



Compensatory Effect of Exogenous Hydrocortisone on Hydrolysis and Absorption of Carbohydrates in Adrenalectomized Animals

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Abstract

The article summarizes current data on the role of hormones of the adrenal glands, the gastrointestinal tract in the regulation of the process of membrane digestion of carbohydrates and concludes that this problem is insufficiently studied and the prospects for its further development for the physiology of the digestive system.

Keywords: Hydrolysis, absorption, adrenal gland, adrenalectomy, hydrocortisone.

Various experimental methods and approaches are used to study the processes of digestion and absorption in the small intestine. Interest in hormones of the adrenal cortex and issues of hormonal regulation of vital processes has increased after the successful use of corticosteroids in inflammatory, allergic diseases, organ transplantation, and postoperative therapy [1].

There are many publications showing a correlation between the functional state of the stomach [2], pancreas [3], intestines [4], and adrenal glands. We investigated the degree of compensation for the processes of hydrolysis and absorption of carbohydrates in the small intestine in adrenalectomized animals with the introduction of hydrocortisone by the latter. Experiments were carried out under in vivo conditions on male Wistar rats (180-200 g). Surgical isolation of the small intestine was performed according to the method described earlier [5]. Then the animals were divided into three groups: sham-operated rats (LEC) (control); adrenalectomized (AEK), treated with injections of hydrocortisone; adrenalectomized treated with saline instead of hydrocortisone (control). The model of adrenal insufficiency was reproduced by bilateral adrenalectomy. For perfusion, glucose (27.5 mmol/L) and maltose (27.5 mmol/L) substrates prepared in Ringer's solution (pH 7.4) were used.



Table 1. Changes in the rate of maltose hydrolysis and absorption of the resulting glucose under the influence of adrenalectomy and with compensatory administration of hydrocortisone, $\mu\text{mol}/\text{min}$ (M+m)

Group of animals	Experiment Days					
	Before AE		5		10	
	hydrolysis	absorption	hydrolysis	absorption	hydrolysis	absorption
LEC	12,4±1,1	9,4±0,9	9,7±1,2	8,9±0,9	12,7±1,4	9,2±1,3
AEC	12,4±0,9*	9,6±0,7*	8,4±0,9*	7,3±0,8*	7,2±0,8	6,1±0,5
AEC + hydrocortisone	-	-	8,4±0,7*	7,0±0,8	9,6±0,9	8,2±0,9

Group of animals	Experiment Days					
	15		20		30	
	hydrolysis	absorption	hydrolysis	absorption	hydrolysis	absorption
LEC	11,9±1,1	10,0±1,1	12,0±1,2	9,5±1,3	12,0±1,4	8,9±1,1
AEC	6,9±0,8*	5,2±0,9*	10,1±0,9*	8,9±0,7*	9,1±0,7	7,7±0,6
AEC + hydrocortisone	8,9±1,1	7,1±1,2	9,6±1,2*	8,3±0,9	10,1±0,9*	9,0±1,2

Table 2. Change in the rate of glucose absorption under the influence of adrenalectomy and with compensatory administration of hydrocortisone, $\mu\text{mol}/\text{min}$. (M+m).

Group of animals	Experiment Days					
	Before AE	5	10	15	20	30
LEC	9,5±0,5	8,7±0,6	10,2±1,1	9,4±0,7	9,6±0,4	10,4±0,9
AEC	9,6±0,6**	6,2±0,5*	6,7±0,9	7,8±0,9	7,3±0,8	6,9±0,7
AEC + hydrocortisone	-	8,3±0,7*	7,9±0,6	10,3±1,1	10,2±1,1	9,9±1,3

Note. LEC - sham-operated Animals, AEC - adrenalectomized animals, LEC+hydrocortisone - adrenalectomized rats treated with hydrocortisone. * - $P < 0.05$; ** - $P < 0.01$; *** - $P < 0.001$.

The absorption rate was estimated from the loss of substrates from perfusion solutions and expressed in $\mu\text{mol}/\text{min}$. Adrenalectomized rats of the experimental group from the 1st to the 31st day daily every 24 hours were injected subcutaneously with a solution of hydrocortisone in 0.005 N. NaOH at the rate of 0.5 mg/kg body weight, control rats - an equivalent volume of saline. Experimental data were collected on days 5, 10, 15, 20 and 30 after adrenalectomy. On the 5th day after the operation, the indicators of membrane digestion and absorption of carbohydrates decreased in the adrenalectomized animals and remained low until the end of the experiment.

Thus, adrenalectomy in adult animals leads to a pronounced inhibition of hydrolysis and absorption of carbohydrates in the small intestine. The introduction of hydrocortisone contributes significantly to the normal bowel.

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