

# Chapter 45 & 46

## Digestive System

### Key Concepts

- Animal nutrition
- general principles of digestion and absorption of food
- overview of vertebrate digestive systems
- mechanisms of digestion and absorption in vertebrates

## Intro to nutrition

- nutrient
  - any substance taken in by an organism that is needed for:
    - survival
    - growth
    - development
    - tissue repair
    - or reproduction
- nutrition
  - process of consuming and using food for nutrients
- animals receive nutrients by consuming food

## Dietary categories

- basic similarities in organ system function lead to similarities in nutritional requirements
- different animal physiologies can have different nutrient demands
- Herbivores
  - eat only plants
  - digestive system contains micro-organisms that help digest cellulose

- Carnivores
  - eat only animal flesh or fluid
- Omnivores
  - eat both

## Animals are heterotrophic

- Heterotrophs
  - ingest feeders
- cannot manufacture more food
- require already synthesized organic compounds of plants of other animals to supply materials
  - survival
  - maintenance
  - growth
  - reproduction

## Gut Tracts

Two types

1. Blind Gut
  - no cavity between gut and body wall
  - one opening
  - primitive form
2. tube-within-a-tube
  - flow through digestive tube
  - body cavity between gut and body wall
  - separate opening (mostly)

## Digestion

- the breakdown of large molecules into smaller ones

## Digestive enzymes (hydrolases)

- carbohydrases
- proteases
- lipases

- nucleases

# Food processing in animals

Occurs in Five phases

1. Ingestion
  - food is taken into the body and moves into a digestive
2. digestion
  - food is broken down into smaller molecules
  - chemical and mechanical
3. transport
4. absorption
  - ions, water, and small molecules are transported into the circulatory system
5. egestion
  - undigested materials and other waste are passed from the body
  - elimination or excretion

## Alimentary canal

- digestive tract or tube
  - Gastrointestinal tract
- Five regions of food processing
- Single tube with opening at each end
- contains smooth muscles in walls
- lined with epithelial cells
  - synthesize and secrete digestive enzymes
  - secrete hormones
  - transport digestive materials
- several specialized regions
  - different structures for different processes
  - storage area

## Structure of GI Tract

- some general structure from midpoint of esophagus, to the anus or cloaca
  - lumen lined by epithelial and glandular cells
  - secretory cells release a protective layer of mucus
  - other cells release hormones
  - glands release enzymes, acids, water, and ions
- Epithelial cells linked by tight junctions and surrounded by layers of tissue made of smooth muscle, neurons, connective tissues, and blood vessels
  - neurons activated by sight and smell of food and presence of food in tract

# Region of Reception

## Buccal cavity

- mouth and accessory structures
- ingestion site and digestion site
- chemical and mechanical
- jaws, teeth, cheek muscles, tongue, and salivary glands (saliva)

## Pharynx

- back of mouth cavity
- point that respiratory and digestive system cross paths

# Region of Conduction

## Esophagus

- tube carrying materials from mouth cavity to the rest of the alimentary canal
- forces/pushes food down
- conducts food from pharynx to stomach
- Peristalsis
  - rhythmic wave-like contractions which propel food forward in the GI tract
- No new digestion here
  - only chemical continuation from buccal cavity

# Region of digestion and storage

## Stomach (mostly)

- saclike organ evolved for storing food
- muscular nature helps break up food
- partial protein digestion
- regulates rate of emptying into small intestine
- Secretions
  - hydrochloric acid
    - kills microbes
    - dissolves particulate matter
    - secreted by parietal cells
  - Pepsinogen
    - converted to pepsin to begin protein digestion
    - secreted by Chief cells
- Epithelium coated with an alkaline mucus
- carbohydrate digestion continues from mouth
- little lipid digestion happens

- lumen (cavity) stomach
  - pepsinogen + HCL -> pepsin (for protein breakdown)

## Region of terminal digestion and absorption

### Small intestine

- near

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