

ACTIVITY OF SOME MITOCHONDRIAL AND LYSOSOMAL ENZYMES OF THE GUINEA PIG LIVER DURING SENSITIZATION AND ANAPHYLAXIS

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During sensitization the activity of succinate dehydrogenase and β -glucosidase rises while that of β -glucuronidase falls sharply; in anaphylactic shock the activity of these enzymes shows no significant change.

In anaphylaxis certain cell structures are damaged and the coordinated activity of enzyme systems is disturbed [3-5]. However, data on this question are few in number and contradictory in nature.

In the investigation described below certain mitochondrial and lysosomal enzymes of the guinea pig liver were studied during sensitization and anaphylactic shock.

EXPERIMENTAL METHOD

Noninbred male guinea pigs weighing about 200 g were used. The animals were sensitized by a single subcutaneous injection of 0.02 ml normal horse serum (NHS) in a dose of 0.7 mg protein/100 g body weight. Lethal anaphylactic shock was induced in the sensitized animals after 25 days, acute shock by intracardiac injection of 1 ml NHS (35 mg protein/100 g), and protracted shock by intraperitoneal injection of 2 ml NHS (70 mg protein/100 g). The control (unsensitized) animals were injected with the equivalent dose of NHS. After laparotomy under local anesthesia, liver biopsy was performed during acute shock before and after injection of the reacting dose (at the 7th-10 minute), and during protracted shock before and 1.5-2 h after the injection.

Activities of succinate dehydrogenase (SDH; 1.3.99.1), glutamate dehydrogenase (GDH; 1.4.1.2), and malate dehydrogenase (MDH; 1.1.1.37) and the protein content were determined in homogenates, in the mitochondrial fraction, and in the supramitochondrial supernatants. Activity of β -glucosidase (3.2.1.21) and β -glucuronidase (3.2.1.31) also was determined in the homogenates. The enzyme activity and protein content were determined by the micromethods developed by Pokrovskii et al. [1, 2]. Activity of the enzymes was expressed in μ moles substrate converted per minute per gram protein.

EXPERIMENTAL RESULTS

At the height of sensitization a significant increase in SDH activity was observed (130.2%; $P < 0.05$). During the development of acute shock, however, a tendency was observed for its activity to decline (89.4% relative to its level in the sensitized animals. This decrease was more marked still during protracted shock (83.9%).

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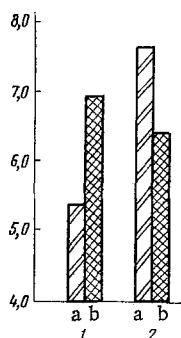


Fig. 1. Succinate dehydrogenase activity in liver of unsensitized (1) and sensitized (2) guinea pigs before (a) and after (b) injection of reacting dose of antigen; ordinate, enzyme activity (in $\mu\text{moles/min/g}$ protein).

Changes in SDH activity in the mitochondrial fraction continued in the same direction as those during the investigation of this enzyme in the homogenate.

Particular attention was paid to differences in the character of the changes of SDH activity in the unsensitized animals after intraperitoneal injection of NHS and in the sensitized animals during protracted shock (Fig. 1). Injection of antigen into the control animals led to a significant increase in SDH activity (126.3%; $P < 0.05$), whereas after injection of the reacting dose of antigen into the sensitized animals the activity of this enzyme fell slightly.

Activity of GDH and MDH determined in the homogenates, the mitochondrial fraction, and the supramitochondrial supernatants was unchanged both in the sensitized animals and in the guinea pigs in a state of shock.

The study of the reaction of the lysosomal enzymes revealed marked changes in acid hydrolase activity only after sensitization. In the sensitized animals β -glucuronidase activity fell sharply (57.6%; $P < 0.01$) whereas β -glucosidase activity rose significantly (155.1%; $P < 0.02$). During the development of acute shock no significant changes were found in the activity of the lysosomal enzymes.

The most marked changes in the activity of the mitochondrial and lysosomal enzymes studied were thus observed only during sensitization.

The results show that the mitochondrial and lysosomal enzyme systems become involved to a different degree and at different stages in the antigen-antibody reaction.

LITERATURE CITED

1. A. A. Pokrovskii and A. I. Archakov, in: *Modern Methods in Biochemistry* [in Russian], Vol. 2, Moscow (1968), p. 5.
2. A. A. Pokrovskii, L. V. Kravchenko, and V. A. Tutel'yan, *Biokhimiya*, **36**, 690 (1971).
3. A. A. Pokrovskii and I. N. Marokko, *Pat. Fiziol.*, No. 3, 24 (1971).
4. H. Hayashi, in: *Biochemistry of the Acute Allergic Reactions*, Oxford (1968), p. 144.
5. P. Treadwell, *Am. J. Path.*, **51**, 505 (1967).