SUCCINATE-DEHYDROGENASE ACTIVITY IN THE BRAIN AND LIVER OF RATS UNDER HYPOTHERMIA AND AFTER REWARMING

V. A. Eliseev

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Succinate-dehydrogenase activity in the brain and liver of rats falls during cooling and rises during rewarming of the animals.

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Clinical death after acute blood loss is mainly the result of anoxia and death of cerebral cortical cells [2, 3]. One method of preventing anoxia is artificial hypothermia, lowering the metabolic rate and reducing the demand of the cells and tissues for high-energy phosphate compounds and oxygen. Changes in activity of the tissue respiration enzymes may thus be expected under these conditions.

Succinate-dehydrogenase activity of the brain and liver was investigated during deep hypothermia and after rewarming of the animals.

EXPERIMENTAL METHOD

Experiments were carried out on 180 albino rats weighing 200-300 g, divided into 6 groups (30 animals in each group): 1) intact rats (control); 2) anesthetized; 3) cooled (rectal temperature 20°); 4) rats kept for 1 h in a state of hypothermia; 5) rewarmed (rectal temperature 37°); 6) rats taken on the day after hypothermia.

The animals were cooled in a bath of ice under ether anesthesia, sufficient to abolish shivering. The rats rewarmed spontaneously, and after 2-2.5 h their rectal temperature had reached 37°. Succinate-dehydrogenase activity was determined in a 10% homogenate of brain and liver tissues by Thunberg's method [4], the homogenate being incubated at 38 and 20°. The tissue homogenate was made up in buffer solution on ice.

Contents of the Thunberg's tube (in ml):

1. borate–phosphate buffer, pH 7.6	1.3
2. sodium succinate, 0.02 M	1.0
3. methylene blue, 1/10,000	1.0
4. 10% homogenate (placed in side tube)	0.2

The tubes were placed in a shaker and lowered into a bath containing water kept in an incubator. The temperature in the tubes reached equilibrium in 10 min, after which the contents were mixed and photometry was carried out every 3 min.

EXPERIMENTAL RESULTS AND DISCUSSION

The results of measurement of the rate of decolorization of methylene blue (in μg/min), calculated at 50% decolorization of the dye, were analyzed statistically by the small sample method [1].

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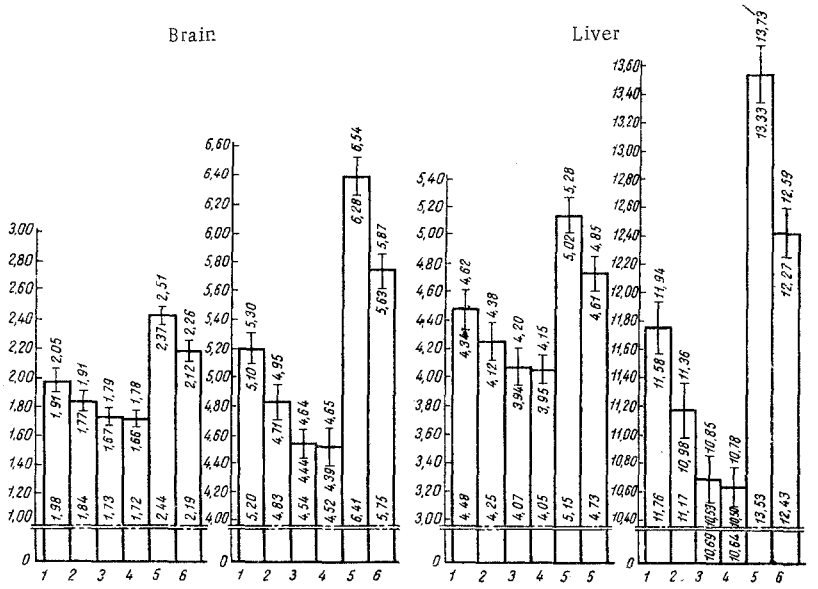

Fig. 1. Succinate-dehydrogenase activity of brain and liver of albino rats during deep hypothermia and after rewarming. Ordinate: rate of decolorization of methylene blue (μg/min). Vertical lines in columns denote confidence limits of variations in enzyme activity in each experimental group of animals.

With incubation of the homogenate at the same temperatures, the succinate-dehydrogenase activity of the brain from anesthetized animals was lower than that from controls ($P < 0.05$). An even more marked decrease in enzyme activity was observed in the cooled animals. The changes in succinate-dehydrogenase activity of the brain in rats under deep hypothermia for 1 h compared with the cooled animals were not statistically significant ($P > 0.1$). During rewarming, activity of the brain enzyme rose sharply, and next day it was higher than in the control ($P < 0.05$).

Activity of the liver enzyme, with the same incubation temperatures of the homogenate, showed similar changes depending on the conditions under which the animal was kept in the experiment, but the changes were less marked than in the case of brain tissue.

The results show that during a change in body temperature of animals, the enzyme activity is lowered or raised to a greater degree than during cooling or rewarming of a homogenate in vitro.

LITERATURE CITED

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