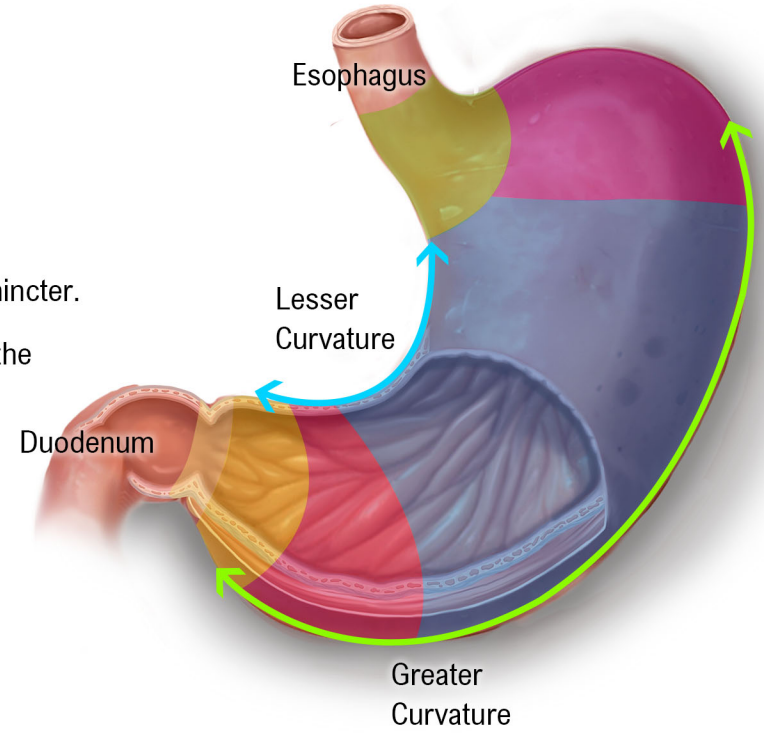
TOPIC: THE STOMACH

Gross Anatomy of the Stomach

My **CAR** is **FUN**, but the **BODY** is a **PYL** of junk

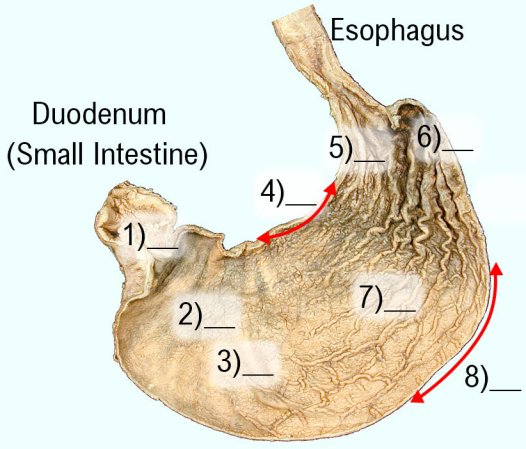
- Regions of the stomach:
  - **Cardia:** _____ portion: near the junction with the esophagus.
  - **Fundus:** _____ of the stomach.
  - **Body (Corpus):** main _____ shaped region.
  - **Pyloric Part:** from Greek for _____.
    - **Pyloric antrum:** connected to the _____.
    - **Pyloric canal:** _____ section before the sphincter.
    - **Pyloric sphincter:** _____ that separates the stomach from the duodenum.
- **Rugae:** inner folds in an _____ stomach.
- Curvature of the stomach:
  - Lesser curvature: _____ curve.
  - Greater curvature: _____ curve.



EXAMPLE

Below is an image of a stomach in cross section taken from a cadaver. For each number, correctly label the region or structure by writing the corresponding letter from the list.

a. Body.
b. Cardia.
c. Fundus.
d. Greater Curvature.
e. Lesser Curvature.
f. Pyloric Antrum.
g. Pyloric Canal.
h. Pyloric Sphincter.



What do we call the "wrinkled" structures visible on the inside of the stomach? _____

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PRACTICE

Food entering the stomach will first pass through the:

a) Fundus. b) Body. c) Pyloric antrum. d) Cardia.

PRACTICE

Which area/structure is NOT a component of the pyloric part of the stomach?

a) Pyloric fundus. b) Pyloric antrum. c) Pyloric sphincter. d) Pyloric canal.

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Layers of the Stomach

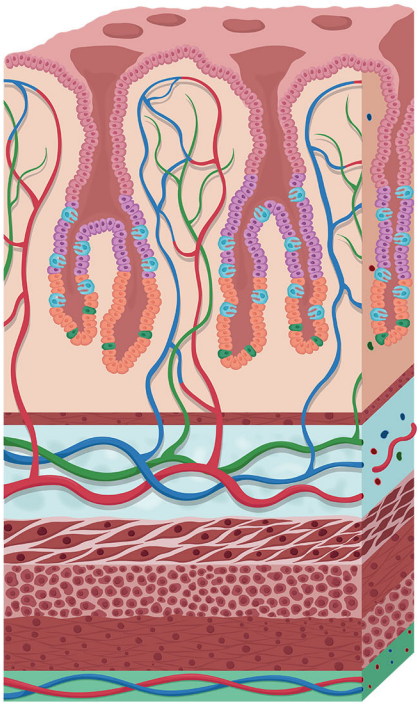
◆ Stomach wall contains the _____ four layers as the rest of the GI tract with certain modifications:

◆ **Mucosa:** _____ to the lumen.
- ▸ **Mucous cells:** stomach epithelium; simple _____ cells.
  - - **Mucosal barrier:** thick _____ mucous – protection.
  - - _____ junctions prevent leakage of gastric juice.
- ▸ **Gastric pits:** opening to _____.

◆ **Submucosa:** connective tissue w/ arteries, veins, and lymph vessels.

◆ **Muscularis externa:** ____ layers of muscle:
- ▸ **Oblique layer:** innermost layer; _____ in stomach.
- ▸ Circular layer: middle layer.
- ▸ Longitudinal layer: outermost layer.

◆ **Serosa:** visceral peritoneum, continuous with _____.



EXAMPLE

A peptic ulcer occurs when the lining of the stomach is breached, and gastric juice digests the underlying tissues. Most peptic ulcers are caused by a bacterial infection by the bacterium *H. pylori*.

a) Which layer of the stomach would you expect to be most vulnerable to damage by ulcers?

Mucosa **Submucosa** **Muscularis externa** **Serosa**

b) What structures/features of the stomach prevent gastric juices from damaging the tissue?

_____

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Which layer of the muscularis externa only exists in the stomach?

a) Oblique layer. b) Circular layer. c) Transverse layer. d) Longitudinal layer.

PRACTICE

Rugae are formed by the two inner most layer of the stomach adjacent to the lumen when the stomach is empty. Knowing this, which stomach layers form the rugae?

a) Muscularis externa & Mucosa.
b) Submucosa & Serosa.
c) Submucosa & Mucosa.
d) Serosa & Muscularis externa.

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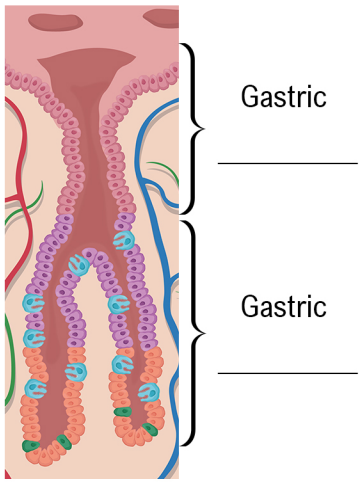
Stomach Glands

◆ Within the mucosae, specialized structures _____ gastric juice.

- **Gastric Juice:** _____, enzyme-rich fluid.
- **Gastric Pits:** _____ like structures connecting gastric gland to the lumen.
- **Gastric Glands:**
  - **Mucous Neck Cells:** Acidic _____.
  - **Parietal Cells:** _____ and _____ factor.
    - HCl: denatures _____, kills bacteria.
    - Intrinsic factor: important for vitamin ____ absorption.
  - **Chief Cells:** _____ and _____.
    - Under acidic conditions pepsinogen → _____.
    - Pepsin digests _____; Lipase digests fats.
  - **Enteroendocrine Cells:** _____ and paracrine molecules.
    - E.g. histamine, gastrin, serotonin, somatostatin.



Parietal cells lower **pH. Chief** cells **chop proteins**.

EXAMPLE

Match the molecules below with the cell type that secretes it. Certain cells may secrete more than one product. Not all molecules may be used.

1) Enteroendocrine cells: _____
2) Mucous neck cells: _____
3) Chief cells: _____
4) Parietal cells: _____

a. HCl.
b. Hormones.
c. Pepsin.
d. Acidic mucous.
e. Paracrines.
f. Pepsinogen.

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PRACTICE

Within the gastric glands, which cells would you expect to find closest to the gastric pits?

a) Chief cells. b) Enteroendocrine cells. c) Parietal cells. d) Mucous neck cells.

PRACTICE

Proton Pump Inhibitors (or PPIs) are some of the widely used drugs in the world and are prescribed for chronic heartburn/ acid reflux. They work by inhibiting the movement of H^+ ions across the membrane into the gastric juice, thereby lowering the concentration of HCl. As described, which cell of the gastric glands would you expect PPIs to affect?

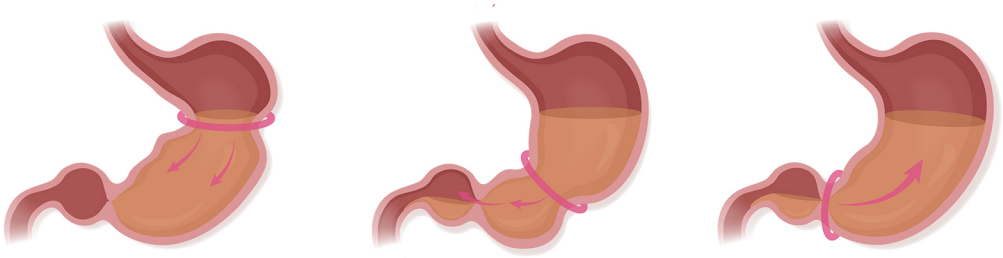
a) Chief cells. b) Enteroendocrine cells. c) Mucous neck cells. d) Parietal cells.

TOPIC: THE STOMACH

Digestion in the Stomach

◆ _____ mechanical and _____ digestion occur in the stomach:

- Mechanical digestion: _____ to any macronutrient.
  - Peristalsis causes _____ of chyme and gastric juices.



- Chemical digestion: multiple chemicals contribute to digestion of macromolecules.
  - **HCl:** low pH (_____), denatures _____, breaks down cell walls, kills bacteria.
  - **Pepsin:** enzyme that breaks proteins into _____ _____; activated by low _____.
  - **Lipase:** enzyme that begin _____ digestion (lipolysis).

Pepsin: **P**rotein **L**ipase: **L**ipids

EXAMPLE

Digestion in the stomach is due to several individual factors. Mach the factor on the left with its digestive function on the right. Some factors may match with more than one function.

1)____ Mechanical digestion by peristalsis.
2)____ Hydrochloric acid.
3)____ Pepsin.
4)____ Lipases.

a) Protein denaturation.
b) Protein hydrolysis.
c) Mixing chyme and gastric juice.
d) Lipolysis.
e) Increasing surface area of food particles.
f) Killing bacteria.

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PRACTICE

Mixing of the chyme with gastric juice is achieved via:

a) Skeletal muscle contractions.

b) Rhythmic contractions of pacemaker cells.

c) Segmentation by contraction of non-adjacent muscles.

d) Peristaltic waves of smooth muscle contraction.

PRACTICE

Which of the following statements about chemical digestion in the stomach are correct:

I. Lipid digestion is begun by enzymes known as lipases.

II. HCl is breaks starches into component monosaccharides.

III. Proteins are denatured by the protein pepsin.

a) I only. b) I & II. c) II, & III. d) I, II, & III.