

SECTION: MEDICAL SCIENCE

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***FEATURES OF THE EFFECT OF HYPERTHERMIA ON EXOCRINE
PANCREATIC SECRETION OF GROWING RATS***

Annotation: Daily effects on growing rats with a high external temperature led to phase changes in the activity of alpha-amylase in pancreatic tissue, the severity of which was different in animals receiving a particular diet. The task of the authors was to identify the specific features of the effect of hyperthermia on the activity of pancreatic enzymes.

Key words: prepubertal, alpha-amylase, thermal exposures, high-carbohydrate, balanced, low-carbohydrate, juvenile, pancreas.

Objective: To identify the peculiarities of the effect of high temperature on the activity of enzymes of various stages of carbohydrate hydrolysis in rats of prepubertal age, who received a diet with an increased and reduced carbohydrate content.

Specific activity of pancreatic alpha-amylase

Daily effects on growing rats with a high external temperature led to phase changes in the activity of alpha-amylase in pancreatic tissue, the severity of which was different in animals receiving a particular diet.

The activity of pancreatic alpha-amylase in rats receiving a balanced diet at the beginning of studies under the influence of high temperature was markedly reduced. On days 4 and 8, it was 38% and 55%, respectively, lower than in animals exposed to heat, but receiving the same diet. Later it sharply increased and on the 15th day of studies it was 4.5 times higher than the level of activity of the enzyme in control animals. By the end of the experimental period, the specific activity of the pancreatic alpha-amylase decreased markedly, but, nevertheless, it was 71% higher than the control level.

Table 1
Specific activity of pancreatic alpha-amylase (mg / g protein) of juvenile rats in the dynamics of their 30-day diet on diets with different amounts of carbohydrates under conditions of thermal exposures

Days of experience	Groups of animals	R A C I O N S		
		Balanced	Low-carb	High-carb
0	Initial	62135± 2800	62135±2800	62135 ± 2800
4	Control An experience	64700 ± 2400	44200± 1300	175500±3300
		40300 ± 5500	33400 ± 3500	66500 ± 12300
8	Control	70900 ± 2500	41700 ± 1400	174000±4000

	An experience	31700± 3800	30600 ± 3100	225400 ±18500
15	Control An experience	70700 ± 2200 317300 ± 10700	53600 ±1100 4700 ± 3600	246200 ± 14500 244000± 15900
30	Control An experience	64300 ± 2600 109900 ± 1800	12800± 1200 11300±1500	131000±5000 39300 ± 2300

In animals kept on a low-carbohydrate diet, in the first days of exposure to high temperature there was an increase in alpha-amylolytic activity of the pancreas. On day 4 of the experiment, it was 21% higher than that of control animals. Subsequently, on day 8 of the studies, the activity of the enzyme in the organ of the experimental animals decreased noticeably and became 27% lower than in rats not exposed to a high external temperature. On the 15th and 30th days of the experiment, the levels of specific activity of alpha-amylase in the pancreas of the experimental and control rats did not differ.

Certain changes in the activity of pancreatic alpha-amylase under the influence of a high external temperature were noted in rats kept on a carbohydrate- rich diet. On day 4, it was 62% lower than in control animals that did not undergo overheating, on the 8th day it increased and exceeded the level of activity in control animals by 30%, then by day 15 decreased to the control level and thereafter, by day 30 experiments, was 70% below control.

Thus, the data suggest that a high external temperature has a marked effect on the activity of pancreatic alpha-amylase in juvenile rats contained on all diets. The first days of the experiment are characterized by a decrease in the specific activity of the enzyme in animals kept in a balanced and high-carbohydrate diet and a slight increase in its level in rats receiving a diet with a low content of polysaccharides. By the end of the studies, alpha-amylolytic activity in rats kept on a balanced diet increased under the influence of a high external temperature, and in animals that were on a high-carbohydrate diet is decreased.

As a result of the fact that a high external temperature has a certain effect on the activity of pancreatic alpha-amylase, the reaction of the pancreas to the applied different food rations changes in animals undergoing hyperthermia. In Fig. the dynamics of alpha-amylase activity during 30 days of dietary application is presented, where the enzyme activity was taken as the initial (100%) on the first day. As can be seen from the figure, in rats receiving a balanced diet, the high external temperature on days 4 and 8, respectively, by 35% and 48% reduces the amylolytic activity of the pancreas. Then, on day 15 of the experiment, it sharply (more than 5 times as compared with the first day) increases, and by the end of the study it decreases, but not to the initial level: and on the 30th day, the activity of the enzyme is 77% higher than the level of the first day.

On a low-carb diet for 4 days of exposure to high temperature, there was also a certain inhibition of amylase activity in the pancreas. On day 8 of the experiment, it decreased significantly and was 50% of the activity level of the first day. Then the amylolytic activity of the gland increased somewhat, but until the end of the studies, the enzyme activity curve in the rats exposed to heat was below the level observed in

the control animals.

In animals that received a diet rich in carbohydrates, a high external temperature led to inhibition of alpha-amylase activity at the beginning of the experiment, as was observed in rats receiving a balanced and low-carb diets. In this group of rats on the 4th day of the experiment the activity of the enzyme remained at the initial level, while in the control animals it increased sharply; Then on the 8th and 15th days it was 262% and 292% higher, respectively, and by the end of the experiment it was reduced to a level equal to 63% of the initial one.

Conclusions: Thus, the results obtained by us indicate that:

1. In pre-pubertal rats, the pancreas clearly adapts to the amount of carbohydrates in the diet. This manifests itself both in a sharp increase in the specific and total activity of amylase in the gland tissue with an excess of starch in food, and a decrease in these parameters with its deficiency.
2. There is a clear correlation between the amount of carbohydrates in the diet and the overall amylolytic activity of the pancreas: in juvenile rats receiving a high-carbohydrate diet, the amylolytic potential of the gland rises sharply, whereas in animals kept on a low-carb diet, it does not increase, despite the increase in gland mass and quantity protein in it.

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