THE PERMISSIVE ROLE OF GLUCOCORTICOIDS IN THE MOBILIZATION OF FAT FROM ADIPOSE TISSUE

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One of the important functions of the glucocorticoids is that their normal secretion ensures the appearance and realization of a number of humoral and neural effects [5, 8]. Thus, after removal of the adrenals fat mobilization from depots to the liver does not occur when the liver is depleted of glycogen. Injection of cortisone into the adrenalectomized animal reestablished the capacity for fat mobilization [9].

In small (physiological) doses glucocorticoids play a permissive role in carrying out the anabolic effect of growth hormone on protein metabolism of the liver and kidneys and its fat-mobilizing effect [2, 3]. In adrenalectomized rats trauma evokes hyperglycemia only if cortisone is given in doses which alone appear to be without effect on the blood sugar level [5]. It may be supposed that the permissive action of glucocorticoids is their acting as coenzymes in hydrogen transfer between pyridine nucleotides in the presence of the corresponding steroid-dehydrogenase [10].

In preceding articles one of us [4] showed that under stress the mobilization of easily utilizable higher nonesterified fatty acids (NEFA) is basically connected with excitation of the sympathetic nervous system and is invoked by the adrenergic mediator—noradrenalin. The glucocorticoids of the adrenal cortex play a permissive role in this related to the fat-mobilizing effect of noradrenalin.

Adrenalin, in addition to noradrenalin, possesses fat-mobilizing activity, the effect being produced upon the addition of adrenalin directly to isolated adipose tissue [1].

Lypolytic Activity in Epididymal Fat Tissue of the Mouse after Addition of Cortisone, Epinephrine and Cortisone + Epinephrine to the Medium

No. of expt.	Weight of mouse (in g)	Medium without addition of hormones	Cortisone (10 μg/ml)	Cortisone (2 μg/ml)	Epinephrine (0.8 μg/ml)	Cortisone (2 μg/ml) + Epinephrine (0.08 μg/ml)	Epinephrine (0.4 μg/ml)	Cortisone (10 μg/ml) + Epinephrine (0.4 μg/ml)
1	230	5.2	5.8	5.2	5.2	7.8	10.0	15.6
2	250	4.2	4.2	4.2	4.2	5.0	7.6	8.8
3	280	5.6	5.6	5.6	5.6	6.8	9.0	11.8
4	250	4.8	4.8	4.8	5.6	7.6	7.6	9.8
5	260	6.4	6.6	6.0	6.4	8.4	13.2	14.6
6	230	5.2	4.8	5.6	5.8	8.2	8.0	10.4
7	210	6.4	7.0	6.4	6.4	8.8	13.2	15.0
8	180	5.8	5.8	5.8	5.8	8.6	10.8	15.6

Note. Lipolytic activity is the difference between the NEFA content before and after incubation (150 min) expressed as microequivalents/ml per one kg of tissue.

Our present work was devoted to elucidating whether a glucocorticoid (cortisone) had a permissive action on the mobilization of fat by adrenalin under experimental conditions using isolated adipose tissue.

METHODS

White male mice weighing 180-280 g were the experimental animals used. The lipolytic activity of the epididymal fat pad was meadured according to the method of Gordon and Cherkes [7], i.e. by the difference between the NEFA content of the incubation medium before and after incubation (150 min. in Krebs–Ringer phosphate buffer, pH 7.3-7.4 containing 5% albumin solution) and expressed in microequivalents of NEFA per one ml per one g of fat tissue. NEFA were measured by the method of Dole.

RESULTS

If follows from the data in the table, that the addition of cortisone to the incubation medium in doses of 10 and two microgm per ml of medium has no effect on the lipolytic activity of the adipose tissue. Epinephrine in a dose of 0.08 μg/ml also is without effect on its lipolysis. Upon simultaneous addition of epinephrine and cortisone to the medium in doses which have no effect on lipolysis, a rise in the release of NEFA from tissue into the medium was observed in all experiments, i.e. fat mobilization was stimulated. As is well known, fat mobilization from the fat depot occurs as a result of the hydrolysis of triglycerides and the release of the breakdown products–the higher free fatty acids [4].

As has been shown previously [1], higher doses of epinephyrine (0.4 μg/ml stimulates the lipolytic activity of fatty tissue by itself. The addition of cortisone to this active dose in all experiments carried out in parallel on epididymal fat pad taken from a single mouse stimulates the lipolytic effect of epinephrine. The dose of cortisone used by itself has no action on lipolysis of adipose tissue.

Thus, in experiments utilizing direct addition of cortisone and epiniphrine to adipose tissue,a permissive effect of cortisone was detected in relation to the fat-mobilizing action of the epinephrine.

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