

NUCLEIC ACIDS IN THE CEREBRAL CORTEX AND LIVER AFTER ISOLATED TOTAL ANOXIA OF THE CENTRAL NERVOUS SYSTEM

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The total RNA level in the tissues of the gray matter of the brain 17-22 min after total hypertensive anoxia of the CNS was 29.1% lower than initially. The total RNA content in the liver tissue at the same time was reduced by 14.1%, evidently because of hypoxic damage to the trophic function of the CNS. The DNA concentration in the tissue of the gray matter of the brain and the liver was indistinguishable from the control.

KEY WORDS: anoxia of the brain; dog liver; DNA and RNA content.

The nucleic acid level in the internal organs in the period after resuscitation depends both on the severity of the hypoxia endured and on the rate and completeness of the animals' neurological recovery [1, 2].

Acute changes in the RNA and DNA content in the cerebral cortex and liver were studied after isolated, complete hypertensive ischemia of the CNS. During the period of cerebral ischemia, the circulation to the rest of the body and its gas exchange were maintained.

EXPERIMENTAL METHOD

Experiments were carried out on 18 heparinized mongrel dogs of both sexes. Isolated total anoxia of the CNS lasting 17-22 min was created in 6 dogs by raising the intracranial pressure to 360 mm Hg by infusion of physiological saline into the cisterna magna [3]. During the period of complete anoxia of the CNS, artificial hyperventilation was maintained and, when necessary, ephedrine solution was injected intravenously to maintain the arterial pressure at a level of not below 100 mm Hg. The skull was trephined under superficial thiopental anesthesia.

TABLE 1. Content of Total RNA and DNA in Cortical Gray Matter and Liver of Dogs in Original State and after Total CNS Anoxia for 17-22 Min ($M \pm m$)

Parameter studied	Brain		Liver	
	original state	after anoxia	original state	after anoxia
RNA (mg %)	11,0 \pm 0,8 (4)	7,8 \pm 0,2* (4)	39,8 \pm 2,1 (8)	34,2 \pm 0,7* (6)
DNA (mg %)	5,4 \pm 0,3 (4)	5,1 \pm 0,4 (4)	18,1 \pm 0,5 (8)	17,6 \pm 0,4 (6)

Note. Results differing significantly from initial state ($P < 0,05$) marked by asterisks. Number of experiments shown in parentheses.

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The RNA and DNA content in the cortical gray matter and liver in the acute experiments was investigated in the initial state (control group, 12 dogs) and at the 17th-22nd minute of anoxia of the CNS in the remaining animals. Nucleic acids were extracted by the method of Schmidt and Thannhauser [7]. The content of total RNA and DNA was determined with the SF-4 spectrophotometer [4].

EXPERIMENTAL RESULTS

As Table 1 shows, a sharp decrease in the total RNA ($P < 0.05$) was observed in the tissues of the cortical gray matter of the dogs after isolated complete anoxia of the CNS for 17-22 min. By the end of the period of anoxia, the total RNA content in the brain tissue was reduced by 29.1% of its initial level. Meanwhile the total RNA content in the liver tissue was reduced by 14.1% ($P < 0.05$) despite maintenance of circulation and gas exchange in the rest of the body during total CNS anoxia.

The DNA content in the period of investigation was indistinguishable from the initial values. Complete isolated anoxia of the CNS thus led to profound changes in RNA metabolism not only in the tissues of the eschemic brain itself, but also in the internal organs and, in particular, in the liver.

Previous investigations showed that during total anoxia of the CNS there is a marked decrease in the synthesis of high-energy phosphate [6] and protein [5], which is closely connected with RNA metabolism, in the brain tissue. Presumably the decrease in the total RNA level in the liver tissue during isolated complete anoxia of the CNS, with maintenance of the circulation and gas exchange in the remaining organs, is due primarily to hypoxic damage to the trophic function of the CNS. The degree of hypoxic damage to the CNS, as well as other factors, determined the future recovery of the level of these macromolecules in the internal organs in the posthypoxic period [2].

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