TRANSLATION NO. 1524

~~DAAA-13~~

DATE: 21 September 1965

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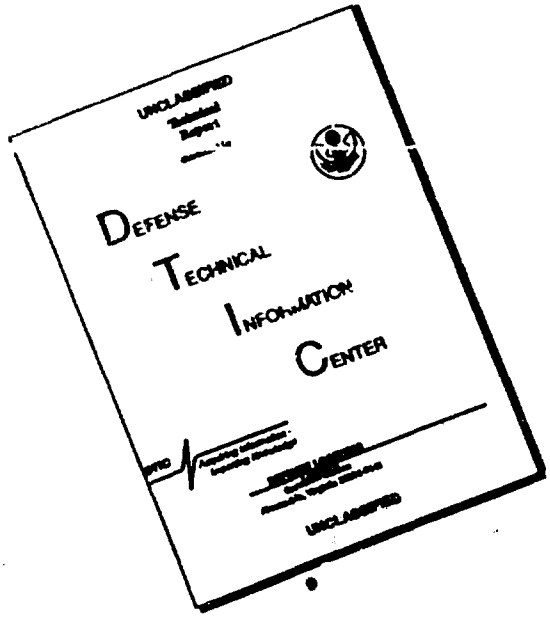

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PHAGOCYTIC REACTION OF HEMOCYTEUKOCYTES AS AN INDICATOR OF PLAGUE IMMUNITY

Mikrobiologiya i Immunologiya osobo opasnykh Infektsiy (Microbiology and Immunology of Especially Dangerous Infections), Saratov, 1964, pp 149-150

G. G. Korobkov and G. I. Borsuk (Irkutsk)

As M. P. Pokrovskaya and L. S. Kaganova have shown (1947), phagocytosis of virulent Pasteurella pestis does not take place in animals naturally susceptible to plague. Burrows and Bacon (1956) found in P. pestis antigens V and W which prevent the capture of the microbes by the RES [reticuloendothelial system] cells. In plague-immune animals there is an active phagocytic reaction which is of great significance as one of the main factors in the organism's non-susceptibility to plague. The question arises whether phagocytic reaction, which plays an important role in immunogenesis resulting from vaccination against plague, cannot be used to determine the degree of the organism's immunity.

In order to clarify this question, we studied phagocytic reaction in a group of vaccinated white mice before and after their inoculation with P. pestis.

The animals were immunized subcutaneously with EV strain in a dose of one million microbe bodies. On the 32nd to 40th day after vaccination blood was taken from mouse caudal vein for study of phagocytic reaction in leukocytes according to the method of V. M. Berman and Ye. M. Slavskaya (1958). The procedure is presented in an article by G. G. Korobkov, G. I. Borsuk and L. M. Samoylova, published in this collection.

One to 3 days after blood was taken from all the vaccinated white mice (74), as well as from 10 control unvaccin-

ated mice, they were inoculated with 10 LD_{50} of virulent P. pestis (strain 1435), and the indicators of phagocytosis completeness were then determined for all animals.

By contrasting the phagocytic-reaction value in both groups of mice, we established the relationship between phagocytosis and the extent of animals' non-susceptibility to plague (Table 1).

Obviously, vaccination did not result in the development of thorough immunity in the white mice that died after plague inoculation, as distinguished from the animals that survived.

Thus, whereas in non-immunized animals complete phagocytosis as per phagocytic number was not noted in a single one of the 10 experiments, in the mice surviving after inoculation phagocytosis occurred in 45 out of 54, and in only 9 (17%) of the mice was phagocytosis incomplete -- phagocytic number in the first smear was less than in the second.

In the mice that proved to be weakly resistant to plague infection and died after inoculation, incomplete phagocytosis was observed in 9 out of 20 experiments (45%).

The difference in the capacity of hemoleukocytes for complete phagocytosis becomes more significant if we single out from the 20 animals that died the 15 that had the disease for less than 10 days. Here the percentage of experiments with incomplete phagocytosis amounts to 80. Thus, for mice that survived plague inoculation the percentage of cases with incomplete phagocytosis equals only 17, while for mice that died in the early stages it is 80. Hence it follows that this indicator of an animal's degree of susceptibility to plague is highly reliable.

A quite characteristic indicator is the percentage of phagocytosis completeness as judged from active leukocytes. As can be seen from the table, there is a reliable difference (according to this phagocytosis indicator too) between mice resistant to plague inoculation and nonresistant mice that perished after inoculation.

Mouse resistance to plague inoculation can also be determined according to the percentage of leukocytes in which microbe propagation is observed. Whereas for mice that perished in less than ten days after inoculation (weak resistance to plague inoculation) the percentage of such leukocytes amounts to 3.3 ± 0.7, for the animals that survived it equals

0.8 ± 0.2. The percentage reduction of cells with propagating microbes in the case of the surviving animals proves to be reliable also with respect to the entire group of fallen animals for which the percentage amounts to 2.4 ± 0.44.

Table 1

PHAGOCYTIC REACTION IN IMMUNIZED AND IN CONTROL WHITE MICE

The table presents arithmetic mean (M) ± standard deviation of calculation (m)

1 Показатели фагоцитарной реакции	2 M ± m равно у зараженных животных		
	3 иммунных		6 контрольных (неиммунных)
	4 выживших	5 погибших	
7 Процент опытов с незавершенной фагоцитарной реакцией по фагоцитарному числу*	17	45	100
8 Процент завершенности фагоцитоза по активным лейкоцитам . .	40±2,5	30,8±3,8	28±6
9 Процент лейкоцитов, в которых отмечено размножение микробов . .	0,8±0,2	2,45±0,44	2,4±0,4

Note: The table shows the percentage difference between number of microbes in a smear before and after cultivation. Numbers of the first smear are taken as 100%.

Keys:

1. Indicators of phagocytic reaction
2. M ± m in the case of inoculated animals equals
3. immune animals
4. that survived
5. that died
6. control (non-immune) animals
7. Percentage of experiments with incomplete phagocytic reaction as per phagocytic number [See Note]
8. Percentage of phagocytosis completeness as per active leukocytes
9. Percentage of leukocytes in which microbe propagation is not noted

Thus, on the basis of the experiments which we conducted we arrived at the conclusion that by staging a phagocytosis

reaction with P. pestis vaccine strain according to the method of V. M. Berman and Ye. M. Slavskaya it is possible to determine whether white mice have immunity to plague. The following considerations serve as the basis for such determination: a) phagocytosis not less than 40% complete according to phagocytic number; b) phagocytosis not less than 40% complete according to active leukocytes; c) absence of leukocytes in which microbe propagation occurs.

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