Chapter 27 Digestive System

1. All animals are heterotrophs and need organic molecules as food. We need food to get nutrients and energy.

2. Cnidarians and flat worms have incomplete digestive system with one opening mouth. Actually this cavity acts as a gastovascular cavity and serves as both digestive and vascular system.

3. Round worms evolved complete digestive system with both mouth and anus.

4. Most animals including humans have an alimentary canal and associated glands.

5. Humans have alimentary canal with: mouth → mouth cavity → pharynx → esophagus → stomach → duodenum → small intestine → large intestine → anus. The associated glands are salivary glands, liver, and pancreas.

6. 4-stages of food-processing: Fig 27.18 Ingestion is the eating of food by an animal. Digestion is mechanical (chewing and churning) and chemical (hydrolase enzymes) breakdown of food. The polymers like starch, proteins, and nucleic acids are broken down to monomers like glucose, amino acids and nucleotides. Bigger molecules like fats are broken into fatty acids and glycerol. Absorption is entry of food from alimentary canal into blood. Elimination is removal of undigested food from anus in the form feces.

7. Digestion in oral cavity: Salivary glands add saliva to lubricate and bind the food in mouth cavity. Saliva has Amylase enzyme and starts digestion of Starch.

   --- salivary amylase
   Starch------------------------- ---------\rightarrow Maltose (sugar)

8. Pharynx: Both food pipe = esophagus and wind pipe = trachea open in Pharynx. Air from the nasal cavity enters trachea. A ball of food from oral cavity is swallowed into esophagus. During swallowing of food epiglottis covers the glottis, the opening of trachea. Uvula a free hanging part of Palate blocks the internal opening of nasal cavity.

9. Digestion in Stomach: Gastric glands secrete HCl (hydrochloric acid) and enzyme Pepsin and change food into Chyme an acidic semi-fluid. Hydrochloric Acid kills bacteria in food and activates the enzyme pepsin. Pepsin starts the Protein Digestion in stomach.

10. Liver: is the largest gland in body. It stores its waste bile in Gall Bladder. Bile is released into duodenum and helps in digestion of fats. Liver secretion, bile, does not have any enzymes in it. Liver absorbs excess glucose from blood and release it back when needed.

11. Pancreas: is the 2nd largest gland in human body. It secretes pancreatic juice into duodenum. The juice changes the acidic food from stomach into slightly basic food. It is very rich in
digestive enzymes and help in digestion of starch, fats, proteins and nucleic acids. Pancreas also secretes 2 hormones Insulin and Glucagon that control the amount of glucose in blood.

12. **Small Intestine**: has a large number of multi-cellular finger like projections called Villi to increase the surface area for absorption. Each cell lining the villi has cell membrane outfoldings called Microvilli that also increase surface area for absorption. Small Intestine is the major site for absorption of nutrients and water. Besides duodenum, jejunum and ileum form small intestine. Digestion of Fats and Nucleic Acids starts in small intestine.

13. **Large Intestine**: A broader Colon is the main part of large intestine and absorbs water to make feces solid. A small caecum with vermiform appendix is present near the beginning of colon. The last part of large intestine is Rectum and leads to anus and outside. Elimination of feces from anus is called defecation.

14. **Eating disorders**: Anorexia is self starvation to keep already underweight body more thinly. Bulimia is the behavior pattern of alternate binge eating and purging the body by induced vomiting etc. Malnutrition is deficiency of one or more nutrients mostly essential amino acids or vitamins. Obesity is having too much weight for particular height. It increases the risk of heart attack, diabetes, and cancer. Page 500

15. **Balanced Diet**: A diet having all the required nutrients in correct ratio is the balanced diet. It varies from person to person. Most of calories should come from carbohydrates and it should include good share of fruits and vegetables. It should include high carbohydrate, moderate protein but low fat foods.

16. **Vitamins**: are different substances which our body cannot make from other nutrients. These are needed in very small quantity and most of them act as Co-enzymes. Water soluble vitamins include B-complex (8 different vitamins) and Vitamin C (ascorbic acid). B-complex vitamins are used either in breakdown of food inside cells or synthesis of important molecules like amino acids, fats and nucleic acids. Vitamin C is needed for healthy membranes, blood vessels and immune responses. Its deficiency causes Scurvy. The symptoms include bleeding gums and weak bones. Fat soluble vitamins include vitamin A, D, E and K. Vitamin A is needed for vision and its deficiency causes Night Blindness. Vitamin D helps in absorption and deposit of Calcium in bones. Table 27.1