VISCERAL RNA AND DNA IN THE LATE POSTRESUSCITATION PERIOD IN ANIMALS WITH COMPLETE AND INCOMPLETE RECOVERY OF CNS FUNCTION

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The degree of recovery of the RNA content in liver, kidney, and heart tissues of animals exposed to total isolated ischemia of the brain or clinical death for a period of 5-8 min as a result of acute blood loss depends not only on the duration and severity of the visceral hypoxia but also on the rapidity of the neurological recovery. The visceral RNA level was particularly low in animals with irreversible damage to CNS functions. The DNA content under these circumstances was not significantly changed.

The study of the pathogenesis of "resuscitation disease" calls for a further examination of the dynamics of the supply of building materials for the formation of cell structures. Regular connections between the character of changes in the nucleic acids in the liver of resuscitated animals, the severity of the hypoxia, and the outcome of resuscitation have been demonstrated previously [1].

The object of the investigation described below was to compare the degree of normalization of the nucleic acid levels in the viscera in the late resuscitation period after clinical death in animals with complete and incomplete recovery of the CNS functions.

EXPERIMENTAL METHOD AND RESULTS

Experiments were carried out on 26 dogs of both sexes weighing 15-20 kg. In 10 animals the model of the terminal state was clinical death, lasting 5-8 min, caused by acute blood loss. The quantity of blood lost in the production of clinical death was 50-80% of the total blood volume of the animal. The dogs were resuscitated by Negovskii's method [2]. In 8 dogs kept on controlled artificial respiration, isolated total cerebral ischemia was produced for 10 or 17 min by raising the intracranial pressure up to 360 mm Hg by injection of physiological saline into the cisterna magna. On the days after resuscitation observations were made on the animals' general condition and behavior: the recovery of hearing and vision, the taking of food, the coordination of movements (postural and walking), and the adequacy of responses to external stimulation. Recovery of all or most of these functions served as the criterion of the completeness of restoration of CNS functions.

The content of RNA and DNA was studied in the liver, kidney, and heart tissues of the dogs in the initial state (control group – 8 dogs) and between the 2nd and 4th weeks after resuscitation in the other groups of animals. The animals whose tissues were to be investigated were killed by electrocution (127 V supply). Nucleic acids were extracted by the method of Schmidt and Thannhauser [4]. The content of total RNA and DNA was estimated with the SF-4 spectrophotometer [3].

Of the 10 animals exposed to clinical death, in 6 dogs the CNS functions were fully restored on the 1st-3rd day (group 1), while in the rest they did not recover completely (group 2). After isolated cerebral

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TABLE 1. RNA AND DNA Concentration (in mg%) in Viscera of Dogs with Complete and Incomplete Restoration of CNS Functions 14-28 Days after Resuscitation (M ± m)

	Liver		Kidney		Heart	
	RNA	DNA	RNA	DNA	RNA	DNA
Initial state (control group)	39,8±2,1 (8)	18,1±0,9 (8)	21,2±0,6 (8)	14,1±1,0 (8)	14,2±1,8 (8)	10,5±0,2 (8)
Complete recovery of CNS functions (group 1)	37,9±1,0 (6)	18,0±0,5 (6)	21,9±1,7 (6)	13,6±0,8 (6)	13,7±0,6 (6)	10,4±0,4 (6)
Incomplete recovery of CNS functions (group 2)	21,7±1,7* (4)	18,2±0,7 (4)	15,0±0,9* (4)	13,6±0,5 (4)	9,7±0,5* (4)	9,4±1,0 (4)
Complete recovery of CNS functions (group 3)	38,9±2,2 (5)	19,2±1,1 (5)	23,3±1,2 (5)	14,9±1,8 (5)	12,9±2,1 (5)	9,8±1,1 (5)
Complete but delayed recovery of CNS functions (group 4)	30,7±1,1* (3)	17,6±2,1 (3)	17,6±0,8* (3)	13,7±2,3 (3)	11,0±0,3* (3)	9,2±2,1 (3)

Note. Number of animals given in parentheses. * indicates that results differ significantly ($P < 0.05$) from control and from RNA level in animals with complete, rapid neurological recovery.

ischemia (10 min) neurological recovery of functions was complete on the 1st day (group 3), while after cerebral ischemia for 17 min the CNS functions were restored on the 7th-10th day (delayed recovery, group 4).

As Table 1 shows, the RNA content in the liver, kidney, and heart tissues was significantly reduced ($P < 0.05$) in the animals with complete but delayed restoration of CNS functions after isolated cerebral ischemia (group 4) and with incomplete neurological recovery after clinical death from blood loss (group 2). In these animals there was no difference in the RNA level in the 2nd and 4th weeks of the recovery period. The total RNA content in the liver, kidney, and heart tissues of the animals with complete neurological recovery (groups 1 and 3) was indistinguishable on the 14th day from its initial level. This level was also maintained on the 28th day after resuscitation. The DNA content in the tissues of these organs showed no significant changes in any of the groups. In the late postresuscitation period, a low RNA concentration was thus regularly found in the liver, kidneys, and heart of the animals with incomplete or with complete but delayed restoration of CNS functions by comparison with its level in animals whose CNS functions were rapidly restored.

Comparison of these results showed that the loss of RNA by the tissues was due not only to the duration and severity of the preceding visceral hypoxia [1], but also to the degree of hypoxic damage to the CNS. This factor, together with others, was evidently responsible for the delayed recovery of the RNA in the viscera. On the other hand, the protracted disturbance of RNA metabolism in the liver, kidneys, and heart during the period of clinical death and in the posthypoxic state, which naturally led to a deficiency of their specific functions, could be an important factor in the mechanism of the CNS lesions in the early postresuscitation period.

LITERATURE CITED

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