SECRETIONS OF THE DIGESTIVE SYSTEM

Mucus

Mucus is secreted by mucous glands in every part of the gastrointestinal (GI) tract. The functions of mucus are to protect the lining of the tract from digestive juices, lubricate the food bolus for easier passage, promote adherence of the fecal mass, and neutralize acids and bases.

Saliva

Saliva consists of mucus and salivary amylase. It is produced by the salivary glands and totals about 1000 mL daily. Saliva has a slightly acidic to neutral pH (6 to 7); it lubricates the food bolus and starts starch digestion.

Gastric Juice

Gastric juice consists of mucus, digestive enzymes, hydrochloric acid, and electrolytes. The gastric glands secrete about 2000 mL of highly acidic (pH of 1 to 3) gastric juice daily. Secretion varies according to time of day, the time and type of food intake, psychological states, and other metabolic activities of the body. It is highest in the evening and lowest in the early morning. Secretion is stimulated by the parasympathetic nervous system (by the vagus nerve), the hormone gastrin, the presence of food in the mouth, and seeing, smelling, or thinking about food.

The major digestive enzyme in gastric juice is pepsin, a proteolytic enzyme (named before the "ase" system of naming enzymes) that functions best at a pH of 2 to 3. Hydrochloric acid provides the acid medium to promote pepsin activity. The major function of gastric juice is to begin digestion of proteins. There is also a weak action on fats by gastric lipase and on carbohydrates by gastric amylase. A large amount of mucus is secreted in the stomach to protect the stomach wall from the proteolytic action of pepsin. When mucus is not secreted, gastric ulceration occurs within hours.

Pancreatic Juices

Pancreatic juices are alkaline (pH 8 or above) secretions that contain amylase for carbohydrate digestion, lipase for fat digestion, and trypsin and chymotrypsin for protein digestion. They also contain large amounts of sodium bicarbonate, a base (alkali) that neutralizes the acid chyme from the stomach by reacting with hydrochloric acid. This protects the mucosa of the small intestine from the digestive properties of gastric juice. The daily amount of pancreatic secretion is about 1200 mL. The hormone cholecystokinin stimulates secretion of pancreatic juices.

Bile

Bile is an alkaline (pH about 8) secretion that is formed continuously in the liver, carried to the gallbladder by the bile ducts, and stored there. The hormone cholecystokinin causes the gallbladder to contract and release bile into the small intestine when fats are present in intestinal contents. The liver secretes about 600 mL of bile daily. This amount is concentrated to the 50- to 60-mL capacity of the gallbladder. Bile contains bile salts, cholesterol, bilirubin, fatty acids, and electrolytes. Bile salts are required for digestion and absorption of fats, including fat-soluble vitamins. Most of the bile salts are reabsorbed and reused by the liver (enterohepatic recirculation); some are excreted in feces.

EFFECTS OF DRUGS ON THE DIGESTIVE SYSTEM

The digestive system and drug therapy have a reciprocal relationship. Many common symptoms (ie, nausea, vomiting, constipation, diarrhea, abdominal pain) relate to GI dysfunction. These symptoms may result from a disorder in the digestive system, disorders in other body systems, or drug therapy. Many GI symptoms and disorders alter the ingestion, dissolution, absorption, and metabolism of drugs. Drugs may be administered to relieve these symptoms and disorders, but drugs administered for conditions unrelated to the digestive system may cause such symptoms and disorders. GI conditions may alter responses to drug therapy.

Drugs used in digestive disorders primarily alter GI secretion, absorption, or motility. They may act systemically or locally in the GI tract. The drug groups included in this section are drugs used for acid-peptic disorders, laxatives, antidiarrheals, and antiemetics. Other drug groups used in GI disorders include cholinergics (see Chap. 20), anticholinergics (see Chap. 21), corticosteroids (see Chap. 24), and antiinfective drugs (see Section VI).

Review and Application Exercises

1. What is the main function of the GI system?
2. What is the role of the parasympathetic nervous system in GI function?
3. List factors affecting GI motility and secretions.
4. Describe important GI secretions and their functions.
5. What factors stimulate or inhibit GI secretions?
6. How does the GI tract affect oral medications?
7. How do oral medications affect the GI tract?

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