DIGESTION
DIGESTION

- General function
  - Ingestion & breakdown of complex organic matter for use in metabolic process of the body
    - Ingestion
    - Mechanical & chemical digestion
    - Nutrient absorption
    - Elimination of remaining undigested materials
Categories of Digestive Systems

- Incomplete vs. complete
  - Gastrovascular cavity
  - Gastrointestinal tract
Quick Quiz: Advantages of a tube-shaped digestive tract include…

A) The ability to process more than one meal at a time
B) Specialization of various portions of the digestive system
C) Ability to expel harmful waste products more efficiently
D) A and B only
E) All of the above
Human Digestive System: Oral Cavity

- **Digestive processes**
  - Mechanical digestion
    - Teeth, tongue
  - Chemical digestion
    - Saliva
      - Softening
      - Amylase
        - Starch breakdown

- **Esophagus**
Human Digestive System: Stomach

- Storage
- Digestion processes
  - Mechanical digestion
    - “churn”
  - Chemical digestion
    - HCl & pepsin
- Protein breakdown
Quick Quiz: True or false: Mechanical digestion is done only in the oral cavity.

A) True
B) False
Human Digestive System: Small Intestine

- **Digestive processes**
  - Chemical digestion
    - Lipase
    - Protease
    - Amylase
  - Absorption
- **Segments**
  - Duodenum (~10 ft)
  - Jejunum (~8 ft)
  - Ileum (~12 ft)
Human Digestive System: Small Intestine

- Absorption
  - 3 levels of folding to increase surface area
    - Organ
    - Circular folds
    - Tissue
    - Villi
    - Cell
    - Microvilli
Small Intestine
Small Intestine

- Absorption of nutrients
- Blood
  - Amino acids
  - Monosaccharides
- Lymph
  - Lipids
Quick Quiz: The small intestine uses all of the following enzymes in digestion EXCEPT…

A) Amylase
B) Lipase
C) Protease
D) Nuclease
Human Digestive System: Accessory Organs

- **Liver**
  - Recycles blood cells
  - Detoxification reactions
  - Nutrient & vitamin storage
  - Bile production

- **Gall bladder**
  - Bile storage & concentration
  - Bile = salts + phospholipids + pigment
Human Digestive System: Accessory Organs

- Pancreas
  - Mixed gland
    - Endocrine
      - Hormones
    - Exocrine
      - Digestive enzymes
      - Bicarbonate
Human Digestive System: Large Intestine (Colon)

- Digestive processes
  - Absorption
    - Water
    - Vitamins
  - Waste concentration
Intestinal Function

- Peristalsis

  Contraction of muscles around the intestine cause food to progress through the gut
Intestinal Function

- **Efficiency of digestion**
  - ~9 L daily intake
    - Food, water, saliva, etc.
  - ~8.5 L absorbed by SI
    - Nutrients
  - ~350 ml absorbed by LI
    - Water
  - ~150 g excreted
    - Moist solid
Quick Quiz: The process of alternating muscular contractions which results in movement of digesting food through the intestine is called…

A) Epistasis
B) Peristalsis
C) Parastalsis
D) Cryostasis
Variations in Vertebrate Digestive Systems

- Relate to variations in diet
  - Herbivores
    - Consume plant material only
  - Carnivores
    - Consume flesh of other organisms primarily
  - Omnivores
    - Consume both plants and flesh
Variations in Vertebrate Digestive Systems

- **Birds**
  - Crop
  - Stomach
    - Gizzard
  - Cloaca
Variations in Vertebrate Digestive Systems

- **Ruminant herbivores**
  - E.g., cow, goat, sheep, antelope
  - Large divided 4-chambered stomach
    - Rumen (1\textsuperscript{st} chamber)
      - "Fermentation vat"
      - Bacterial breakdown of cellulose
      - Regurgitate & rechew (cud)
Variations in Vertebrate Digestive Systems

- Non-ruminant herbivores
  - E.g., rabbit, rodents (some), horses
    - Enlarged cecum
    - Coprophagy
Variations in Vertebrate Digestive Systems

- Carnivores
  - Shorter intestines
  - Small cecum
  - Gorging
Quick Quiz: Which of these animals is most likely to have a large cecum and no rumen?

A) Guinea pig  
B) Deer  
C) Penguin  
D) Chimpanzee