

EFFECT OF HYDROCORTISONE ON ACTIVITY
OF HEXOKINASE AND GLUCOSE-6-PHOSPHATE
AND 6-PHOSPHOGLUTONATE DEHYDROGENASES
IN THE LIVER AND ADIPOSE TISSUE OF RABBITS

G. M. Daudova and I. B. Soliternova

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Glucose-6-phosphate dehydrogenase (G6PDH) activity in the rabbit liver is significantly higher in January-April than in May-July. G6PDH activity in the liver is definitely lowered after a single injection of 25 mg/kg hydrocortisone and after repeated injections of the hormone in January-April but is unchanged in May-July. The activity of hexokinase, G6PDH, and 6-phosphogluconate dehydrogenase in the adipose tissue of rabbits is unchanged after repeated injections of hydrocortisone.

KEY WORDS: hydrocortisone; carbohydrate metabolism; liver, adipose tissue of rabbits.

The effect of injection of various doses of hydrocortisone on the activity of hexokinase (HK) and glucose-6-phosphate and 6-phosphogluconate dehydrogenases (G6PDH and 6PGDH) in the liver and epididymal adipose tissue (EAT) was studied in rabbits.

EXPERIMENTAL METHOD

The activity of the enzymes was determined in the supernatant (after centrifuging homogenates of the liver at 45,000 g for 1 h and of the EAT at 15,000 g for 40 min) spectrophotometrically [1, 2] and expressed in $\mu\text{moles NADP} \cdot \text{H}_2 / \text{mg protein and } / \text{g wet weight of tissue per hour}$. Protein was measured spectrophotometrically at 280 nm.

EXPERIMENTAL RESULTS

The G6PDH activity in the liver was found to be approximately 1.5 times higher in January-April than in May-July whether calculated per milligram protein or per gram weight of tissue. The results obtained in experiments carried out at similar times of the year on animals receiving hydrocortisone and control rabbits were therefore compared. It will be clear from Fig. 1 that 12 h after a single injection of the hormone (25 mg/kg) the G6PDH activity in the liver was definitely lowered, by about the same degree as after multiple injections of the hormone in January-April. Smaller doses of hydrocortisone, or injections given at different times, had no inhibitory effect on the activity of this enzyme. Likewise, no decrease in G6PDH activity in the liver was found in rabbits receiving hydrocortisone twice a day in a dose of 25 mg/kg for 2 days in May-July, i.e., at a time when the enzyme activity in the liver of the control rabbits was significantly lower than in the experiment carried out at the beginning of the year.

The activity of HK, G6PDH, and 6PGDH in the EAT of the rabbits was unchanged after repeated injection of hydrocortisone.

Departments of General Pathology and Biochemistry, Institute of Experimental Medicine, Academy of Medical Sciences of the USSR, Leningrad. (Presented by Academician of the Academy of Medical Sciences of the USSR P. N. Vesilkin). Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 78, No. 11, pp. 57-59, November, 1974. Original article submitted October 12, 1973.

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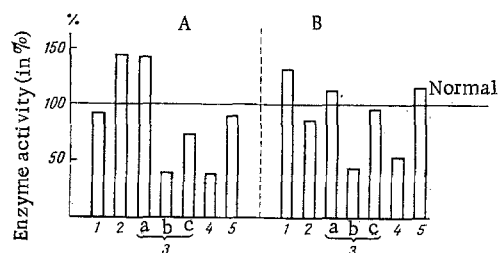


Fig. 1. Effect of hydrocortisone on G6PDH activity in the rabbit liver: A) Calculated in $\mu\text{moles/g tissue/h}$; B) calculated in $\mu\text{moles/mg protein/h}$. Control taken as 100%; 1) 17 h after injection of the hormone in a dose of 5 mg/kg (4 experiments); 2) dose 10 mg/kg (two experiments); 3) dose 25 mg/kg; a) after 4 h (four experiments); b) after 12 h (four experiments); c) after 17 h (two experiments); 4) hydrocortisone injected repeatedly in doses of 25 or 50 mg/kg in January-April (7 experiments); 5) the same in May-July (six experiments).

Inhibition of the G6PDH activity in the liver of the rabbits after injection of hydrocortisone in winter and the absence of an effect of injection of the hormone in summer may perhaps be explained by the action of the high air temperature of the animals. The temperature in the animal house at this time was 27-28°C and under these conditions the rabbits are in a state of heat stress. This state could act on rabbits as a stressor activating adrenocortical function, and a relatively high concentration of glucorticoids, depressing the activity of enzymes of glycolysis and the pentose phosphate pathway was present both in the blood and in the tissues. Under those conditions, i.e., when the corticosteroid concentration in the blood stream is already raised, the rabbits were unable to respond adequately to additional loading with the hormone from outside.

LITERATURE CITED

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