

b. Major Salivary Glands – requires ducts to carry their secretions

- Located some distance from the oral cavity.

- Secretions can be *serous*, *mucous* or *mixed*.

Secretions of Salivary Glands

- Serous cells** – produced watery secretions containing enzymes, ions and small amount of mucin.
- Mucous cells** – produced viscous, stringy secretion called *mucous*.
- Mixed glands** – from minor salivary glands have both mucous and serous glands

Major Salivary Glands and Secretion

- Parotid gland** produces *serous* secretion.
- Mandibular gland** (submandibular, submaxillary) is a *mixed glands*.
- Sublingual gland** secretes *mucous*.

Saliva

- Consist of 97-99.5%, thus hypo osmotic
- Contains sodium, potassium, chloride, bicarbonate and phosphate (all of these are electrolytes)
- Slightly acidic: pH 6.75-7

Functions of Saliva

1. Solubilizes food
 2. Provides alkaline buffering fluid
 3. Removes waste
 4. Lubricates and binds
 5. Initiates starch digestion
 6. Assist oral hygiene
 7. Enables evaporative cooling
- 1. Solubilizes food** – dissolves food so they can be tasted and digestive reactions can occur.
 - 2. Provides alkaline buffering and fluids** – bicarbonate and phosphate can neutralize acidic feedstuff.
 - The addition of alkaline fluid via the saliva is particularly important in ruminants.
 - 3. Removes wastes** – urea and uric acid are excreted in the saliva
 - 4. Initiates starch digestion** – amylase in the saliva begins starch digestion.
 - 5. Lubricates and binds**
 - Mucous in the saliva helps bind masticated food so it can be formed into bolus.

- Saliva coat oral cavity and esophagus

6. Assist oral hygiene

- Lysozyme** – (found in saliva) a bacteriostatic enzyme that lyses bacteria, protects the mouth.
- IgA** – attaches to microbes decreasing their ability to penetrate the epithelium.
- Cyanide** – acts as a bactericide
- Defensins** – act as cytokines to attract lymphocytes and neutrophils.
- Lactoferrin** – (bacteriostatic) keeps mouth and teeth protected against infections.

7. Enable evaporative cooling

- Particularly important in dogs which have poorly developed sweat glands.
- Used by cats that preen themselves.
- Avian species that display gular flutter (very rapid but shallow respiration)

Salivary Secretions in:

- Nonruminants:** As secretion of saliva increases, concentration of sodium, bicarbonate and chloride increase while potassium decreases.
- Ruminants:** As saliva production increases, levels of sodium and phosphate in saliva decrease while bicarbonate, chloride and potassium increase.

Salivary glands and Salivation

- Salivary glands continuously secrete saliva keeping the oral cavity moist.
- Presence of food increases salivation (due to parasympathetic n.s stimulation)
- Sight, smell, sound or thought of food can stimulate saliva production, evidenced by

Pavlov Experiment

- Pavlov trained dogs to salivate at the sound of a bell.
- Such salivation helps initiate digestion as soon as food enters the oral cavity.

Ruminant Saliva

- Isotonic, contain high concentrations of bicarbonate and phosphate and high pH
- Acts to buffer acids produced during fermentation in the rumen
- Adult cow produces as much as 100 to 200 L of saliva/day

Tongue

- Maneuvers food mass in the mouth
- Assists movement of food in the esophagus
- Prehension (in ruminants)

Chewing (Mastication)

- A chemical process which includes:
 - a. Grinding of food
 - b. Breaking of food
 - c. Mixing food with saliva

Swallowing (Deglutition)

- a. Moves food from the mouth;
- b. Through the pharynx
- c. Transport food to the stomach

Stages of Swallowing

1. **Voluntary Stage** – bolus moves into the oropharynx
2. **Pharyngeal Stage** – Bolus moves involuntarily through the pharynx to the esophagus
3. **Esophageal Stage** – bolus moves involuntarily through the esophagus to the stomach.



Fig. 17.12. Swallowing. During swallowing, the tongue forces the bolus into the oropharynx, thus raising the soft palate and closing off the nasopharynx. Then, the larynx rises, allowing the epiglottis to cover the glottis, directing the bolus to the esophagus while preventing its entry into the larynx. Once in the esophagus, the bolus is moved to the stomach by peristaltic waves. (Figure modified from Pasquini et al., 1995.)

Esophagus

- Collapsible muscular tube lying behind the trachea
- In many species of birds, upper portion is expanded to form the crop
 - Crop stores food in some species (pigeons)
 - Produces secretion (crop milk) that is used to feed the young.

Pharynx and Esophagus

- Propels mass of food (bolus) forward by peristalsis

- Gastrointestinal sphincter regulates passage of food to the stomach preventing reflux out of the stomach.
 - Sphincters prevent large volumes of air from entering and regurgitation
 - Excessive gas leads to burping/belching (eructation)

Functions of Stomach

1. Filling, storing, mixing* and emptying* (*occur by peristalsis)
2. Mechanical breakdown of ingested food
3. Disruption of chemical bonds of food through the action of acids and enzymes
4. Production of intrinsic factor required for Vitamin B12 absorption from the small intestine (IF deficiency leads to pernicious anemia)

Stomach

- **Regions:**
 - a. **Cardia.** the smallest region, located near the heart. This region contains numerous mucous glands that help protect the esophagus from the acids and enzymes of the stomach.
 - b. **Fundus.** act as a blind-ended sac.
 - c. **Body.** the largest region, functions as a mixing tank for the stomach, and it is the site where most acid and enzyme secretion occurs.
 - d. **Pyloric region.** The pyloric region is the caudalmost portion of the stomach.
- **Monogastric animals** have single, simple stomach; J-shaped
- **Ruminants** have complex stomach consists of 4 chambers
- **True stomach** is the area that produces hydrochloric acid

Gastric Glands

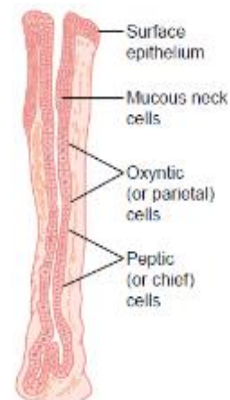


Figure 64-4

Oxyntic gland from the body of the stomach.