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Influence of the Physiology of Intestinal Digestion on the Oral Cavity

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Annotation. Inorganic substances are represented by chlorides of sodium, potassium, calcium, magnesium, sulfates and phosphates. The main feature of the inorganic composition of pancreatic juice is a high concentration of bicarbonates, which create a pH of 7.5–8.8. Such an alkaline reaction ensures the neutralization of the acidic gastric chyme, the termination of the action of gastric pepsins and the creation of optimal conditions for the action of enzymes.pancreatic and intestinal juices. Organic substances are represented by enzymes. In the pancreatic juice contains all groups of enzymes that can carry out hydrolysis and proteins, and fats, and carbohydrates.

Keywords. Proton pump inhibitors, esomeprazole, cytoprotector, rebamipid, preepithelial

The duodenum is called the central link of digestion. Acid gastric chyme that has entered the intestine under the influence of digestive juice is alkalized, which creates an optimal environment for further hydrolysis of nutrients.

Three digestive juices are secreted into the duodenal cavity: pancreatic, intestinal and bile. pancreatic juice.

The exocrine elements of the pancreas secrete pancreatic juice, which is secreted through the ducts into the duodenal cavity. 1.5–2.5 liters of juice is formed per day. Composition of pancreatic juice: 99% - water, 1% - dry residue.

The dry residue consists of inorganic and organic substances.

Pancreatic juice is a colorless transparent liquid.The main proteolytic enzymes that break down proteins are trypsinogen and chymotrypsinogen (as well as carboxypolypeptidase and elastase), which are secreted as proenzymes. Trypsinogen under the influence of entero-kinase (a proteolytic enzyme of the intestinal juice of the duodenum 12) is converted into an active form - trypsin. Chymotrypsinogen under the influence trypsin is converted to chymotrypsin. Trypsin also activates other proteolytic enzymes.

The main amylolytic enzyme that hydrolyzes carbohydrates is pancreatic α-amylase. This enzyme hydrolyzes polysaccharides to disaccharides (amylose, maltose) and dextrins. breakdown of starch, started in the oral cavity and stomach is vigorously continued by the pancreatic α-amylase and ends with intestinal disaccharidases.

The main lipolytic enzyme in the pancreas that breaks down fats is pancreatic lipase. In an adult, lipid hydrolysis begins in the duodenum. Pancreatic lipase is secreted in an active form. The hydrolysis of fats is also facilitated by bile, which emulsifies them. Reducing the size of fat droplets increases the affinity of the enzyme for the substrate, as a result, lipolysis is accelerated.

The composition of pancreatic juice also contains ribo- and deoxyribonuclease, but the role of these enzymes in digestion is small. regulation of pancreatic secretion.

The secretion of pancreatic juice, like gastric juice, proceeds in three phases.

1. Cerebral - increased pancreatic secretion in response to conditioned reflex stimuli and unconditioned reflex mucosal irritations oral cavity ingested food.

2. Gastric - an increase in pancreatic secretion in response to irritation of the receptors of the stomach with its contents.

3. Intestinal (main) - an increase in pancreatic secretion in response to the entry of chyme into the duodenum.

The regulation of pancreatic juice production is carried out by nervous (reflex) and humoral mechanisms. Composition and amount of secret depends on the amount and composition of the food.

The main secretory nerve of the pancreas is the vagus nerve. During a meal, the tone of the nuclei of the

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vagus nerves reflexively increases, which leads to an increase in the secretion of juice. Sympathetic fibers of the splanchnic nerves, on the contrary, inhibit pancreatic secretion.

The secretion of pancreatic juice also increases reflexively during the evacuation of acidic gastric chyme into the duodenum.

The main humoral stimulators of pancreatic secretion are gastrointestinal hormones: gastrin increases sap secretion, secretin, VIP (vasoactive intestinal peptide) - increase the production of bicarbonates and water in the composition of the juice, CCK-PZ - increases the formation of pancreatic enzymes.

Pancreatic secretion is also increased by serotonin, insulin, bombesin, bile salts, hydrochloric acid. Inhibits - glucagon, somatostatin, substance P, enkephalins, calcitonin.

Bile.

Bile is formed in hepatocytes continuously, because. is a product of metabolism. It is finally formed as digestive juice in the bile ducts and is deposited in the gallbladder, from where through the bile ducts duct is secreted into the duodenum. Approximately 0.5–1.5 liters of bile is formed per day. It is a golden liquid.

Bile composition: 95–97% water and 3–5% solids. The dry residue contains inorganic and organic substances.

Inorganic substances are represented by sodium, potassium, calcium ions, chlorine. But the most important inorganic component of bile is bicarbonate, which creates an alkaline reaction in bile - pH 7.3–8.

The main organic components of bile are: bile acids, bile pigments, cholesterol, fatty acids, inorganic salts, lecithin.

It should be noted that the composition of cystic bile differs from that of the liver. In the gallbladder, water and salts are absorbed, so gallbladder bile is more viscous, dark and thick. The dry residue in it is up to 20%. To bile mucus of the bile ducts and bladder is added. The pH decreases to 6.5–6.8.

The value of bile:

1) emulsifies fats, increasing their surface for hydrolysis by lipase;
2) increases the activity of pancreatic and intestinal enzymes;
3) neutralizes acidic gastric chyme;
4) inactivates pepsins;
5) promotes the absorption of fat-soluble vitamins, amino acids, cholesterol, calcium salts;
6) participates in parietal digestion, facilitating the fixation of enzymes on the intestinal microvilli;
7) enhances intestinal motility;
8) stimulates bile formation and bile secretion: bile acids in the small intestine, they are absorbed into the blood, through the portal vein they reach the liver and again participate in choleresis and cholekinesis (the intestinal-hepatic circulation of bile acids is 6–10 cycles per day);
9) inhibits the development of pathogenic flora, prevents putrefactive processes in the intestine. regulation of bile synthesis.

As noted earlier, bile formation (choleresis) occurs continuously in the liver. Bile excretion (cholekinesis) is associated with food intake. The intensity of bile formation and bile excretion directly depend on the diet. Strong stimulants are milk, meat, bread, eggs yolks, butter.

As for the nervous regulation, the parasympathetic fibers of the vagus nerves increase choleresis and cholekinesis, while the sympathetic ones depress.

Humoral stimulants are secretin, bile acids, gastrin, CCK-PZ, the latter becoming the main one.

Digestion in the small intestine

The small intestine is the main chemical reactor of the digestive tract. Here, abdominal and parietal digestion occurs, which complete the hydrolysis of nutrients, followed by absorption of products. hydrolysis into blood and lymph. Digestion is the hydrolysis of nutrients digestive juice enzymes. Digestion provides hydrolysis of 50% carbohydrates and 10% proteins, resulting in the formation of oligomers from polymers.

Parietal digestion is carried out on the villi and microvilli of the mucous membrane of the small intestine. The outer surface of their plasma membrane is covered with glycocalyx - mucopolysaccharide filaments on which enzymes of pancreatic and intestinal juices are adsorbed, hydrolyzing oligomers to dimers.

Intestinal juice is produced by the glands of the mucous membrane of the thin intestines throughout. 2.5 liters of intestinal juice are produced per day.

It is a cloudy viscous liquid.

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The composition of the intestinal juice: 98% water and 2% solids. In the dry residue, inorganic and organic substances are distinguished.

Inorganic substances are represented by chlorides, bicarbonates, phosphates, sodium, potassium, calcium ions, which create an alkaline reaction (pH 7.2–7.5), and with increased secretion to 8.6–9.3.

Organic substances are represented by proteins, amino acids, urea, uric acid. There are more than 20 different enzymes in the intestinal juice, involved in intestinal digestion: proteases, peptidases, nucleases, amino-, dipeptidases, lipases, phospholipases, amylase, maltase, lactase, enterokinase, etc. Intestinal juice also contains mucus produced goblet cells, which forms a protective layer and protects mucous membrane from injury regulation of intestinal secretion.

Along with the nervous and humoral mechanisms of regulation of intestinal secretion, the leading role belongs to local mechanisms.

Excitation of the parasympathetic fibers of the vagus nerves increases the production of enzymes in the small intestine, without affecting the amount of discharge juice. Excitation of sympathetic nerve fibers, on the contrary, reduces intestinal secretion. Humoral regulation - duocrinin and enterocrinin, produced in mucous membrane of the small intestine, VIP, motilin, hormones of the adrenal cortex (cortisol and deoxycorticosterone) stimulate the secretion of intestinal juice, and somatostatin has an inhibitory effect.

Local regulatory mechanisms are associated with mechanical stimulation mucous membrane of the small intestine with chyme, which causes an increase in secretiontion of the liquid part of the juice, and the impact of the products of digestion of nutrients, contributes to the increased production of intestinal juice enzymes.

Motor function of the small intestine.

Motility of the small intestine promotes hydrolysis and absorption of nutrients. It occurs as a result of coordinated contractions circular and longitudinal layers of muscles that form the intestinal wall.

1. Peristaltic contractions are a simultaneous contraction of the longitudinal and annular muscles that spreads along the intestine in waves. Contraction of the circular muscles of the proximal area intestine promotes the chyme into a simultaneously expanded due to longitudinal muscles of the distal portion of the intestine. Thus, peristaltic contractions contribute to the movement of chyme in the distal direction. At the same time they move along the intestine several peristaltic waves. Their speed is 0.2–2 cm/s. Most often, peristatic waves originate in the duodenum at the time of evacuation gastric contents.

2. Rhythmic segmentation occurs as a result of simultaneous contraction of the circular muscles in several adjacent sections of the intestine, followed by their relaxation, and contraction of the muscles of the following sections, previously were in a relaxed state. Rhythmic segmentation separates intestine into segments, contributing to the rubbing of chyme and mixing it with digestive juices.

3. Tonic contractions are local in nature or spread at a very low speed. Tonic contractions are due the initial basal tone of the smooth muscles of the intestine. They narrow the gap intestines, compress chyme, and thereby increase intra-intestinal pressure.

4. Pendulum contractions occur as a result of successive contraction of the longitudinal and annular muscles of the intestine, which moves content back and forth. This type of contraction mixes the chyme with the digestive juices. Regulation of motility of the small intestine. Motility of the small intestine is regulated by myogenic, nervous and humoral mechanisms. Myogenic mechanisms are fundamental and nervous and humoral mechanisms are superimposed on them. Smooth muscle the cells that form the muscular membrane of the intestinal wall are capable of automaticity, and their adequate stimulus for contraction is the stretching of the contents, i.e. chyme.

A large role belongs to local reflex reactions associated with the activity of the metasympathetic division of the ANS. Parasympathetic influences predominantly increase peristalsis small intestine, and sympathetic - inhibit.

There is a law of reflex regulation of motor activity of the gastrointestinal tract (“gut law”): adequate irritation of any part of the gastrointestinal tract, i.e. its overflow with chyme causes an increase in the motor-evacuation activity of the underlying departments and at the same time inhibits the motility of the upstream ones.

Humoral factors: serotonin, motilin, gastrin, CCK-PZ, histamine, vasopressin, oxytocin, substance P, bradykinin increase motility small intestine, and secretin, VIP - inhibit.

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