

# CHANGES IN GUANASE ACTIVITY IN THE LUNGS AND SERUM OF GUINEA PIGS WITH ANAPHYLACTIC SHOCK

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The guanase activity of the lung tissue and blood serum of guinea pigs is increased after anaphylactic shock.

The clinical picture of anaphylactic shock is formed under the influence of enzyme systems activated as a result of the antigen-antibody reaction and of biologically active substances liberated during this reaction [8]. Guanase, an enzyme participating in purine metabolism, is found in the blood plasma of some experimental animals: guinea pigs, rats, dogs, etc. The blood guanase activity of these animals is 50-70 times higher than that of man. In these animals, guanase enters the circulation in the lungs.

The object of this investigation was to study the guanase activity of the lungs in guinea pigs with anaphylactic shock, having regard to the fact that the lungs in these animals are an organ primarily affected by this condition.

## EXPERIMENTAL METHOD

Experiments were carried out on 22 guinea pigs weighing  $170 \pm 20$  g. After preliminary sensitization with egg albumin, anaphylactic shock was produced in 12 of these animals by administration of an aerosol of the same antigen. The control group consisted of 10 animals. Blood was taken from the experimental animals by exsanguination. After removal of the branches of the bronchi and blood vessels the lungs were homogenized in the cold, in 0.25 M sucrose solution (in the ratio 1:10) by means of a homogenizer fitted with a Teflon pestle, for 10 min by the method of Levine et al. [7]. The resulting homogenate was centrifuged for 20 min at 20,000 g (MSE Superspeed Centrifuge), by Hogeboom's method [5]. Guanase activity in the supernatant was investigated by the method of Hue and Free [6], and expressed in i.u./g fresh weight. Three parallel tests were carried out for each guinea pig and the mean calculated.

Student's criterion was used for statistical analysis of the results. The significance of the differences was calculated from Sepetliev's tables [3].

## EXPERIMENTAL RESULTS

The results of the investigations are given in Table 1. An increase in activity of the enzyme was found both in the soluble part of the lung homogenate and in the blood serum by 44.3 and 34.3%, respectively, above the control value. The differences are statistically significant ( $P < 0.01$ ).

The increase in serum enzyme activity can be explained by its liberation into the blood stream from the lung parenchyma. So far as the mechanism of the increase in guanase activity in the lungs is concerned, however, it can only be postulated that in anaphylactic shock the content of guanine bases is increased, with a consequent increase in guanase activity. An increase in enzyme activity may also develop as a result of

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TABLE 1. Changes in Guanase Activity of Lungs and Serum of Guinea Pigs in Anaphylactic Shock ( $M \pm \sigma$ )

Index	Expt.	Control	P
Guanase activity of lungs . . . . .	348,5±25,9 (12)	241±17,5 (10)	<0,01
Serum guanase activity . . . . .	55,5±3,74 (12)	41,3±3,23 (10)	<0,01

Note. Number of animals given in parentheses.

increased synthesis of the enzyme or its activation through disturbance of the spatial configuration of its secondary and tertiary structure, with the formation of additional active centers. Activation of the synthesis of this enzyme is unlikely, because a large quantity of ATP would be required for this purpose. However, as the writers' other experiments have shown, the ATP content of the lungs in guinea pigs with anaphylactic shock is considerably reduced. Other evidence against the activation of synthesis is the presence of injury to the lung tissue as a result of hypoxia and activation of proteolysis and cytolysis in anaphylactic shock [9].

According to Blyuger et al. [1], the raised blood enzyme level is a response of the cell organelles to the action of the injurious agent leading to disturbance of oxidative phosphorylation. As a result of the subsequent disturbance of permeability of the cell membranes, enzyme is liberated into the blood stream. Probably the lungs are not the only source of guanase in these cases. It has been found that the serum guanase activity is also increased after toxic injury to the liver, an organ which plays a much more important role in the pathogenesis of anaphylactic shock in guinea pigs in connection with the fixation of antigen during sensitization and localization of antigen-antibody complexes.

#### LITERATURE CITED

1. B. F. Blyuger, M. L. Belen'kii, and Ya. Ya. Shuster, *Vopr. Med. Khimii*, No. 1, 12 (1964).
2. B. F. Korovkin, *Enzymes in the Diagnosis of Myocardial Infarction* [in Russian], Leningrad (1965).
3. D. Sepetliev, *Statistical Methods for the Analysis of the Results of Medical Scientific Investigations* [in Russian], Sofia (1965).
4. U.A.S. Al-Khalidi and T. H. Chaglassian, *Biochem. J.*, 97, 318 (1965).
5. G. Hogeboom, *Methods Enzymol.*, 1, 16 (1955).
6. A. C. Hue and A. H. Free, *Clin. Chem.*, 11, 708 (1965).
7. R. Levine, T. C. Hall, and C. A. Harris, *Cancer (Philadelphia)*, 16, 269 (1963).
8. W. Raab, *Allergy Asthma*, 12, 71 (1966).
9. G. Ungar and H. Hayashi, *Ann. Allergy*, 16, 542 (1958).