

10. S. A. Khachatryan and G. A. Navasardyan, in: Proceedings of the 4th All-Union Conference on the Physiology of the Autonomic Nervous System [in Russian], Erevan (1976), p. 317.
11. R. J. Bing and K. Kato, *Circulation*, 24, 483 (1961).
12. M. D. Bogdanoff et al., *Proc. Soc. Exp. Biol. (New York)*, 100, 503 (1959).
13. W. B. Cannon, *Bodily Changes in Pain, Hunger, Fear, and Rage*, New York (1934).
14. R. S. Sklarin et al., *Geriatrics*, 16, 374 (1961).
15. E. Shafrir et al., *J. Lipid Res.*, 1, 109 (1959).

ROLE OF CORTICOSTEROIDS IN THE REGULATION OF NUCLEIC ACID METABOLISM IN THE SPLEEN AFTER SEVERE MECHANICAL TRAUMA

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The RNA and DNA concentration in the spleen of adrenalectomized rats and of rats receiving ACTH was studied before trauma and 10 min and 5 and 10 h after the beginning of crushing of the soft tissues of the hind limbs. The results suggest that corticosteroid hormones influence the changes in nucleic acid metabolism in the spleen following mechanical trauma.

KEY WORDS: shock; metabolism; corticosteroids; nucleic acids.

Many pathological processes are known to cause changes in nucleic acid metabolism and structure [1]. However, little information is available on the changes in the splenic nucleic acids during severe mechanical trauma. A significant increase in the nucleic acid content spleen, mainly on account of DNA, has been demonstrated under the influence of mechanical trauma. The view has been expressed that the increase in the nucleic acid concentration in the spleen is evidence of activation of the genetic apparatus of the cells caused by pituitary and adrenocortical hormones. Meanwhile many aspects of this problem remain inadequately explained. In particular, there is no information on the role of pituitary and adrenocortical hormones in the mechanism of the disturbance of nucleic acid metabolism in the spleen during shock.

The object of this investigation was to study this problem.

EXPERIMENTAL METHOD

Experiments were carried out on 240 male albino rats weighing 180-220 g. Mechanical trauma was inflicted on the animals by crushing the soft tissues of the hind limbs. RNA and DNA were determined by a quantitative spectrophotometric method [4] and expressed in mg % phosphorus. The animals were divided into three main groups: 1) control, 2) adrenalectomized rats, and 3) rats receiving ACTH before trauma and also 10 min and 5 and 10 h after the beginning of trauma (different series of experiments). Ten rats were used in each series of experiments.

EXPERIMENTAL RESULTS

Mechanical trauma led to marked changes in the DNA content in the spleen. At all periods of the investigation it was significantly below the initial level. The RNA concentration rose sharply but only 10 h after the beginning of trauma ($P < 0.01$; Table 1).

When these facts are assessed it can tentatively be suggested that during adaptive responses of the injured animal intracellular mechanisms of nucleic acid and protein synthesis in the spleen are activated. How-

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TABLE 1. Changes in RNA and DNA Content in Spleen at Various Times after Crushing Soft Tissues in Rats after Adrenalectomy and in Rats Given ACTH Previously ($M \pm m$)

Experimental conditions	RNA	DNA
	mg	% P
Before trauma	41,70 \pm 2,18	57,04 \pm 2,84
After trauma		
10 min	46,45 \pm 2,07	29,42 \pm 4,46*
5 h	47,25 \pm 3,51	78,89 \pm 3,25*
10 h	58,04 \pm 3,82*	95,46 \pm 6,47*
Before trauma	71,66 \pm 4,00	73,91 \pm 3,63
After trauma		
10 min	57,98 \pm 2,24*	97,61 \pm 5,07*
5 h	92,18 \pm 6,18*	31,52 \pm 2,05*
10 h	62,35 \pm 4,87	73,18 \pm 6,74
Before trauma	50,90 \pm 2,50	53,57 \pm 4,07
After trauma		
10 min	190,88 \pm 10,05*	21,03 \pm 1,76*
5 h	168,7 \pm 9,60*	27,47 \pm 1,94*
10 h	80,91 \pm 3,02*	89,19 \pm 3,75*

* $P < 0.05$.

ever, with respect to the pathological conditions studied in the present experiments, when hyperfunction of the pituitary-adrenal system plays an important role in the adaptive reactions of the body and the spleen tissue undergoes lysis and partial atrophy, this hypothesis seems unlikely. Possibly nucleic acids from the destroyed nuclei remain unchanged for a long time and can be detected by chemical methods of investigation.

On the 7th day after adrenalectomy the RNA and DNA content in the animals' spleen was sharply increased. Since enlargement of the spleen and hyperplasia of its follicles are found after adrenalectomy [3], this suggests that the accumulation of RNA and DNA was the result of induction of protein synthesis in the lymphoid tissue of the spleen. A significant increase in the RNA concentration in the spleen ($P < 0.05$) and an increase in the DNA concentration ($P < 0.01$) in the spleen were observed 10 min after the beginning of crushing of the soft tissues of the thigh in the adrenalectomized animals. By the end of the 5th hour, the RNA content was increased ($P < 0.05$) and the DNA content reduced ($P < 0.01$). The concentration of the nucleic acids in the spleen 10 h after the beginning of trauma did not differ significantly from initially.

Injection of ACTH into the rats caused an increase in the RNA concentration in the spleen ($P < 0.05$). Preliminary activation of the pituitary-adrenal system also had a profound effect on the dynamics of the nucleic acid concentration in the spleen after trauma. The RNA concentration rose significantly at all times of the investigation whereas the DNA concentration decreased both 10 min and 5 h after trauma ($P < 0.01$). The DNA concentration after 10 h was significantly above its initial level ($P < 0.01$).

The results suggest that changes in nucleic acid metabolism in the spleen observed after trauma are attributable to a definite degree to the effects of corticosteroid hormones. However, it should be noted that a preliminary decrease and increase in the corticosteroid level in the body before trauma does not lead to any distinct changes, opposite in character, in the nucleic acid level in the spleen of the experimental rats compared with the controls. The action of trauma on nucleic acid metabolism in the spleen is evidently not entirely due to a hormonal mechanism, but also depends on other influences.

LITERATURE CITED

1. I. B. Zbarskii, D. K. Krasnopol'skaya, and T. I. Tikhonenko, in: I. B. Zbarskii et al., The Chemistry and Biochemistry of Nucleic Acids [in Russian], Leningrad (1968), p. 282.
2. A. A. Zor'kin and V. I. Nikulyanu, in: Current Problems in the Pathophysiology of Trauma [in Russian], Kishinev (1969), p. 56.
3. A. Grollman, Clinical Endocrinology and Its Physiological Basis [Russian translation], Moscow (1969), p. 311.
4. R. G. Tsanev and G. G. Markov, Biokhimiya, No. 1, 151 (1960).