

EFFECT OF HYDROCORTISONE ON LIPID METABOLISM IN HEPATOCYTE
PLASMA MEMBRANES

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Hormones influence virtually all organs and tissues through their action on the genetic apparatus and on permeability of cell membranes [1, 3, 7]. It has recently become known that entry of steroid hormones into the cell is controlled by special "recognizing" systems, located in the plasma membranes (PM) [4]. Essential components of this system are lipids, which largely determine the binding of hormones with receptors [10]. At the same time it has been shown that steroid hormones can actively modify intracellular lipid metabolism [5, 7]. However, many problems concerning the mechanism of action of steroid hormones on lipids of biomembranes remain unsolved.

The aim of this investigation was to study the effect of hydrocortisone on the lipid composition of PM and on activity of the lysosomal phospholipases of hepatocytes.

EXPERIMENTAL METHOD

Experiments were carried out on 48 male rats weighing 100-130 g. PM were obtained from the liver by the method in [6]. Hydrocortisone (Richter, Hungary) was injected intraperitoneally in a dose of 5 mg/kg. The rats were decapitated 2, 4, 12, and 24 h after injection of the hormones.

Membrane lipids were extracted by the method in [2]. To determine the lipid composition, thin-layer chromatography on Silufol-254 plates was used in systems of n-hexane-ethyl ether-glacial acetic acid (80:20:2) and chloroform-methanol-water (65:25:4) for determination of total lipids and various fractions of phospholipids, respectively. Chromatograms were subjected to densitometry at 560 nm in reflected light on the EGR-65 densitometer (Karl Zeiss, East Germany).

To study enzyme activity, a homogenate was prepared [1]. Activity of phospholipases A_1 [9] and C [11] was determined.

EXPERIMENTAL RESULTS

The content of total lipids and of the various phospholipid fractions, and also the ratio between them in hepatocyte PM were determined first under normal conditions.

Under the influence of hydrocortisone considerable changes in these parameters were found in the rat hepatocyte PM. The hormone caused a decrease in the phospholipid concentrations 2 h after its injection. Meanwhile, an increase was observed in the relative content of free fatty acids, and this could be one cause of the disturbance of the structure of PM [10].

An important role in changes of this kind could be played by enzymes of lipid metabolism and, in particular, of catabolism. In fact, determination of activity of phospholipases A_1 and C revealed correlation between the increase in their activity in the hepatocytes and the fall in the relative level of phospholipids in the PM of these cells. Maximal changes in enzyme activity were observed 4 h after injection of the hormone: 23.1 μ M com-

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pared with 16 μ M for phospholipase A₁ (P < 0.05) and 20.1 μ M compared with 15.3 μ M for phospholipase C (P < 0.05).

The relative content of the various phospholipid fractions changed unequally under the influence of hydrocortisone. For instance, the time course of changes in phosphatidylcholine and phosphatidylserine was similar to that of changes of the total phospholipid component of the membrane, but the phosphatidylethanolamine level had not returned to its initial values 24 h after injection of the hormone and it continued to decline.

As a result of a single injection of hydrocortisone a decrease in the relative content of phospholipids and disturbance of the normal ratio between their fractions were thus found in the hepatocyte PM. One cause of this effect, in the writers' opinion, is activation of lysosomal phospholipases. Interaction of lysosomes with hepatocyte PM and its importance in processes of "recognition" of steroid hormones have been described previously [8]. It can also be tentatively suggested that the cyclase system participates in the changes in lipid metabolism of PM revealed by these experiments.

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