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THE ENZYME SPECTRUM OF THE SMALL INTESTINE WITH HYPODYNAMIA UNDER CONDITIONS OF HIGH TEMPERATURE

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Translation of "Fermentnyi spektp tonkoi kishki pri gipodinamii v usloviyakh vysokoi temperatury",
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16. Abstract

This is a report on a study of the influence of hypodynamia on the functioning of various body organs and systems. The methodology used and the results obtained are discussed in detail.

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The enzyme spectrum of the small intestine with hypodynamia under conditions of high temperature

It has been established that limiting motor activity affects human health. In persons who lead a sedentary form of life the appearance of ischemic heart disease, hypertonia, dysfunction of the gastrointestinal tract and so forth is possible (1).

Experiments on animals show that when movement is limited changes occur in secretion of pancreatic juice and the digestive-absorbtive activity of the small intestine(2). In connection with this the study of the influence of hypodynamia on the functioning of various organs and systems seems timely. Research on this question is particularly interesting in conditions of high temperature, which itself leads to impairment of the motor-evacuatory and absorbtive functions of digestive organs (3).

We studied the influence of hypodynamia in high temperature conditions on the enzyme spectrum of the mucous membrane of the small intestine of rats, and simultaneously identified several specifically intestinal enzymes.

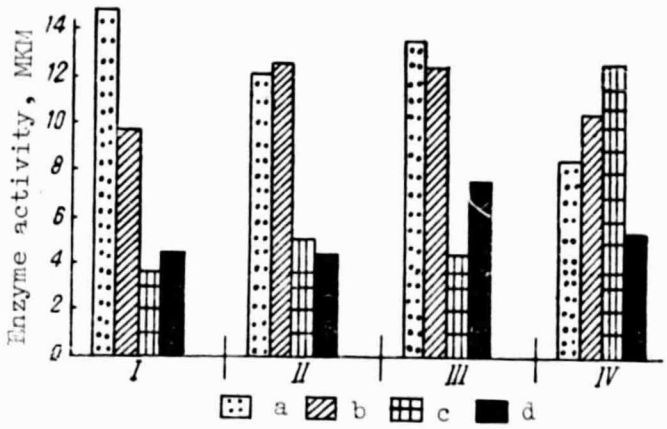
Experiments were carried out on 24 male rats of the Vistar strain. The animals were divided into control (6 individuals) and test (18 individuals) groups. The control group was kept at room temperature with unlimited standard feed. The test group was divided in turn into three subgroups: the first group was kept in individual

cages at a high temperature with unlimited movement; the second was kept at room temperature in special cages that sharply limited the animals' freedom of movement; and the third group was kept in the same hypodynamic conditions, but at a high temperature (35-36° C). On the 20th day of the experiment all of the animals were killed, and in the mucous membrane, which was taken from the entire surface of the small intestine (excluding the duodenum), invertase, dipeptide hydrolase, and monoglyceride lipase activity were determined by the photocalorimetric method worked out by A.M. Ugolev and colleagues (4), and alkali-phosphatase activity was determined according to Fiske and Subborw (5).

The results of the research showed that the heat factor led to variously-directed change in the activity of certain enzymes in the mucous membrane of the small intestine, and promoted deviation of the enzyme spectrum from the norm (figure). Invertase activity in these conditions decreased slightly, dipeptidase activity increased, and monoglyceride lipase and alkali-phosphatase activities did not change. Under conditions of hypodynamia at normal temperatures, invertase activity remained at nearly the same level, and dipeptidease, monoglyceride lipase and alkali-phosphatase activities slightly increased. With hypodynamia at a high temperature invertase activity fell very sharply, dipeptidease activity did not change, and monoglyceride lipase activity increased rather sharply, while alkali-phosphatase activity changed negligibly.

It should be noted that the effects indicated were also evident in the body mass of the animals. During the 20-day period it increased in the control animals by 18%, in those kept at high temperature without hypodynamia it increased by 22%, with hypodynamia at normal temperature it remained at the original level, and with hypodynamia in combination with high temperature it decreased by 28%.

Figure



Changes in invertase (a), dipeptidease (b), monoglyceride lipase (c), alkali-phosphatase (d) activity in the small intestine of animals kept under various conditions.
I control II heat III hypodynamia IV heat + hypodynamia

Thus, high temperature and hypodynamia are factors influencing the enzyme spectrum of the small intestine and the body mass of animals. When they act conjointly on the organism specific damage to enzyme activities is observed, which obviously should be taken into consideration when formulating scientifically based feeding rations under conditions of limited mobility and high temperature.

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