Fractionation of leukocytic pyrogen on a Sephadex G-75 column thus yielded two separate fractions, one stimulating hematopoiesis, the other possessing pyrogenic activity and inhibiting hematopoiesis. The elution profile of the Sephadex G-75 column suggests that the stimulaing action is a property of high-molecular-weight substances whereas the pyrogenic and inhibitory actions are properties of low-molecular-weight substances. It is possible that the pyrogenic and inhibitory activities are associated with different substances. The nature of the inhibitory factor requires further study. It may perhaps be a substance of chalone type [4].

LITERATURE CITED

1. T. A. Prigozhina, M. G. Kakhetelidze, and O. M. Efremov, Patol Fiziol., No. 2, 68 (1976).
2. T. A. Prigozhina, G. N. Kurbanova, M. G. Kakhetelidze, et al., Patol Fiziol., No. 5, 66 (1976).
3. A. V. Sorokin and O. M. Efremov, in: Proceedings of the 3rd Scientific Conference of Pathophysiologists of the Northern Caucasus [in Russian], Rostov-on-Don (1969), p. 238.
4. T. Rytömaa, Bibl. Haematol. (Basel), 39, 885 (1973).

EFFECT OF CHOLESTEROL ON THE STATE OF THE ADRENAL CORTEX IN SEVERE STRESS

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The effect of cholesterol, administered for 14 days, on the response of the adrenal cortex was studied in rats during severe stress. Under these conditions the degree of activation of the gland and the degree of its structural changes were lower than in the control. It is suggested that the action of cholesterol depends on its influence both on the hypothalamus and on the adrenocortical tissue. The latter effect is connected with the action of cholesterol as a substance delaying peroxidation.

KEY WORDS: *adrenal cortex; stress; structural changes; cholesterol.*

One of the manifestations of exposure to severe stress is the development of degenerative and necrobiotic changes in various organs including the adrenal cortex [4, 9-11]. Such changes can be assumed to lead to the development of functional insufficiency of the affected organs. One of the problems arising in the pharmacological control of stress is therefore the prevention of these structural changes.

The object of the present investigation was to study the effect of cholesterol on the state of the adrenocortical tissue under conditions of severe stress.

The writers previously [7] postulated that delipoidization of the adrenals, with a lowering of their cholesterol level during stress [5], is one of the conditions determining death of the adrenocorticocytes in these situations. Data in the literature on the antioxidant action of cholesterol [13], its ability to delay peroxidation [2], and also on the role of peroxides in the mechanism of cell death [3] and the accumulation of peroxides in the body during stress [1] were taken into account. It was also borne in mind that administration of cholesterol to rats leads to moderate hypercholesteremia in the animals [8] without causing dystrophic changes in the adrenocortical tissue [12].

EXPERIMENTAL METHODS

Experiments were carried out on adult male albino rats divided into four groups: 1) 22 intact rats; 2) the control group of 20 rats exposed to combined stress in the form of uni-

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TABLE 1. Effect of Cholesterol Administration on Morphometric Indices of Adrenal Cortex in Rats with Severe Stress (M±m)

Index	Group of animals			
	1. intact	2. stress	3. administration of cholesterol	4. cholesterol administration + stress
Width of adrenal cortex, in μ	654±17	884±29	715±35	829±20
P		<0,001		
P_1				>0,05
P_2				<0,01
width of zona glomerulosa				
P	52±2,5	22±2,1	50±2,9	41±2,0
P_1		<0,001		
P_2				<0,001
Diameter of nuclei, μ: zona fasciculata	5,9±0,05	6,5±0,06	6,0±0,06	<0,02 6,2±0,07
P		<0,001		
P_1				<0,01
P_2				<0,05
Zona fasciculata	5,3±0,05	5,7±0,08	5,4±0,07	5,5±0,09
P		<0,001		
P_1				>0,05
P_2				>0,2

Note. P) Comparison of groups 1 and 2, P_1) comparison of groups 2 and 4, P_2) comparison of groups 3 and 4.

lateral adrenalectomy, performed under ether anesthesia during the morning, 24 h after which the animals were fixed in the supine position by Selye's method for 24 h and then killed; 3) 15 rats each receiving a 5% aqueous emulsion of cholesterol per os in a dose of 0.5 ml emulsion/100 g body weight for 2 weeks; 4) 15 rats receiving cholesterol in the same way as the animals for group 3, and exposed to stress in the same way as the control animals.

The animals were decapitated between 8 and 10 a.m. The adrenals were removed immediately after decapitation and were fixed in Carnoy's fluid. Serial paraffin sections 6 μ thick were cut from the middle layer of the gland and stained with hematoxylin–eosin. During the study of the sections particular attention was paid to the severity of the dystrophic and necrobiotic changes. The functional state of the gland was studied by means of a combination of morphometric methods: The mean width of the adrenal cortex was determined by means of the MOV-15 ocular micrometer (on the basis of four measurements in each case), the width of the zona glomerulosa was determined (10 measurements), and the diameter of the nuclei of the adrenocorticocytes measured in the outer zona fasciculata and zona reticularis (50 nuclei were measured in each zone). The results were subjected to statistical analysis.

EXPERIMENTAL RESULTS

The study of the adrenals of animals of the control group revealed a combination of features pointing to their intensive activation. This was manifested as marked widening of the cortex on account of the zona fasciculata and zona reticularis, and an increase in the size of the nuclei in the cells of these zones (Table 1). Evidence in support of this conclusion was given by disappearance of the lipid vacuoles in the adrenocorticocytes and dilation of the capillaries with swelling of their endothelium, visible in sections stained with hematoxylin–eosin. Parallel with these changes, severe degenerative changes also were observed: granular, vacuolar, and hyaline degeneration of the epithelial cells, a holocrine pattern of secretion, loss of the complex structure of the epithelial bands, hemorrhages, and foci of necrosis of various sizes (Fig. 1).

Administration of cholesterol to the animals appreciably modified the response of the adrenal cortex to stress. Morphometric evidence of activation of the gland was less marked in the control animals (Table 1). Structural changes in the organ also were much less marked than in the control (Fig. 2). It was manifested as granular and slight vacuolar degeneration with, occasionally (in two cases), signs of a holocrine pattern of secretion.

The results are evidence that administration of cholesterol to the rats reduced the severity of the changes in the adrenal cortex in response to stress. The lower degree of ac-

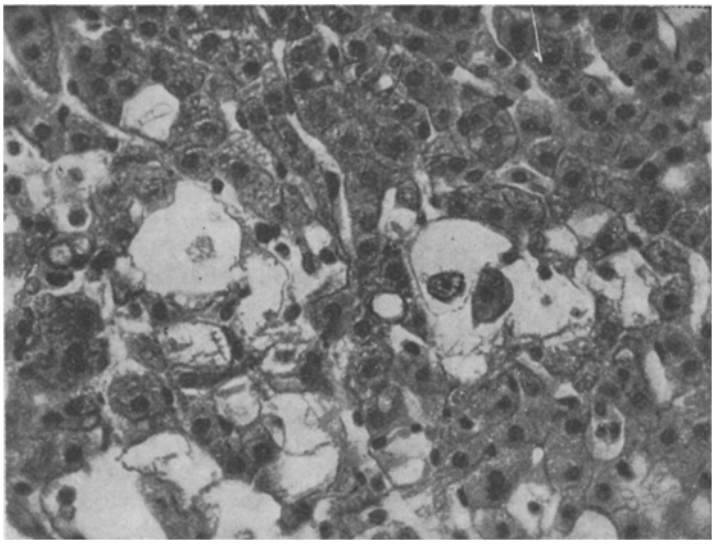

Fig. 1. Zona fasciculata of adrenal of rat immobilized after unilateral adrenalectomy. Degenerative changes in glandular cells with holocrine pattern of secretion. Hematoxylin–eosin, 280×.

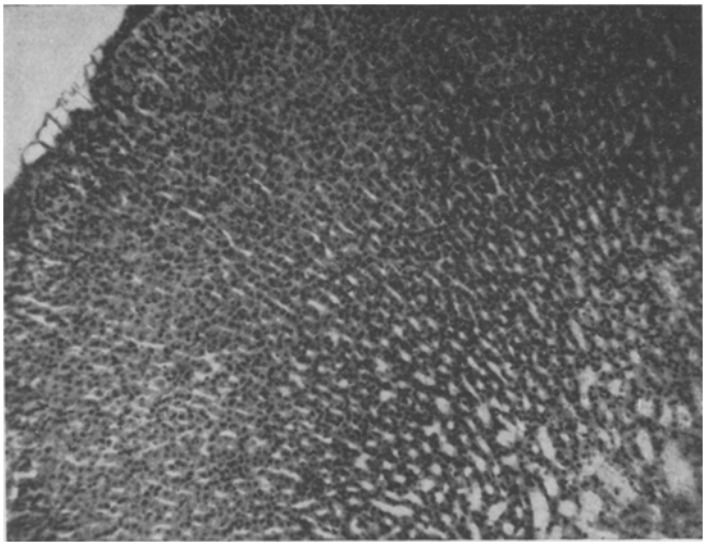

Fig. 2. Adrenal of rat receiving cholesterol for 14 days and immobilized after unilateral adrenalectomy. No marked evidence of destruction present. Hematoxylin–eosin, 56×.

tivation of the gland was evidently due to the effect of cholesterol on the hypothalamic centers controlling the function of the pituitary–adrenal system. This can be concluded from the data on the effect of hypercholesteremia on the hypothalamus obtained in experiments on rabbits [6]. It can also be tentatively suggested that the increase in the cholesterol content in earlier experiments [8] reduced the peroxide formation which is characteristic of stress, with the result that stimulation of the interoceptors and activation of the hypothalamic centers were reduced. Finally, it seems very probable that the effect of cholesterol described above was connected with the elevation of its level in the adrenal tissue before the beginning of exposure to stress and the reduced loss of cholesterol during the action of the extremal factor.

In the writer's view the results confirm the earlier suggestion that one of the "useful effects" of hypercholesteremia is an increase in adaptability to unfavorable factors at the cellular and organ level.

LITERATURE CITED

1. I. I. Brekhman, V. G. Golotin, I. V. Dardymov, et al., in: Adaptation and Problems in General Pathology [in Russian], Vol. 1, Novosibirsk (1974), pp. 74-76.
2. A. I. Zhuravlev, in: Biological Antioxidants [in Russian], Moscow (1975), pp. 15-29.
3. Yu. N. Kozlov, in: Biological Antioxidants [in Russian], Moscow (1975), pp. 5-14.
4. I. N. Kochetov, R. A. Voronov, A. N. Gansburgskii, et al., Abstracts of Proceedings of the 8th All-Union Congress of Anatomists, Histologists, and Embryologists [in Russian], Tashkent (1974), pp. 208-209.
5. M. A. Krekhova and M. K. Chekhranova, Probl. Éndokrinol., No. 4, 81 (1974).
6. L. N. Lebedeva, L. M. Chuvil'skaya, and N. S. Shenkman, Byull. Éksp. Biol. Med., No. 8, 117 (1973).
7. M. T. Lutsenko and B. Ya. Ryzhavskii, in: Mechanisms of Adaptation [in Russian], Blagoveshchensk (1975), pp. 93-105.
8. M. T. Lutsenko et al., in: Mechanisms of Adaptation [in Russian], Blagoveshchensk (1975), pp. 93-106.
9. I. N. Potapova, The Pathomorphology of the Glands of Internal Secretion in Childhood [in Russian], Moscow (1971).
10. V. I. Prilutskii, Farmakol. Toksikol., No. 3, 339 (1964).
11. A. A. Rogov and L. I. Aruin, in: Adrenal Hormones in Surgery [in Russian], Moscow (1965), pp. 88-105.
12. B. Ya. Ryzhavskii, in: Adaptation of the Organism to an Increased Cholesterol Content [in Russian], Blagoveshchensk (1973), pp. 64-76.
13. V. Ya. Yavorskii, Usp. Sovrem. Biol., 77, 331 (1974).

EFFECT OF PULSATING LOCAL NEGATIVE PRESSURE WITH OXYGEN ON BIOELECTRICAL ACTIVITY OF THE UTERUS IN PREGNANT ALBINO RATS WITH INTRAUTERINE STREPTOCOCCAL INFECTION

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Bloodborne intrauterine streptococcal infection of albino rats during pregnancy (implantation, placentation) leads to disturbances of uterine bioelectrical activity which are restored to normal by treatment with pulsating local negative pressure together with periodic administration of oxygen.

KEY WORDS: *streptococcal infection; uterine bioelectrical activity; pulsating local negative pressure.*

It is stated in the literature that during intrauterine infection of the fetus spontaneous and recurrent abortions and premature births are frequently observed [1-3].

The object of these investigations was to study uterine bioelectrical activity at different stages of pregnancy during bloodborne fetal infection and treatment with pulsating local negative pressure (PLNP) combined with oxygen.

EXPERIMENTAL METHODS

Experiments were carried out on 98 pregnant albino rats.

To produce intrauterine infection of the fetus a culture of group A type 1 M hemolytic streptococcus, in a dose of 1 billion bacterial cells, combined with an extract of uterine

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