

Chapter 15 Digestion and Nutrition

Digestive System:

Digestion refers to the mechanical and chemical breakdown of foods so that nutrients can be absorbed by cells. The digestive system consists of the _____ canal, through which the food passes, and the accessory organs that aid in digestion. List the accessory organs of the digestive system.

Wall of alimentary canal: The wall of the alimentary canal consists of the same four layers throughout its length, with only slight variations according to the functions of specific sections of the canal.

The inner layer is the _____ that is lined with _____ attached to connective tissue. It protects tissues of the canal and carries on secretion and absorption.

The next layer is the _____ which is made up of _____ connective tissue containing blood and lymph vessels and nerves; it nourishes the surrounding layers of the canal.

The _____ layer consists of inner _____ fibers and outer longitudinal fibers that propel food through the canal.

The outer layer, or _____, is composed of visceral peritoneum that protects underlying tissues and secretes _____ fluid to keep the canal from sticking to other tissues in the abdominal cavity.

Movements of the tube: The motor functions of the alimentary canal are of two types: _____ movements and _____ movements.

The former movements occur when smooth muscles contract rhythmically in small sections of the tube.

The latter movements include a wavelike motion called _____, which is caused by contraction behind a mass of food as relaxation allows the mass to enter the next segment of the tube.

Mouth:

The mouth is the first portion of the alimentary canal; It functions to receive food and begins _____ digestion by mastication. _____ form the lateral walls of the mouth.

The _____ are highly mobile structures that surround the mouth opening.

What is their function?

Tongue and teeth: The tongue is a thick, muscular organ covered by _____ membrane with taste _____ within _____; It is attached to the floor of the mouth by the _____.

Two sets of teeth develop in sockets within the alveolar processes. How many primary teeth are there? How many secondary?

What is the function of the teeth?

Different teeth are adapted to handle food in different ways, and include incisors, cuspids, bicuspids,

and molars. Each tooth consists of a crown and a root. The surface of teeth are covered with _____ while the bulk of the tooth beneath is made of _____. The central cavity is called the _____ cavity.

A tooth is held tight in its socket by a _____ ligament.

Palate: The palate forms the roof of the oral cavity and has an anterior _____ palate and posterior _____ palate.

The latter and a flap called the _____ function to close off the nasal cavity during swallowing.

Tonsils: Associated with the palate in the back of the mouth are _____ tonsils, which because they are _____ tissue, help to protect the body against infection.

Another lymphatic tissue mass, _____ tonsils (adenoids), are located on the posterior wall of the pharynx, above the border of the soft palate.

_____ tonsils are lymphatic tissues located at the root of the tongue.

Salivary glands: The salivary glands secrete _____, which moistens and dissolves food particles, binds them together, allows tasting, helps to cleanse the mouth and teeth, and begins _____ digestion.

Salivary glands contain _____ cells that produce a watery fluid with an enzyme called _____, and _____ cells that produce lubricating and binding fluid.

Salivary glands receive parasympathetic stimulation that triggers the production of a large volume of saliva at the _____ or _____ of food.

The _____ glands, lying in front of the ear, are the largest of the major salivary glands; they secrete a clear, watery fluid rich in amylase.

The _____ glands, located on the floor of the mouth, secrete a more viscous fluid.

The _____ glands, inferior to the tongue, are the smallest of the major salivary glands and secrete saliva that is thick and stringy.

Pharynx:

The pharynx is a cavity lying behind the mouth. It functions in both the _____ and _____ systems.

The pharynx connects the nasal and oral cavities with the larynx and esophagus and is divided into a _____ (top portion), _____ (middle portion), and _____ (bottom portion).

Swallowing mechanism: Swallowing reflexes can be divided into three stages.

Food is mixed with saliva and voluntarily forced into the _____ with the tongue.

Sensory receptors here sense food, which triggers swallowing _____.

In the third stage of swallowing, _____ transports the food in the esophagus to the _____.

Esophagus:

Mucous glands are scattered throughout the _____ of the esophagus and produce mucus to moisten and lubricate the inner lining of the tube.

The lower _____ sphincter helps to prevent regurgitation of the stomach contents into the esophagus.

Stomach:

The stomach is a J-shaped muscular organ that uses gastric juices to begin _____ digestion.

The stomach is divided into cardiac, fundic, body, and pyloric regions and a pyloric canal. Be able to identify and locate these parts.

A _____ sphincter controls release of food from the stomach into the small intestine.

Gastric secretions and functions: _____ glands within the mucosa of the stomach open as _____ pits. These glands generally contain three types of secretory cells.

_____ cells produce thick fluid that protects the stomach lining.

_____ cells secrete pepsinogen, which is activated when it comes in contact with _____ acid. The active form of pepsinogen is _____.

_____ cells secrete this acid.

Other components of gastric juice include _____ factor, required for vitamin B₁₂ absorption from the small intestine.

Gastric Absorption : The stomach absorbs only small quantities of water and certain _____, alcohol, and some lipid-soluble _____.

Mixing and Emptying Actions: Following a meal, mixing actions of the stomach turn the food into _____ and pass it toward the pyloric region using _____ waves.

What factors regulate the rate of stomach emptying?

Regulation of Gastric Secretions:

Gastric secretions are enhanced by parasympathetic impulses and the hormone _____, which is released from gastric glands.

As more food enters the small intestine, secretion of gastric juice from the stomach wall is reflexly inhibited.

Presence of fats and proteins in the upper small intestine causes the release of _____ from the _____ wall, which also decreases gastric mobility.

Pancreas:

The pancreas has an _____ function of producing pancreatic juice that aids digestion.

The cells that produce pancreatic juice, called pancreatic _____ cells, make up the bulk of the pancreas.

These pancreatic cells cluster around tiny tubes that merge to form larger ones, and then give rise to the _____ duct.

The pancreatic and _____ ducts join and empty into the small intestine, which is regulated by the _____ sphincter.

Secretions and functions of the pancreas: Pancreatic juice contains enzymes that digest what type of macromolecules? List the pancreatic enzymes.

Protein-digesting enzymes are released in an _____ form and are activated upon reaching the small intestine.

Regulation of Pancreatic Secretion: The nervous and endocrine systems regulate release of pancreatic juice. The hormone _____ from the duodenum stimulates the release of pancreatic juice with a high bicarbonate ion concentration but few digestive enzymes.

_____ from the wall of the small intestine stimulates the release of pancreatic juice with abundant digestive enzymes.

Liver:

The reddish-brown liver, located in the upper _____ quadrant of the abdominal cavity, is the body's largest internal organ.

The liver is divided into right and left _____, and is enclosed by a fibrous capsule.

Each lobe is separated into _____ lobules consisting of _____ cells radiating from a central vein.

Hepatic _____ separate groups of hepatic cells.

Blood from the hepatic _____ vein carries blood rich in nutrients to the liver.

_____ cells carry on phagocytosis in the liver.

Secretions from hepatic cells are collected in _____ canals that converge to become hepatic ducts and finally form the _____ duct.

Bile: Bile is a yellowish-green liquid that _____ cells secrete; it includes water, bile salts, bile pigments, cholesterol, and electrolytes. Bile pigments are breakdown products from _____ blood cells.

Only the bile _____ have a digestive function.

Liver functions: The liver carries on many diverse functions for the body.

The liver is responsible for the metabolism of many chemicals, such as _____, _____ and _____.

The liver also stores glycogen, vitamins _____, _____ and _____, iron, and blood.

The liver filters the _____, removing damaged red blood cells and foreign substances, and removes _____.

The liver's role in digestion is to secrete _____.

Gallbladder:

It is connected to the _____ duct, which joins the hepatic duct; these two ducts merge to form the _____ duct leading to the duodenum. A sphincter muscle controls the release of bile from the common bile duct.

Function and regulation: Bile does not normally enter the duodenum until _____ stimulates the gallbladder to contract.

The _____ sphincter remains contracted unless a peristaltic wave approaches it, at which time it relaxes and a squirt of bile enters the duodenum.

Bile salts emulsify _____ into smaller droplets and aid in the absorption of fatty acids, cholesterol, and certain _____.

Small Intestine:

The lengthy small intestine receives secretions from the accessory organs: _____ and _____. It completes digestion of the nutrients in chyme, absorbs the products of digestion, and transports the remaining residues to the _____ intestine.

The small intestine consists of what three parts?

The _____ is the shortest and most fixed portion of the small intestine; the rest is mobile and lies free in the _____ cavity.

The small intestine is suspended from the posterior abdominal wall by a double-layered fold of peritoneum called _____.

Structure of the small intestinal wall: The inner wall of the small intestine is lined with finger-like intestinal _____, which greatly increase the surface area available for _____ and aid in mixing actions.

Each _____ contains a core of connective tissue housing blood capillaries and a lymphatic capillary called a _____. Between the bases of adjacent villi are tubular intestinal glands.

Functions of small intestine: Cells that secrete mucus in the small intestine include _____ cells, which are abundant throughout the mucosa.

Intestinal glands at the bases of the villi secrete large amounts of watery fluid that carry digestive products into the villi. Epithelial cells of the mucosa have embedded digestive enzymes on their tiny hairlike _____. What are these enzymes?

Regulation of Small Intestinal Secretions: Mechanical and chemical stimulation from chyme causes goblet cells to secrete mucus. Distention of the intestinal wall stimulates _____ reflexes that stimulate secretions from the small intestine.

Absorption in the small intestine: The small intestine is the major site of absorption within the alimentary canal.

Simple sugars called _____ are absorbed by the villi through active transport or _____ diffusion and enter _____ capillaries.

Building blocks of proteins, _____ acids are absorbed into the villi by active transport and are carried away in the _____.

Fatty acids are absorbed and transported differently than the other nutrients. Fatty acid molecules _____ into the cell membranes of the villi. The _____ of the cells reconstruct the lipids. These lipids collect in clusters that become encased in protein, called _____.

These clusters are carried away in _____ until they eventually join the bloodstream.

The intestinal villi also absorb water, by _____, and electrolytes, by _____.

Large Intestine:

The large intestine absorbs _____ and _____ and forms and stores _____.

The large intestine consists of the _____ (pouch at the beginning of the large intestine), _____ (ascending, transverse, descending, and sigmoid regions), the _____, and the _____ canal.

The anal canal opens to the outside as the anus; it is guarded by an involuntary _____ sphincter and a voluntary external _____ muscle.

Structure of the large intestinal wall: The large intestinal wall has the same four layers found in other areas of the alimentary canal, but lacks many of the features of the small intestinal mucosa such as villi.

Fibers of longitudinal muscle are arranged in _____ that extend the entire length of the colon, creating a series of pouches called _____.

Functions of the large intestine: The large intestine does not digest or absorb nutrients, but it does secrete mucus. The large intestine contains important _____ that synthesize vitamins and use cellulose.

_____ are composed of undigested material, water, electrolytes, mucus, and bacteria. Both their color and odor is due to the action of bacteria.

Nutrients:

_____ is the process by which the body takes in and uses nutrients.

_____ nutrients are those that cannot be synthesized by human cells.

Carbohydrates:

Carbohydrates, such as sugars and starches, are organic compounds used for sources of _____ in the diet. Carbohydrates are ingested in a variety of forms, list some of these forms.

During digestion, complex carbohydrates are broken down into _____, which can be absorbed by the body.

_____ is a complex carbohydrate that cannot be digested, but provides bulk (fiber), facilitating the movement of food through the intestine.

Carbohydrate utilization: The monosaccharides that are absorbed in the small intestine are fructose, galactose, and glucose; The liver converts them all into _____. Excess glucose is stored as _____ in the liver or is converted into _____ and stored in adipose tissue. Certain body cells (neurons) need a continuous supply of glucose to survive; If glucose is scarce, _____ may be converted to glucose.

Carbohydrate requirements: The need for carbohydrates varies with a person's _____ requirements; The minimum requirement is unknown.

Lipids:

Lipids are organic substances that supply _____ for cellular processes and to build structures. The most common dietary lipids are _____.

Lipids include _____, _____ for cell membranes, and _____.

_____ are found in plant- and animal-based foods. Where are saturated fats found? Unsaturated fats? Cholesterol?

Lipid utilization: Digestion breaks down _____ into fatty acids and _____.

The _____ and adipose tissue control triglyceride metabolism that has many steps.

The _____ can convert fatty acids from one form to another, but it cannot synthesize the _____ fatty acids that must be obtained from the diet.

The _____ controls circulating lipids and cholesterol. Excessive lipids are stored in _____ tissue.

Proteins:

Proteins are polymers of _____ acids with a wide variety of functions in cells and in the body. List these functions.

Animal sources of protein contain _____ proteins, which contain all _____ amino acids.

Plant sources of protein are missing one or more essential amino acids making them _____ proteins that should be consumed in combinations.

Protein requirements: Protein requirements vary according to body size, _____ rate, and _____ requirements.

For the average adult, nutritionists recommend _____ grams of protein per day per kilogram of body weight; pregnant and nursing women need more.

Vitamins:

Vitamins are organic compounds required in small amounts for normal metabolic processes, and are not produced by cells in adequate amounts. Vitamins are classified as _____-soluble (vitamins A, D, E, and K) or _____-soluble (B vitamins and vitamin C).

Fat-Soluble Vitamins: Fats-soluble vitamins dissolve in fats and are influenced by some of the factors that influence lipid absorption. Fat-soluble vitamins are stored in moderate quantities in the body and are usually not destroyed by cooking or processing foods.

What are the functions of the 4 fat soluble vitamins?

Water-Soluble Vitamins: Water-soluble vitamins, including the B vitamins and vitamin C, are necessary for normal cellular _____ in the oxidation of carbohydrates, lipids, and proteins.

Vitamin _____ (ascorbic acid) is needed for the production of _____, the metabolism of certain _____, and the conversion of folacin into folic acid.

What are the functions of the B vitamins?

Minerals:

Dietary minerals are derived from the soil and are essential in human metabolism. Minerals are responsible for _____% of body weight, and are concentrated in the _____ and _____.

Minerals may be incorporated into organic molecules or inorganic compounds, while others are free ions.

Minerals comprise parts of the structural materials in all body cells, where they may also be portions of _____; They contribute to the _____ pressure of body fluids and play roles in conduction of _____, _____ contraction, _____ of blood, and maintenance of _____.

Major Minerals: _____ and _____ account for 75% by weight of the minerals, and are thus called major minerals.

What are the other major minerals?

Trace Minerals: Trace elements are essential nutrients needed only in minute amounts, each making up less than 0.005% of adult body weight. List them.

Adequate Diets:

An adequate diet provides sufficient energy as well as adequate supplies of essential nutrients to support growth, repair, and maintenance of tissues.

_____ is poor nutrition that results either from a lack of essential nutrients or a failure to utilize them; It may result from under nutrition or over nutrition.