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Effect of experimental toxic anemia on the pancreas

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Abstract - *The decrease in hydrolytic capacity relative to polysaccharides observed in the initial hydrolysis phase of carbohydrates was expressed in the small intestinal secretion of α-amylase in the pancreas, a decrease in enzyme activity in the small intestinal chymus. Chronic exposure to toxicants leads to an increase in pancreatic tissue and enzyme activity in the blood due to a decrease in α-amylase activity in the small intestine. Decreased pancreatic secretion and increased secretion are indicative of pancreatic insufficiency. It was shown the regulator treatment of growing rats by hemotoxicants (phenilhydrasine and lead acetate) resulted to increase of incretion and decrease of secretion of pancreas. These changes take place at the histological destroy of pancreas. These data are shown the toxic anemia stimulates development of pancreatitis in growing rats.*

***Keywords*:** toxic anemia, phenylhydrazine hydrochloride, lead acetate, α-amylase, blood, pancreatic tissue, small intestine chymus.

1.INTRODUCTION

It is known that the increase of anemia is due to environmental pollution. Anemia is more common in people living in man-made contaminated and other environmentally unstable areas, especially in children under 3 years of age and women of reproductive age [3]. Many xenobiotics are widespread in environmentally polluted areas due to their negative effects on erythropoiesis and the high sensitivity of children to exogenous factors. Due to the fact that soil, water and air ecotoxicants in Karakalpakstan and Khorezm region exceed the permissible norms, almost half of preschool children suffer from various types of anemia [1].

2. THE MAIN FINDINGS AND RESULTS

Most of the ecotoxicants that cause or exacerbate anemia are contained in agricultural chemicals, industrial wastes, exhaust gases, and medicinal substances that enter the digestive tract through nutrients and water through trophic chains and directly affect the hydrolytic and transport systems of the digestive tract. Therefore, the study of the morphofunctional properties of the digestive tract, which is the main protective barrier of most hemolytic substances entering the gastrointestinal tract, is of scientific and practical importance.

Today, it is recognized by all experts that the change of one chain in any functional system in the body directly or indirectly affects other functional chains. The release of some elements in the functional system from the system that maintains the stability of the internal environment leads to a state of pathology in other organs [2].

The aim of the study – chronic peroral administration of phenylhydrazine hydrochloride and lead acetates revealed pancreatic α-amylase activity in pancreatic tissue (synthesis and accumulation), small intestinal chymus (secretion), and blood (inclusion), i.e., some homeostatic

parameters of α-amylase involved in the initial hydrolysis of carbohydrates and the histostructure of the pancreas were studied.

3.MATERIALS AND METODS

In the experiments, non-pedigree rats bred in the vivarium of the National University of Uzbekistan were used. The rats were not restricted in feeding and drinking water. The animal feed consisted of standard food, which was stored at room temperature and in natural light.

To produce toxic anemia, hemolytic substances phenylhydrazine hydrochloride and lead acetate were given perorally in relatively small doses (5 mg / kg for both hemotoxicants) daily from the first day of postnatal life for up to 48 days.

Pancreatic α-amylase activity was determined by the A.M.Ugolev (1969) method [7].

The results were processed using Excel program. Here arithmetic mean (M), mean deviation index (± m) and statistical reliability index (P) were calculated. When P <0,05 the results were considered as statistically reliable.

4.RESULTS AND ANALYSIS

The initial stages of hydrolysis of carbohydrates were determined by the activity of α-amylase in pancreatic tissue (synthesis and concentration of enzymes in tissue) in the small intestine chymus (pancreatic secretion) and blood (pancreatic incretion), i.e., in the initial hydrolysis of carbohydrates were analyzed. Data on the chronic effects of hemolytic substances on the activity of α-amylase in pancreatic tissue, small intestine chymus and blood are given in Table 1.

Activity of α-amylase in pancreatic tissue. In 12-day-old rats administered phenylhydrazine perorally, enzyme activity in pancreatic tissue was found to be 1.9-fold higher than in control rats, while enzyme activity was recorded in control sizes at 48-day-old rats. Under the influence of lead acetate, enzyme activity in pancreatic tissue was increased 1.7-fold and 1.2-fold in 12-day and 48-day-old rats, respectively.

Activity of α-amylase in small intestinal chymus. Enzyme activity was observed at control levels in 12- and 48-day-old growing rats under the influence of phenylhydrazine. As a result of oral administration of lead acetate, enzyme activity was also recorded at control levels in 12-day-old rats, while secretion decreased in 48-day-old animals, a decrease of 27.3% relative to control sizes.

Table -1: Effect of chronic give of hemolytic substances to growing rats on pancreatic tissue, small intestine chymus, and α-amylase activity in blood (M ± m; n = 6-7)

Given substances	Pancreatic tissue (g/min/g/protein)	%	Small intestine chymus (mg/min/ml)	%	Blood (mg/min/ml)	%
a 12-day period						
0,9% NaCl	10,6±1,1	100,0	82,3±6,3	100	0,5±0,03	100
$C_6H_8N_2$*HCl	19,8±1,2	186,8	80,3±6,1	97,6	0,8±0,06	160,0
$Pb(CH_3COO)_2$	17,6±1,1	166,0	79,3±5,2	96,3	0,7±0,05	140,0
P_1	<0,001		>0,5		<0,001	
P_2	<0,001		>0,5		<0,002	
a 48-day period						
0,9% NaCl	99,9±5,8	100	101,4±9,1	100,0	2,1±0,2	100,0
$C_6H_8N_2$*HCl	99,6±6,1	99,7	82,7±4,7	81,5	2,9±0,3	138,1
$Pb(CH_3COO)_2$	119,4±4,7	119,5	73,3±3,6	72,3	2,9±0,2	138,1
P_1	>0,5		<0,05		<0,02	
P_2	<0,02		<0,02		<0,02	

Activity of α-amylase in blood. The activity of α-amylase in the blood was significantly lower than in other trials. In response to the two hemolytic substances being tested, his reaction was observed to varying degrees. In 12-day-old animals administered phenylhydrazine perorally, the activity of the enzyme α-amylase in the blood increased by 1.2 times compared to control values, while in 48-day-old rats, the enzyme activity increased by 38.1% under the influence of exogenous phenylhydrazine. In animals given exogenous lead acetate perorally daily, enzyme activity in the blood of 12- and 48-day-old rats was found to increase by 40% and 38.1%, respectively.

Thus, a specific response is observed in the pancreas on repeated exposure to hemolytic substances. Chronic delivery of hemotoxins leads to increased α-amylase activity in organ tissue and a decrease in enzyme secretion at the end of the observation. The inclusion of α-amylase is observed only in animals treated with lead acetate. Decreased secretion and increased incretion are indicative of the development of pathological processes in the pancreas.

Histological images of the pancreas under control, phenylhydrazine hydrochloride, and lead acetate were shown in Figure 1.

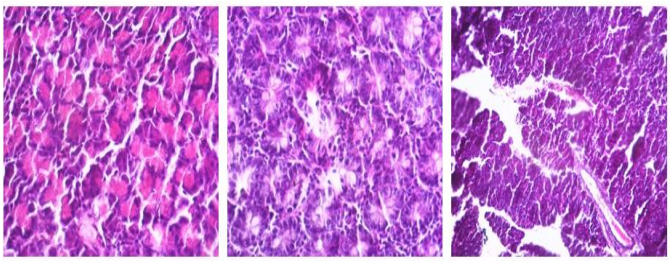

Fig -1: Effect of repeated administration of hemolytic substances on the microstructure of the pancreas. Dye - hematoxylin eosin (x400, microscope DN-300M)

As can be seen from the picture, in the control group rats, the pancreatic acinus is separated from each other by reticular fibers. In growing rats given phenylhydrazine hydrochloride orally, tumors are observed due to edema of the acinus in the pancreatic tissue, i.e., accumulation of sap. Under the influence of lead acetate, the structural structure of the pancreas is lost, agglomeration of cells and the opening of gaps between the acinus structures.

Hence, chronic peroral give of phenylhydrazine hydrochloride and lead acetate, which have a hemolytic effect, leads to a shift from the normal state of histological structures in the pancreas. Structural shifts in pancreatic tissue are more pronounced in lead acetate than in phenylhydrazine.

5.CONCLUSIONS

The α-amylase enzyme is usually secreted into the duodenal cavity through the pancreatic ducts after a bite enters the digestive tract. In pancreatitis, diabetes, pancreatic cancer and other diseases, the amount of α-amylase in the blood increases sharply. A-amylase can pass into the blood through venous capillaries, lymph flow and, in some pathological cases, through the peritoneal tract [5]. Experimental results show that the homeostasis of α-amylase activity in biological systems changes under the influence of hemolytic drugs, especially lead acetate. The specific effect of lead acetate in this case (decreased secretion and increased secretion in the pancreas) may be due to the accumulation of heavy metal-binding metallothionines in the body [8], vacuolization of organelles, tissue necrosis and other causes. Activation of lipid peroxidation oxidation processes in pancreatic cells and organelle membranes under the influence of hemolytic toxicants also disrupts the secretory activity of organs [6]. Increased intracranial pressure (increased α-amylase activity in the hemocirculation) and decreased secretion of amylase in the duodenum due to blockage of organic matter clots in the excretory tract of pancreatic juice, destruction of lipids in the membrane of acinar pancreatic cells and other causes decrease in activity) is observed in various pancreatitis [4]. When hemolytic substances such as phenylhydrazine hydrochloride and especially lead acetate are administered, pancreatitis-specific shifts are observed in the pancreatic tissue.

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