

- Composition ,function and regulation of gastric secretion
- Gastric Secretion:
- Composition:
- **The Stomach Mucosa Has Two Important Types of Tubular Glands.**
- The oxyntic (acid-forming) glands are located in the body and fundus. They contain three types of cells:
  - Mucous neck cells, which secrete mainly mucus but also some pepsinogen.
  - Peptic (chief) cells, which secrete pepsinogen and
  - parietal (oxyntic) cells, which secrete hydrochloric acid and intrinsic factor.
- • The pyloric glands, which are located in the antrum, secrete mainly mucus for protection of the pyloric mucosa but also some pepsinogen and, importantly, the hormone gastrin.
- **Gastric Acid Is Secreted by Parietal Cells.** When these cells secrete their acidic juice, the membranes of the canaliculi empty their secretion directly into the lumen of the oxyntic gland. The final secretion entering the canaliculus contains concentrated hydrochloric acid (155 mEq/L), potassium chloride (15 mEq/L), and small amounts of sodium chloride.
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- **Hydrochloric Acid Is as Necessary as Pepsin for Protein Digestion in the Stomach.**
- The pepsinogens have no digestive activity when they are first secreted; however, as soon as they come into contact with hydrochloric acid and especially when they come into contact with previously formed pepsin plus the hydrochloric acid, they are changed to form active pepsin.
- Parietal Cells Also Secrete “Intrinsic Factor.” Intrinsic factor is essential for absorption of vitamin B12 in the ileum. When the acid-producing cells of the stomach are destroyed, which often occurs with chronic gastritis, the person develops not only achlorhydria but often also pernicious anemia owing to failure of the red blood cells to mature.
- Regulation of gastric secretion:
- **Basic Factors That Stimulate Gastric Secretion Are Acetylcholine, Gastrin, and Histamine.**
- Acetylcholine excites secretion of pepsinogen by peptic cells, hydrochloric acid by parietal cells, and mucus by mucous cells. In comparison, both gastrin and histamine strongly stimulate secretion of acid by parietal cells but have little effect on the other cells.

- **Acid Secretion Is Stimulated by Gastrin.**
- Nerve signals from the vagus nerves and local enteric reflexes cause gastrin cells (G-cells) in the antral mucosa to secrete gastrin. Gastrin is carried by blood to the oxyntic glands, where it strongly stimulates parietal cells and peptic cells to a lesser extent. **Histamine Stimulates Acid Secretion by Parietal Cells.**
- Whenever acetylcholine and gastrin stimulate the parietal cells at the same time, histamine can enhance acid secretion. Thus histamine is a cofactor for stimulating acid secretion.
- **Pepsinogen Secretion Is Stimulated by Acetylcholine and Gastric Acid.** Acetylcholine is released from vagus nerves or other enteric nerves. Gastric acid probably does not stimulate peptic cells directly but elicits additional enteric reflexes. When the ability to secrete normal amounts of acid is lost, the pepsinogen level is low even though the peptic cells are normal.
- **Gastric Secretion Is Inhibited by Excess Acid in the Stomach.**
- When the pH of gastric juice falls below 3.0, gastrin secretion is decreased for two reasons:
  - (1) the high acidity stimulates the release of somatostatin from delta cells, which in turn depresses gastrin secretion by the G-cells, and
  - (2) the acid causes an inhibitory nervous reflex that inhibits gastric secretion. This mechanism protects the stomach.
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- **There Are Three Phases of Gastric Secretion**
- The cephalic phase accounts for 30% of the response to a meal and is initiated by the anticipation of eating and the odor and taste of food. It is mediated entirely by the vagus nerve.
- The gastric phase accounts for 60% of the acid response to a meal. It is initiated by distention of the stomach, which leads to nervous stimulation of gastric secretion. In addition, partial digestion products of proteins in the stomach cause gastrin to be released from the antral mucosa.
- The gastrin then causes secretion of a highly acidic gastric juice.
- The intestinal phase (10% of the response) is initiated by nervous stimuli associated with distention of the small intestine. The presence of digestion products of proteins in the small intestine can also stimulate gastric secretion via a humoral mechanism.

- **Chyme in the Small Intestine Inhibits Secretion During the Gastric Phase.**
- This inhibition results from at least two influences:
- **Enterogastric reflex.** The presence of food in the small intestine initiates this reflex, which is transmitted through the enteric nervous system and through the extrinsic sympathetic and vagus nerves; it inhibits stomach secretion.
- The reflex can be initiated by distention of the small bowel, the presence of acid in the upper intestine, the presence of protein breakdown products, or irritation of the mucosa.
- **Hormones.** The presence of chyme in the upper small intestine causes the release of several intestinal hormones.
- Secretin and gastric inhibitory peptide are especially important for inhibition of gastric secretion.