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SECRETION AND HOMEOSTASIS OF ENZYMES OF THE PANCREAS IN CABBAGE FORMATION IN POSTNATAL ONTOGENESIS

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Abstract: Hydrolytic enzymes such as α-amylase, lipase, trypsin, chymotrypsin, and pepsin are specialized hydrolases that break down macromolecules - carbohydrates, lipids, and proteins - in the digestive tract. These enzymes are produced by the exocrine cells of the enterocytes of saliva, the stomach, pancreas, and small intestine, and are secreted into the lumen of the digestive tract to carry out their catalytic activity. Many researchers note that under normal conditions, these enzymes are present in the blood in small quantities, but at a stable concentration, and a sharp increase in digestive enzymes occurs in pathologies such as acute and chronic pancreatitis, obstruction of the excretory duct of the glands, gastrocephalus reflex, or damage to the intestinal mucosa [7, 8, 9, 10, 11].

This indicates the existence of complex mechanisms in the body that ensure the transport of enzymes from the digestive glands into the blood and their homeostasis in the blood vessels. As a result of changes in the physiological activity of the glands, depending on the circadian rhythm of the body, food intake, or hunger, the concentration of enzymes in the blood may temporarily increase due to changes in hydrostatic pressure in the glandular duct or changes in neurohumoral regulation of the secretory process. In pathological conditions such as inflammation, apoptosis, or cell necrosis, hypersecretion of enzymes can arise as a result of disruption of the integrity of the excretory duct of the tissue or gland.

Regulation of digestive enzymes in the blood is carried out through a complex of homeostatic mechanisms, including renal and extrarenal removal of enzymes, inactivation in the presence of specific proteases (for example, alpha-1-antitrypsin), regulation of the secretory activity of glands [3].

In addition to the diagnostic significance of enzymes in the blood, their participation in such metabolic processes as regulation of blood metabolism and ensuring systemic homeostasis deserves attention. The study of the mechanisms of their circulation in the body has interdisciplinary significance, uniting such areas of science as the physiology of the digestive system, biochemistry, molecular biology, and clinical medicine, and contributing to the improvement of the diagnosis of diseases of the gastrointestinal tract, including the early detection of pancreatitis, cholecystitis, or intestinal obstruction[2].

During postnatal ontogenesis, age-related changes in enzymes secreted by the digestive glands and their activity in the blood can occur due to the stabilization of metabolism and the formation of the digestive tract. Changes in enzyme homeostasis in the elderly are caused by involution in the body.

Studying the age dependence of enzymatic activity facilitates the diagnosis of pathologies such as pancreatitis, myocardial infarction, or oncological diseases, and also allows for the

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identification of subclinical pathologies, contributing to the development of individual approaches to prevention and treatment.

Purpose of studying: to study the formation of pancreatic enzyme secretion and homeostasis in rats of different ages.

Experimental methods on animals: The experiments were conducted on white, outbred, male rats of different ages in the institute's vivarium. Rats were controlled at birth, fed feed containing proteins, fats, and carbohydrates. After reaching a certain age (15 days, 1 month, 1.5 months, 2 months, 3 months, and 4 months), they were decapitated under anesthesia, and the pancreas was isolated from them. The blood released during decapitation was collected. A homogenate was prepared by mixing the glands with physiological saline in a 1:10 ratio. Amylolytic and lipolytic activity, as well as the total protein content in the filtrate and blood serum, were determined by the colorimetric method. Comparing the obtained results with the indicators of 4-month-old adult rats, the formation of the activity of these enzymes in the pancreas and blood in postnatal ontogenesis was analyzed.

Analysis of the obtained results. The obtained results are reflected in Table 1. In the experiment, white, outbred, male rats aged 15 days to 4 months were used. 4-month-old rats were considered mature, the secretory process of the pancreas and enzyme homeostasis were fully formed, therefore we compared the results obtained in other age groups with the indicators of these mature rats.

Table 1

Formation of pancreatic enzyme secretion and their activity in the blood in postnatal ontogenesis

The age of rats	Rat weight	Amylase		Lipase		Total protein	
		The pancreas homogenate	Blood serum	The pancreas homogenate	Blood serum	The pancreas homogenate	Blood serum
15 day old rats	22.4±0.3***	143.3±12.8***	30.4±2.6***	59.0±6.8***	16.4±1.5***	33.8±2.3***	37.6±1.8***
1 month old rats	55,5±3,7***	280,0±25,0***	49.3±2.3***	150.2±18.3**	27.1±2.0***	30.8±4.0***	50.5±1.4***
1,5 month old rats	62.6±1.5***	284.2±16.7***	51.1±4.8***	146.8±10.2**	31.1±1.5***	34.5±3.9***	53.0±3.9***

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2 month old rats	94.7±0.3***	527.0±3.7***	70.6±11.2***	184.3±4.1**	43.3±6.6**	58.2±3.1	58.7±3.7***
3 month old rats	146.3±6.4 79%	909.0±48.9 65%	86.7±3.3	202.5±13.1**	53.3±0.5***	91.8±3.9***	53.5±1.3***
4 month old rats	183.8±2.8	1405.8±127.5	96.1±2.9	262.5±16.1	68.2±1.4	60.8±1.2	73.3±1.4

Note: the difference in the indicator in 4-month-old rats is R=0.001* R=0.01** R=0.05***

One of the indicators of rat maturity is the increase in their body weight and reaching maturity. The weight of the rats in our experiment increased with age and averaged 183.8±2.8 in 4-month-old rats.

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The level of amylolytic activity in the pancreatic tissue and blood serum of 15-day-old rats is different, the activity of this enzyme in the blood is several times less than in the pancreatic tissue. This is natural, as the amylolytic activity in the blood mainly consists of P- and C-amylases synthesized in the pancreas and salivary glands and incorporated into the blood [4, 7, 12, 13]. In experimental animals of this age, the amylolytic activity in the pancreatic tissue and blood is approximately five times lower, while in adult rats, the amylolytic activity in the gland tissue is almost fourteen times higher than in its blood. This is due to the diverse functions of enzymes secreted directly from the gland into the digestive tract and blood.

The enzyme amylase, released into the digestive tract, hydrolyzes carbohydrates contained in food, while amylase in the blood primarily serves as an enzyme depot and circulates in the blood, which can be reclaimed by the digestive glands according to the body's needs. Of course, in the metabolism of an adult organism, carbohydrates are used in large quantities as an energy material, and sufficient carbohydrases are necessary for their assimilation. To meet this need, the synthesis of the amylase enzyme in the digestive glands and its release into the digestive tract increases. Our results show how much the synthesis of the enzyme in the digestive glands increases to meet the need for this enzyme, the amylolytic activity of the pancreas in adult rats is ten times higher than in 15-day-old rats.

To determine the relationship between the amylolytic activity of pancreatic tissue and blood serum, we conducted a correlation analysis of these activities in them (Table 2J) and found that the correlation coefficient was positive and high in rats of all ages.

The second hydrolytic enzyme we studied is lipase, whose activity is significantly lower than the amylolytic activity in pancreatic tissue and blood serum. It can be seen that the lipolytic activity in the pancreatic tissue of mature rats is five times lower than the amylolytic activity,

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and in the blood this indicator is almost one and a half times lower (Table 1). This is due to the different sources of these enzymes in the blood; while lipase is mainly injected from the pancreas [6], amylase is injected from the pancreas (R-amylase) and salivary glands (S-amylase) [1, 5, 6, 7].

Interrelation of pancreatic homogenate and serum enzymes (correlation coefficient r =)

The age of rats	Amylase	Lipase	Total protein
15 day old rats	0.90	0.96	0.96
1 month old rats	0.87	0.95	0.97
1.5 month old rats	0.96	0.83	0.94
2 month old rats	0.91	0.95	0.94
3 month old rats	0.93	0.96	0.93
4 month old rats	0.90	0.99	0.91

The secretion of this enzyme and its activity in the blood increases with age, and as can be seen from Table 1, the lipolytic activity in the pancreatic tissue and blood of 4-month-old mature rats reaches its maximum level.

The conclusion: We also studied changes in the amount of total protein in pancreatic tissue and blood serum in postnatal ontogenesis. If we take the total protein content in the pancreatic tissue and blood serum of adult rats as 100%, then in 15-day-old rats this indicator was 50-55%. Enzymes make up 10-32% of mature rats' blood serum and glandular tissue, since the total protein in the blood consists not only of enzymes, but also of specific blood proteins. The total protein content in the pancreatic tissue of 3-month-old rats was even higher than in 4-month-old experimental animals, which may be a wave in the formation of enzyme synthesis.

Consequently, the secretory activity of the pancreas and the formation of enzymes in the blood of rats in postnatal ontogenesis differ in the context of various enzymes (amylase and lipase).

References

1. Bulgakova V.A. Saliva diagnostics of the level of endogenous and exogenous blood components.: Abstract of Cand. Biol. Sci. (2009). – Krasnodar, 1999. – 17 p.

pISSN:2349-5707 Volume:12,Issue 09,September-2025 eISSN:2349-5715

2. Galanina, A.V. Immunogenetic parameters, changes in clinical and laboratory parameters and their correction in atopic dermatitis in young children: Abstract of Doctor of Medicine (2008). – Kirov: [b. i.], 2008. – 38 p.

3. Kamakin, N.F. Pathways of homeostasis in the blood of hydrolases secreted by the digestive glands, their anabolic regulatory role: Abstract of Doctor of Medicine (2008). – Tomsk: [b. i.], 1985. – 40 p. (28).

4. Korotko, G. F. Digestive gland enzymes in the blood (Essays on enzyme homeostasis) / G. F. Korotko. - Tashkent: Meditsina, 1983. - 212 p.

5. Korotko, G. F. Pancreatic secretion. - Krasnodar: Kuban State Medical University, 2005. - 312 p. (106)

6. Korotko, G. F. Endocretion of enzymes in modulating the activity of the digestive tract // Rus. journal of gastroenterology. hepatology. coloproctology. - 2005. - No. 5. - P. 97-104. (107)

8. Korotko, G. F. Secretion of the salivary glands and elements of saliva diagnostics / G. F. Korotko. – Moscow: Academy of Natural Sciences, 2006. – 192 p.

10..Korotko, G. F. Digestion – a natural technology / G. F. Korotko. – Krasnodar: EDVI, 2010. – 304 p. (44)

11.Korotko, G. F. Recirculation of digestive gland enzymes / G. F. Korotko. – Krasnodar: EDVI, 2011. – 144 p. (48)

12.Korotko, G. F. Signaling and modulating role of digestive gland enzymes / G. F. Korotko // Russian Journal of Gastroenterology, Hepatology, Proctology. – 2011. – V. 21, No. 2. – P. 4–13.(52)

13. Ugolev, A. M. Evolution of digestion and principles of evolution of functions. Elements of modern functionalism / A. M. Ugolev. – Leningrad: Nauka, 1985. – 544 p. (93)

14. Mazo, V. K. Absorption of protein antigens and food allergy / V. K. Mazo // Food Allergies and Food Intolerances / ed. by A. M. Nogaller, I. S. Gushchin, V. K. Mazo, I. V. Gmoshinsky. – Moscow: Meditsina, 2008. – P. 93–117.

15. Rothman, S. S. Passage of proteins through membranes – old assumptions and new perspectives / S. S. Rothman // American Journal of Physiology. – 1980. – Vol. 238, no. 5. – P. G391–G402.