**Lecture 19 – Digestive System**

In this lecture, you will learn why animals eat and how food is digested.

* Animal’s diet must supply:

1. (Chemical fuel for cellular respiration)

- This is fundamentally important because all cells need fuel.

Glucose example) **C6H12O6** + 6 O2 🡪 6 CO2 + 6 H2O + Energy (ATP + heat)

1. (organic building blocks)

- Carbon-based macromolecules necessary for development and maintenance

- Examples include carbohydrates, fat, proteins, and nucleic acids

1. (essential nutrients (can’t survive without it, can’t be synthesized))

- Required materials that cannot be synthesized

* 1. Essential Amino Acids
     + Animals need all 20 amino acids, but only 10 can be synthesized from diet
     + The rest must be obtained from food in prefabricated forms (which makes these essential)
  2. Essential Fatty Acids
     + Only two known for humans (Alpha-linolenic acid and linoleic acid)
  3. Essential Vitamins
     + Organic molecules required in small amounts
     + 13 essential to human
  4. Essential Minerals
     + calcium (Ca), phosphorous (P), sulfur (S), potassium (K), chlorine (Cl), sodium (Na), Magnesium (Mg), etc.
* Animals have diverse dietary requirements

1. (herbivores) eat plants or algae.

Examples:

1. (carnivores) eat other animals.

Examples:

1. (omnivores) eat both plants/algae and other animals.

Examples:

* Anatomy reflects diverse dietary requirements in animals.

You need to understand why there are differences in the digestive system between a carnivore and an herbivore. Look up Figure 41.17 (p. 890) if unclear.

* Phylogenetic perspective: Animal digestive system evolved from single opening to two openings.
  1. Early animals such as Cnidaria have only one opening in the digestive system (mouth = anus) and this is called the ().
  2. Animals that belong to Deuterostomia, Lophotrochozoa, and Ecdysozoa have two openings in the digestive system (mouth and anus) and this is called the

(Complete digestive tract  **or** alimentary canal).

* There are four main stages of food processing:

(Ingestion) 🡪 (Digestion) 🡪 (Absorption) 🡪 (Elimination)

Ingestion – take in food

Digestion – breaking down food

Absorption – body takes in nutrients

Elimination – defecate (poopy)

* You need to know the name and function of every organ involved in the human digestive system. You also need to know how food travels through the digestive system from mouth to anus. Be familiarized with Figure 41.9 (p. 883).

1. Mouth:
2. Salivary glands:
3. Esophagus:
4. Stomach:
5. Liver:
6. Gall-bladder:
7. Pancreas:
8. Small intestine:
9. Large intestine:
10. Rectum:
11. Anus:

* Some terms to know:
  + Sphincter: ring-like valves at junctions between specialized compartments
  + Peristalsis: alternating waves of contraction and relaxation in the smooth muscles lining the alimentary canal
  + Saliva: contains amylase (chemical digestion of starch) and mucin (lubricant)
  + **Epiglottis:** prevents food from entering the trachea
  + **Mastication –** chewing food
  + **Saliva –** amylase(chemical digestion of starch) mucin (lubricant)
  + Pepsin: enzyme produced in the stomach, breaks down protein, maximum activity at pH 2.0
  + Bile: chemical produced by liver; stored in gall bladder; break down fat
  + Pancreatic juice: multi-functional; rich in bicarbonate (neutralize acids); contains various enzymes for digesting carbohydrates, proteins, nucleic acids, and lipids
  + Villi & microvilli: finger-like projections in the inner lining of intestines; increase surface area, maximizing nutrient absorption
* A good summary of chemical digestion in the human digestive system is found in Figure 41.12 (p. 886). You need know which organic compounds are digested in which organ.