

INFLUENCE OF ADRENOCORTICOTROPIC HORMONE ON THE CHOLESTEROL LEVEL IN THE RAT LIVER IN VITRO

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The great amount of factual material accumulated by now permits us to consider it proven that ACTH influences primarily the adrenal cortex [2, 3].

Nonetheless, in recent years indications have appeared of a direct action of ACTH on other tissues as well, for example, adipose tissue, stimulating (in vitro) the secretion of free fatty acids into the medium or suppressing tri-glyceride synthesis [8].

It is generally accepted that the most important organ participating in the cholesterol metabolism is the liver. There are indications [9] that evidently the site of application of the action of various hormones regulating the lipid metabolism should be sought in the liver.

In this work we investigated the possibility of the direct action of ACTH not only on the adrenals, but also on the lipid (cholesterol) content in other tissues, in particular, in the liver.

PROCEDURE

The investigations were conducted on adult male rats, 150-200 g in weight, which had been starved for 24 h before the experiment. After decapitation, the livers of the rats were removed and homogenized. Three series of experiments were conducted. In the first series, the total cholesterol content was determined in the rat liver homogenates, for which the samples were covered with an alcohol-ether mixture (3 : 1) and left for 24 h. Then the samples were heated to boiling for complete extraction of the cholesterol, and brought up to equal volumes with the mixture. After filtration and evaporation, the Lieberman-Burchardt reaction was conducted, followed by colorimetry.

In the second (control) and third series, weighed samples of liver homogenates were incubated for three hours in an atmosphere of oxygen, where ACTH (Elenya Gura, Poland), diluted with physiologic solution, was added to the homogenates in the third series, in an amount of 500 milliunits per 100 mg of liver tissue. After incubation, the total cholesterol content was determined in all the samples according to the procedure described above.

RESULTS

The cholesterol level in the samples of the first series corresponded to the usual cholesterol content in the liver in adult healthy rats (see table). In the second series of experiments, we observed no statistically reliable changes in the cholesterol content in the incubated samples. A pronounced decrease in the cholesterol level ($P = 0.01$) in comparison with the experiments of the first series was observed in the incubated samples to which ACTH was added. The difference between the incubated samples with the addition of ACTH and the samples kept under the same conditions, but without the addition of ACTH, were statistically reliable ($P = 0.02$). Thus, the results of the in vitro experiments show that the preparation produces a drop in the cholesterol content in liver tissue.

Influence of ACTH on the Cholesterol Content
in Rat Liver Tissue in Vitro

Number of experiment	Scheme of experiment	Cholesterol content (in mg%)
15	1) III (incubation + ACTH)	249.8 ± 10.1
15	2) II (control incubation)	245.9 ± 12.7
14	3) I (control)	201.9 ± 10.4

It is well known that ACTH exerts a pronounced influence on the lipid metabolism of the adrenal cortex, stimulating the formation of a number of corticosteroids and correspondingly decreasing the cholesterol content in these organs. Intensified penetration of steroids into the blood, caused by ACTH, in turn leads to an increase in the cholesterol synthesis [4, 7] and lecithin synthesis [4, 5, 7] in the liver. Some decrease in the fat content in the liver of rats that received ACTH is noted [1].

The change in the cholesterol content found in our experiments permits us to propose the possibility of a direct influence of ACTH on the lipid metabolism in liver tissue. The literature data confirm the fact that cholesterol biogenesis in adult rats is less pronounced in comparison with young individuals [6]. Hence, the decrease in the cholesterol level in our experiments may evidently be explained more likely by intensified decomposition of cholesterol under the influence of ACTH than by inhibition of cholesterol biosynthesis. However, the question of the mechanism of the effect of ACTH on the lipid metabolism in the tissues will require further development.

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