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ON ENZYMATIC ACTIVITY OF PANCREAS

A. Abdusattarov and G. I. Smirnova

Translation of "Vliyaniye ogranicheniya dvizheniya v usloviyakh  
vysokoy temperatury na fermentativnuyu aktivnost' podzheludochnoy zhelezy",  
Uzbekskiy Biologicheskiy Zhurnal, No. 1, 1979, pp 35-37

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16. Abstract Effects of 30-day hypodynamia coupled with high temperature (35-36°C) on enzymatic activity of the pancreas of male adult rats were studied. The test animals were divided into four groups. Group I served as controls (freedom of movement and a temperature of 25-26°C, considered optimal). The remaining animals were divided into three additional groups: Group II--freedom of movement but high temperature (35-36°C); group III--hypodynamia but an optimal temperature; group IV--hypodynamia and 35-36°C. Enzymatic activity in the pancreas of the four groups is shown in the diagram with group I taken as 100%.			
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EFFECT OF RESTRICTED MOTION IN HIGH TEMPERATURE  
ON ENZYMATIC ACTIVITY OF THE PANCREAS

A. Abdusattarov and G. I. Smirnova

In hypodynamia there is a disruption in the functions of the cardio- /35\*\*  
vascular [1], neural-endocrine systems, a change in the level of the water-  
electrolyte, carbohydrate, lipid, protein, and vitamin metabolism [2]. How-  
ever, the function of the digestive organs in this respect has not been  
sufficiently studied, although it is known that in hypodynamia the appetite  
is impaired, heartburn appears, and constipation develops that has a  
stable nature. K. V. Smirnov et al. [2] demonstrated that in people in  
an immobile state for 49 days an inhibition in the motor-evacuatory activity  
of the stomach is observed, an increase in the acidity of the gastric juices,  
intensification of bile formation, etc.

The problem of studying the functions of the digestive organs during  
hypodynamia acquires especial importance in conditions of a hot climate which

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leaves a certain imprint on the course of gastro-intestinal diseases induced by different extremum factors [4,5].

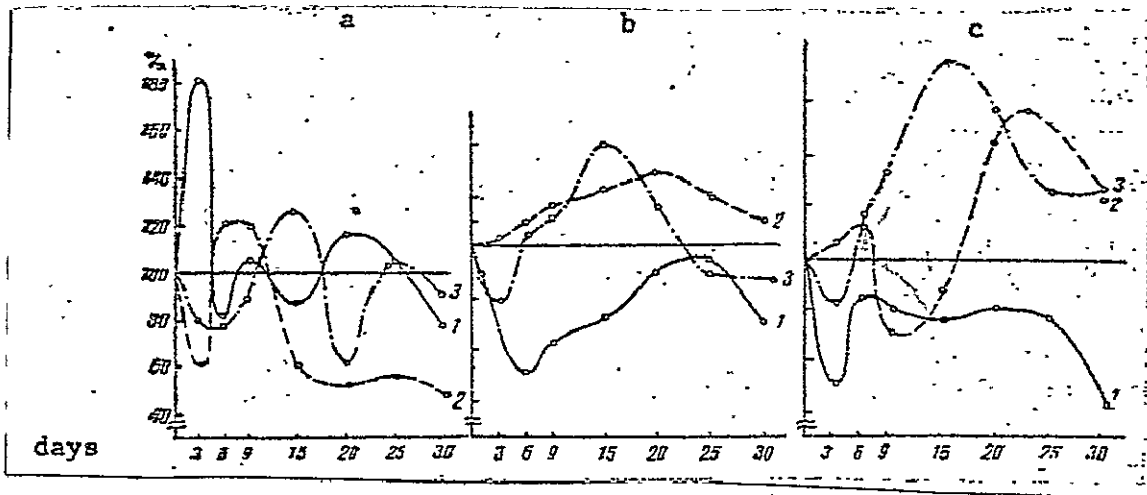
We studied the effect of 30-day restricted movement on the enzymatic activity of the pancreas in model experiments which were done on four groups of adult male rats of the Wistar strain.

The first group had free movement under conditions of the optimal temperature (25-26°); the second--free movement, but under conditions of high temperature (35-36°); third--in specially designed cages that strongly restrict the movement with the optimal temperature), and the fourth--with restricted movement in combination with high temperature (35-36°).

The animals were killed on the third, sixth, ninth, 15th, 20th and 25th and 30th days of the experiment, and in the homogenate of the pancreas an analysis was made of the amylolytic [6], lipolytic [7] and proteolytic [8] activity computed for 1 g of dry tissue weight. In the period of the experiment all the animals were kept on the same standard ration without restriction of drinking.

The experiments demonstrated that during the 30 days of observations each of the employed factors (heat, hypodynamia and hypodynamia + heat) results in a considerable change in the enzymatic activity as compared to the control, taken as 100%. Thus, the amylolytic activity (figure, a) with chronic thermal effect sharply rose by the third day of the experiment dropped to the level below the control by the sixth day, and further revealed phase shifts. During hypodynamia, on the contrary, it dropped in the beginning of the experiment, somewhat increased by the 6-9th day, and again dropped in the subsequent periods. Hypodynamia in combination with the thermal resulted in a longer reduction (up to the ninth day) in the enzymatic activity with subsequent phase shifts..

A clearer pattern was revealed in the lipolytic activity (figure, b).. /36  
With the thermal factor it was sharply reduced on the sixth day, gradually rose, reached the control level on the 20-23rd day, and again dropped by the end of the experiment. Hypodynamia with the optimal temperature resulted



Effect of 30-Day Stay under Conditions of High Temperature (1), Hypodynamia (2) and Hypodynamia in Combination with High Temperature (3) on Amylolytic (a), Lipolytic (b) and Proteolytic (c) Activity of Pancreas

in a slow increase in lipolytic activity up to the 20th day with a gradual decrease to the control amounts by the 30th day. Under conditions of hypodynamia in combination with high temperature the enzymatic activity initially was reduced, by the 15th day it gradually reached the level considerably higher than the control, with a subsequent decrease in the later periods of study.

The proteolytic activity (figure, c) under conditions of the thermal effect was characterized by a fairly great reduction from the beginning to the end of the 30-day observations. During hypodynamia without the effect of high temperature the activity of the enzyme up to the sixth day was insignificantly altered, somewhat dropped by the ninth day, progressively rose up to the 25th and had a certain tendency to decrease (towards the control) by the 30th day. Hypodynamia in combination with the thermal effects somewhat decreased the enzymatic activity by the third day with subsequent stable increase, reaching the maximum level in the middle of the observations.

The cited results indicate that adaptation of the organism to the thermal factor and restricted movement is accompanied by a considerable change in the enzymatic spectrum of the pancreas. With the combined

effect of these two stresses under conditions of the adaptation of the organism especially sharp shifts occur in the enzymatic activity. One can hypothesize that depending on the type of stress and the degree of its severity for the organism different stages of the stress reactions do not occur with the same rate, and the metabolism of carbohydrates, lipids and proteins is altered in different ways which is reflected in the nature of the shifts of the enzymatic systems of the pancreas responsible for the initial stages of hydrolysis of the main food components.

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