The Digestive System

Key Concepts

Absorption: The passage of digestive end products from the gastrointestinal tract into the blood or lymph.

Chylomicrons: Small fat droplets that are covered with a protein coat in the epithelial cells of the mucosa of the small intestine.

Chyme: The semifluid mixture of food and gastric juice that leaves the stomach through the pyloric sphincter.

Mesentery: Extensions of peritoneum that are associated with the intestine.

Peristalsis: Rhythmic contractions of the intestines that move food along the digestive tract.

Plicae circulars: Circular folds in the mucosa and submucosa of the small intestines=.

Rugae: Longitudinal folds in the mucosa of the stomach.

Functions of the Digestive System

The digestive system prepares nutrients for utilization by the cells of the body.

Activities of the digestive system – ingestion, mechanical digestion, chemical digestive, mixing and propelling movements, absorption, and elimination of waste products.

General Structure of the Digestive Tract

Mouth, Pharynx, and Esophagus

The wall of the digestive tract consists of a mucosa, submucosa, muscular layer, and an outer adventitia (above diaphragm) or serosa (below the diaphragm).

The lips and cheeks are muscles covered with epithelium and lined with mucous membrane. The palate is the roof of the mouth. The anterior portion is supported by bone; the posterior portion is muscle and connective tissue.

The tongue is composed of skeletal muscle. The dorsal surface is covered with papillae, some contains taste buds. The tongue manipulates food in the mouth, contains sensory receptors for taste, and is used in speech.

The primary teeth are the deciduous teeth that fall out and are replaced by the secondary or permanent teeth. There are 20 teeth in the complete primary set and 32 teeth in the complete secondary set. The incisors have sharp edges for biting; cuspids have points for grasping and tearing; bicuspids and molars have flat surfaces for grinding. Each tooth has a crown, a neck, and a root. Enamel is the protective layers the covers the crown.
The pharynx is the passage way that transports food to the esophagus. It is divided into the nasopharnyx, oropharnyx, and laryngopharynx.

The esophagus is posterior to the trachea and anterior to the vertebral column. The lower esophageal splincter controls the passage of food into the stomach.

The parotid, submandibular, and the sublingual glands secrete saliva, which contains the enzyme amylase, water, and mucus. The parotid glands are anterior and inferior to the ear; the submandibular glands are along the medial surface of the mandible; and the sublingual glands are under the tongue.

Saliva moistens food, dissolves substances for taste, and begins digestion of carbohydrates.

Stomach

The stomach is divided into a fundus, cardiac region, body, and pyloric region and has a greater curvature and a lesser curvature.

The mucosal lining has folds called rugae, and there are three layers of smooth muscle in the wall.

Mucous cells secrete mucus; parietal cells secrete hydrochloric acid and intristic factor; chief cells secrete pepsinogen; and endocrine cells secrete gastrin.

The regulation of gastric secretions is divided into cephalic, gastric, and intestinal phases. Thoughts and smells of food start the cephalic phase; the presence of food in the stomach initiates the gastric phase; and the presence of acid chime in the small intestine starts the intestinal phase.

Relaxation of the pyloric sphincter allows chime to pass from the stomach into the small intestine. The rate at which stomach emptying occurs depends on the nature of the chime and the receptivity of the small intestine.

Small Intestine (digestion and absorption)

The absorptive surface area of the small intestine is increased by the plicae ciculares, villi, and microvilli. Each villus contains a blood capillary network and a lymph capillary called a lacteal.

The small intestine is divided into the duodenum, jejunum, and ileum. The duodenum has mucous glands in the submucosa; the jejunum has numerous, long villi; and the ileum has a large number of goblet cells.

Cells in the small intestine produce peptidase, which act on proteins; maltase, sucrose, and lactase, which act on disaccharides; and lipase, which acts on neutral fats.

The small intestine produces two hormones, secretin and cholecystokinin. Secretin stimulates the pancreas and cholecystokinin stimulates the gallbladder and digestive enzymes from the pancreas.

The presence of chime in the duodenum stimulates intestinal secretions.

Large Intestine

The mucosa of the large intestine does not have villi, but has a large number of goblet cells. The longitudinal muscle layer is limited to three bands called teniae coli.

The large intestine consists of the cecum, colon, rectum, and anal canal. The colon is divided into the ascending colon on the right side, transverse colon across the anterior abdomen, descending colon on the left, and sigmoid colon across the pelvic brim.

It functions to absorb water and electrolytes and the elimination of feces.

Chemical Digestion

Carbohydrates are first broken down into disaccharides by amylase. Disaccharides are then broken down into monosaccharides by sucrose, maltase, and lactase. The end products of carbohydrate digestion are the monosaccharides glucose, fructose, and galactose.

Pepsin and trypsin break proteins into shorter chains called peptides. Peptidase breaks peptides into amino acids. The end products of protein digestion are amino acids.

Fats are broken down by bile and lipase acts on those and breaks them down into monoglycerides and free fatty acids are the end products of lipid digestion.