

CONTENT OF NONESTERIFIED FATTY ACIDS IN BLOOD SERUM AND ADIPOSE TISSUE OF CASTRATED RATS DURING ELECTRICAL STIMULATION

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The concentration of nonesterified fatty acids in the blood serum and particularly in the perirenal adipose/tissue of fasting castrated rats is higher than in fasting intact animals. The effects of electrical stimulation were also more marked in fasting castrated rats than in fasting intact animals.

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The object of this investigation was to study the effect of castration on the content of nonesterified fatty acids (NEFA) in the blood serum and adipose tissue of animals subjected to electrical stimulation. This form of stimulation has been shown to cause mobilization of free fatty acids from fat depots. The basis for the castration experiments was a report in the literature that with exclusion of gonad function changes begin to occur in several indices of the state of lipid metabolism [2].

EXPERIMENTAL METHOD

Experiments were carried out on male rats weighing 250-300 g deprived of food for 24 h before the experiment. The animals likewise received no food for 20 h after the end of the experiment.

Electrical stimulation of the rats immobilized on a frame was carried out by means of electrodes implanted beneath the skin of the forelimbs, using square pulses (5-7 V, 50/sec) for 3 h. The animals were sacrificed by decapitation. Castration was carried out 12-14 days before the main experiment. The NEFA concentration in the blood serum and perirenal adipose tissue was determined by Dole's method [5].

Five series of experiments were carried out on 60 rats: I) intact rats; II) rats fasting for 45 h; III) animals exposed to the combined effects of electrical stimulation and immobilization against a background of fasting; IV) fasting castrated animals exposed to the same procedures as those in series III; and V) fasting castrated rats not subjected to electrical stimulation or immobilization.

EXPERIMENTAL RESULTS

The results obtained are illustrated in Fig. 1. Fasting for 45 h led to an increase in the NEFA concentration both in the blood serum and in the adipose tissue of the animals (series II). These results are in agreement with those already reported in the literature [3, 4, 10, 11].

In response to electrical stimulation the NEFA level in the blood serum rose still higher (series III). This action of electrical stimulation in mobilizing fat has been described by several workers previously [7, 8]. It is interesting to note that no further increase in the NEFA concentration took place under these conditions in the adipose tissue. Evidently in the case of electrical stimulation equilibrium occurred between the processes of hydrolysis of the triglycerides of adipose tissue and release of NEFA into the blood stream.

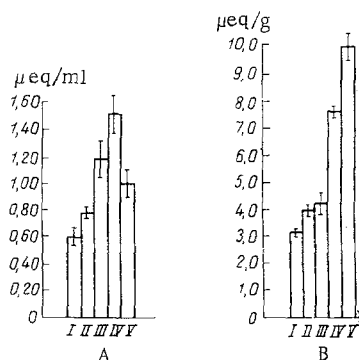


Fig. 1. Concentration of free fatty acids in blood serum and adipose/tissue of rats. I, II, III, IV, V) Series of experiments (see text); mean values together with their confidence limits ($M \pm tm$) are given.

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The NEFA concentration in the serum of fasting castrated animals (series V) not subjected to immobilization and electrical stimulation was higher than in the animals of series II. The NEFA content in their perirenal fat was much higher than in animals of the other experimental groups.

In response to electrical stimulation of the fasting castrated rats (series IV), an apparent redistribution of NEFA took place between the adipose tissue and blood: their content in the blood serum was higher, while in the fatty tissue it was lower than in animals which were fasted and castrated only (series V).

Comparison of the effects of electrical stimulation (against a background of fasting) on normal (series III) and castrated (series IV) animals shows that in the latter the changes in lipid metabolism were more marked.

Changes in the functional state of the central nervous system produced by castration are possibly responsible for the more marked changes in content of free fatty acids in the serum and fatty tissue of these animals than in normal rats. In particular, under these circumstances a significant role may be played by differences in the secretion of hormones possessing adipokinetic action by the pituitary [1, 6, 9].

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