

CHANGES IN THE BLOOD LYSOZYME CONCENTRATION IN ANIMALS  
FOLLOWING INJECTIONS OF STREPTOCOCCUS  
AND OF HOMOLOGOUS TISSUE ANTIGEN

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During the study of the effect of vaccination and the specific immunological modification of the organism on the mechanisms of natural resistance of animals it has been found [1-2] that active immunization with various antigens usually causes a temporary lowering of the serum lysozyme concentration in man and animals, which persists for a considerable time (from 16 to 60 days). Regardless of the species of antigen, the maximal fall in the lysozyme titer was observed at roughly the same period (the 7th-15th day), coinciding in most cases with the period of accumulation of specific antibodies in the blood.

In our studies during the last 2 years of the principles governing the development of experimental endocarditis in rabbits, we have used the hemolytic streptococcus and extract of homologous heart tissue to reproduce this pathological process. From previous results it has been concluded that these agents always affect the state of the factors of natural resistance of animals, and especially the lysozyme.

In the present investigation the changes in the blood lysozyme concentration were studied during the development of experimental endocarditis in rabbits.

#### METHOD

Experiments were carried out on 28 rabbits, divided into groups differing from each other by the method of administration of the antigens (streptococcus was injected subcutaneously, intravenously, or into the region of the palatine tonsils, but the heart extract was always injected intravenously). There is no need to describe the different methods which we used in detail (they are all described elsewhere), because the results of the investigation of lysozyme in the different experimental groups were identical, regardless of the character of the antigen and the method of its administration. The only point to note is that the injections of streptococcus and heart homogenate were multiple in every case (from 4 to 10) and were given at intervals of 3-7 days.

The titer of lysozyme in the blood serum was investigated immediately before the beginning of the experiment, and then every 7-14 days throughout the period of observation on the animals (3 months) or until death, using the ordinary indirect method in which the test organism was Micrococcus lysodeikticus. At the same times parallel determinations were made of the number of leukocytes in the peripheral blood.

#### RESULTS

The study of the serum lysozyme concentration showed that most of the rabbits used in the experiments reacted to the agents during the first few days after the experiments began. A curve is shown in Fig. 1, reflecting the mean results obtained by titration of the lysozyme in 20 rabbits. The change in the lysozyme titer in the blood observed in these conditions was similar in character to that found in the experiments on vaccinated animals. On the 7th day after the beginning of the injections of streptococcus or heart homogenate, the serum lysozyme concentration had

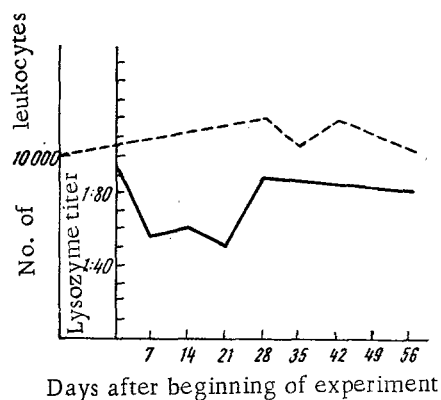


Fig. 1. Change in lysozyme titer of rabbits' blood under the influence of injections of streptococcus and heart antigen.

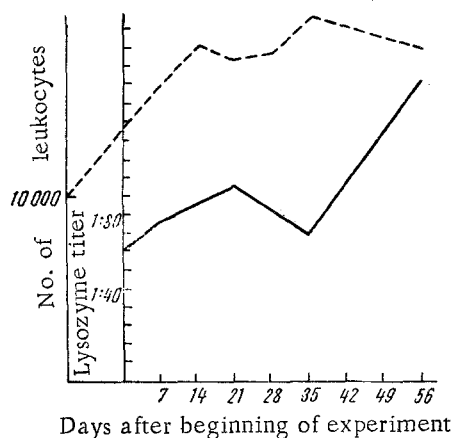


Fig. 2. Change in lysozyme concentration in blood of rabbits with experimental endocarditis accompanied by leukocytosis, under the influence of injections of streptococcus and heart antigen.

zyme titer and the mean leukocyte count in the blood of the rabbits at different times after the beginning of the experiment. The serum lysozyme concentration of these rabbits not only did not fall following the injection of streptococcus and homogenate, but it actually rose parallel with the increasing leukocytosis.

Consequently, an inflammatory focus may serve as the site of formation and of liberation into the blood stream of lysozyme, as was first established by the study of the change in the serum lysozyme concentration after vaccination with BCG [3].

To determine which of the two agents which were used had the greater effect on the change in the serum lysozyme concentration in the animals, the results of injecting rabbits with homogenate of heart tissue only were studied. These experiments showed that following the repeated injection of this homologous tissue antigen the serum lysozyme activity of the sensitized animals also fell, although the extent of the fall was rather less than after the simultaneous injection of heart tissue homogenate and streptococcus or injection of streptococcus alone.

fallen by half (in some rabbits by 75%). The low lysozyme titer persisted for 3 weeks, after which the concentration rose gradually towards its initial level. Once having gained this level, it remained unchanged throughout the period of observation regardless of the outcome of the experiment.

In the course of this period the number of leukocytes in the peripheral blood of the experimental animals remained within normal limits (10,000-12,000).

The change in the blood lysozyme titer was not associated with any special feature of the course, the severity, or the outcome of the pathological process, the clinical manifestations of which appeared much later. The first symptoms of the disease (apathy, wasting, disturbance of the cardiac activity) usually developed during the 3rd-4th week, i.e., at a time when the blood lysozyme concentration had returned to normal. Marked pathological changes in the heart were observed later still. Hence, the impression was created that the fall in the lysozyme concentration was related, not to the development of the disease, but to the primary action of the corresponding antigens (streptococcus, heart homogenate), and that it was only one of the initial reactions of the organism to an extraordinary stimulus. This view was confirmed by the fact that a fall in the lysozyme titer was also observed in cases in which endocarditis did not develop following the administration of these agents, and the animals remained healthy at the end of the experiment.

A different picture was observed in cases when the development of experimental endocarditis was accompanied by leukocytosis. The latter was evidently associated with the development of concomitant suppurative inflammatory foci in the subcutaneous areolar tissue, lymph glands, lungs, pleura, and so on. In none of the 8 rabbits of this group was a fall in the blood lysozyme concentration observed, as it always was in the experimental animals with a normal leukocyte count in the blood. The curves given in Fig. 2 show the mean lyso-

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