REACTIVITY OF GREAT GERBILS TO P. PESTIS DURING THE DEVELOPMENT OF THE EPIZOOTOLOGICAL PROCESS

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Report IV. Experience in Using the Passive Hemagglutination Reaction in a Study of the Natural Plague Focus in the Muyun Kum.

[Following is the translation of an article by L. A. Peysakhis, A. G. Stogova, K. M. Muminov, G. Yu. Pak, G. I. Kiselev, and N. A. Sukharnikova, published in the Russian-language periodical Materialy Nauchnoy Konferentsii po Prirodnoy Ochagovosti i Profilaktike Chumy (Materials from the Scientific Conference on the Natural Focalness and Prophylaxis of Plague), Alma-Ata, Feb., 1963, pages 178--180. Translation performed by Sp/7 Charles T. Ostertag, Jr.]

While working in an active part of the Central Asian Desert plague focus in Muyun Kum, we decided to approbate the feasibility of using the passive hemagglutination reaction (RPGA) for directional searches for the plague microbe in populations of the main carrier of the infection -- great gerbils. Together with this we undertook the mission to study the dynamics of these antibodies in the blood of gerbils, frequency of encountering and the variation of serum titers in sectors of the focus which differed in an epizootic respect, depending on the percentage of infected animals exposed bacteriologically.

We began the work in the fall of 1961 in a known enzootic section of the Muyun Kum territory. The animals were captured in points which had a known epizootological nature. For bacteriological investigation we captured no less than 100--150 gerbils from each point and on the average we investigated the sera of 30 of them. As a control, nonepizootic territory, where the background species of rodents is also the great gerbil, we selected Lyuk Kum (Vostochnoye Pribalkhashye). All told for a year and a half in Muyun Kum and Lyuk Kum more than 7 thousand gerbils were investigated bacteriologically, and of these the sera of 2,193 animals were investigated.

All the points in the known enzootic territory of Muyun Kum, which were investigated for the presence of specific antibodies in gerbils, may be divided into three groups: Active epizootic, epizootic in previous years, and nonepizootic.

In all the active epizootic points gerbils were detected with the

presence of antibodies in the blood. With a fluctuation in the percentage of gerbils infected with the plague microbe from 0.4 to 8.5%, the percentage of positively reacting sera varied from 5.0 to 52, and the individual titer indices from 1:40 to 1:20480, with an average titer of 1:398.

Out of 7 previously epizootic points with a percentage of from 0.3 to 6.5 gerbils infected with the plague microbe, in 4 there were animals with the presence of antibodies in the blood. The percentage of positively reacting sera fluctuated from 6.2 up to 54, the average titer equaled 1:447, and individuals varied from 1:40 to 1:5120.

Out of the nonepizootic points of the enzootic territory of Muyun Kum in 7 cases gerbils were detected which reacted positively to the presence of antibodies. The percentage of positively reacting fluctuated within the limits of 4--26 average titer -- 1:240, and individual fluctuations of ticers -- 1:40--1:1280. Subsequently in two of these seven points cultures of the plague microbe were isolated.

The study of the dynamics of antibodies in great gerbils at the same points still did not reveal any specific regularity. In several of these, following the discontinuance of isolating cultures of the plague microbe, the percentage and titers of positively reacting sera declined, and at some they remained at the same level under the conditions of observation up to five months.

In the nonepizootic territory of Lyuk Kum not one out of 594 sera of great gerbils contained agglutinins.

For the present this work permits the following conclusions to be made. Sera of great gerbils which were positive for the presence of plague specific hemagglutinins were detected only in the enzootic territory of Muyun Kum. In all the active epizootic points the percentage which reacted positively to the presence of antibodies exceeded by far the exposed percentages of animals infected with the plague microbe. At the presently and previously epizootic points the percentage indices of sera reacting positively to the RPGA, the average titers and their individual variations exceeded by far those at the nonepizootic points. However, in a whole number of cases we did not succeed, based on these indices, in differentiating epizootic points from those which were nonepizootic at the present time. Along with this we did not detect existing differences in these indices in active epizootic points and those which were epizootic in the past.

An analysis of experimental data on the study of the dynamics of hemagglutinins in gerbils infected with the plague microbe (see reports II and III) makes it possible to express the assumption that in all cases of the detection of antibodies in gerbils in previously epizootic or nonepizootic points of the enzootic territory of Muyun Kum we observed an attenuation or

aggravation of the epizootic process. This position is confirmed by the fact of the isolation of the plague causative agent at two points, where earlier gerbils with specific hemagglutinins were detected. We consider that it is possible that in the cases of the nonexposure of the plague microbe in places where live gerbils contain hemagglutinins in their sera, the guilt lies in the insufficient number of rodents investigated bacteriologically. In other words, the RPGA is a reaction which is not retrospective, but for the present time or the most recent past. This position is strengthened by the known fact of the annual 70--80% change in the populations of great gerbils.

At the present time it can be considered that the passive hemagglutination reaction is completely suitable for directed searches for the plague microbe and should enter into the complex of methods for the field diagnosis of plague. Together with this, for the purpose of correctly evaluating the indices of this method it is necessary that it be studied further before it is put into wide field practice. It should still be carried out by qualified specialists in a known enzootic territory, in various phases of the epizootic process and with variations in the volume of rodents investigated for the presence of the plague microbe and their sera for the presence of antibodies. A similar type of investigations will apparently lead in the end result to an establishment of the necessary quantitative forms for the investigation of carriers for the isolation of the plague causative agent in various phases of the epizootic process and particularly in the period of depression.

In conclusion we would like to thank the Rostov Antiplague Institute and M. I. Levi for valuable practical advice in the process of work and the regular sending of the plague diagnostic agent.