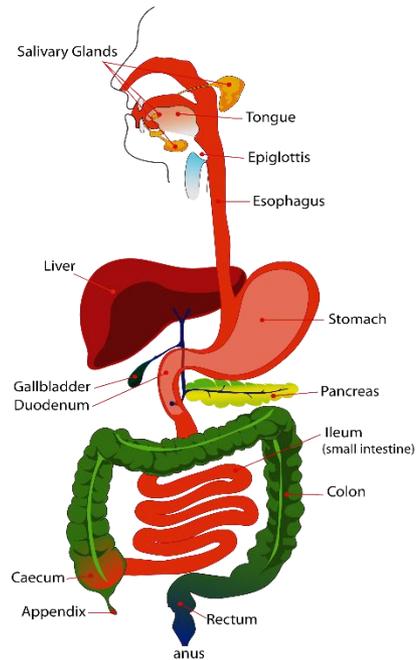




2. GASTRIC MOTILITY & VOMITING.

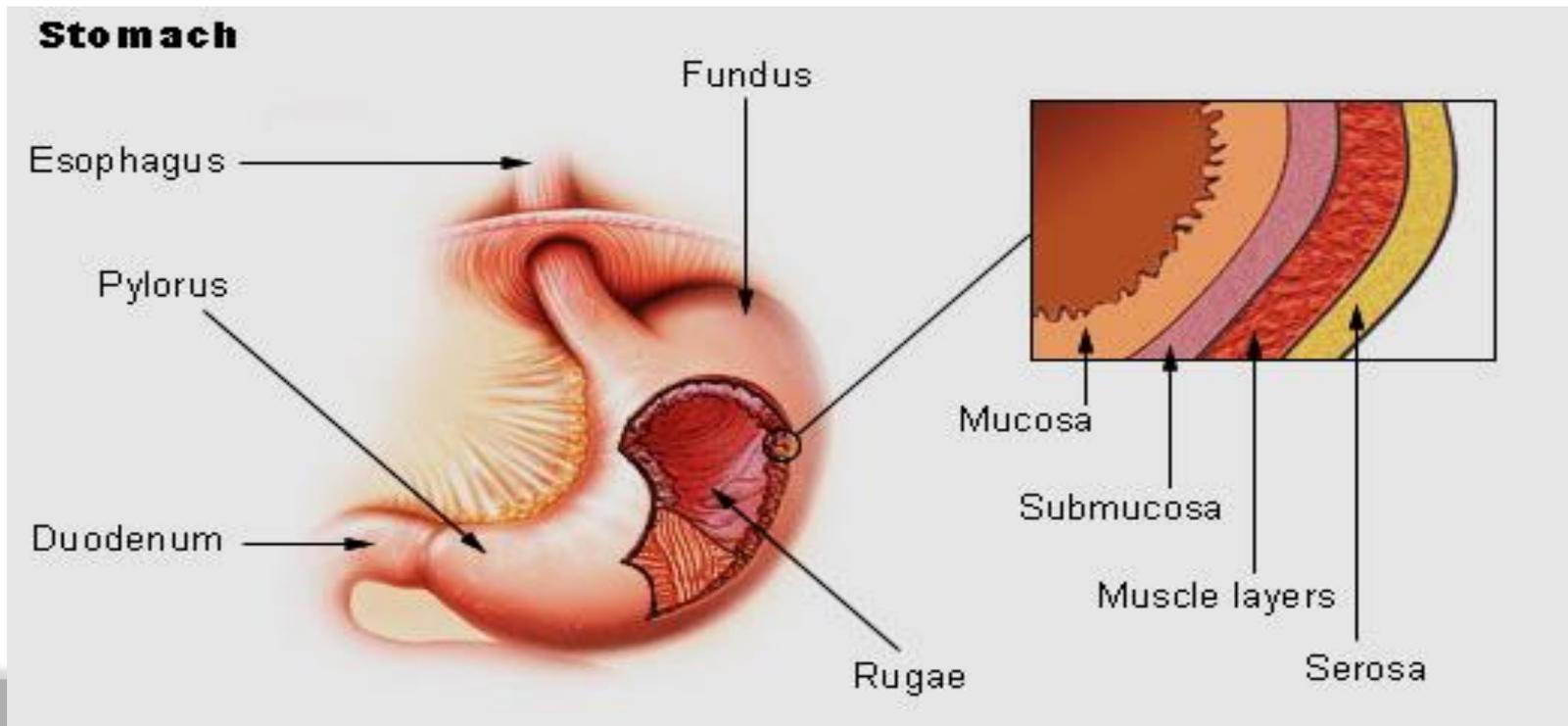


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The stomach

•Function of stomach:

- 1-Storage of food.
- 2-Slow evacuation of meal to allow good digestion and absorption.
- 3-Partial digestion of proteins and fats.
- 4-Sterilization of ingested food by high acidity.
- 5-Secretion of Hcl, enzymes,....
- 6-Help defecation by gastro-colic reflex.
- 7-Absorption of small amounts of water and alcohol.



Gastric Motility

*Filling and Storage of food in the stomach:

The stomach accommodates up to one liter of food **without** increase of intra-gastric pressure because :

- a. Plasticity of gastric wall.
- b. Receptive relaxation.
- c. Law of Laplace: $P=T/r$ ($\uparrow P \rightarrow \uparrow$ radius with less \uparrow in tension $\rightarrow \downarrow$ pressure towards normal).

*Types of movements of the stomach:

a-Tonic gastric waves :

-Regular weak contractions (3 waves/min) which take place in empty stomach, mainly in the fundus to maintain the intra-gastric pressure & mix gastric secretion with food.

b. Receptive relaxation :

- It is a reflex relaxation of the fundus and body to receive the bolus of food.
- Initiated by vagal reflexes (conditioned and unconditioned).
- Also by plasticity of gastric muscles.

c. Peristaltic movement :

-Distension of stomach by food \rightarrow stimulate stretch receptors \rightarrow vago – vagal reflex peristalsis at the middle of stomach and proceeds toward the pyloric antrum with gradual increase in strength leading to:

- Grinding of food to fine particles.
- Emptying of fine particles into the duodenum (propulsive movements).
- Peristalsis in opposite direction from pyloric antrum to fundus (Anti-peristalsis) \rightarrow pyloric mill for mixing of food with gastric secretion.

d. hunger contractions :

-Fasting hypoglycemia → activation of the feeding center in hypothalamus →

- Sends impulse to limbic cortex → hunger sensation.

- Sends impulse to vagal nucleus → hunger strong painful contraction near the fundus (Atropine injection or vagotomy abolish hunger contraction but not hunger sensation).

-They start slowly, then increase → tetanic contraction for 2 minutes then disappear and reappear in the next feeding time to reach maximal intensity in 3-4 days then gradually disappear. (May due to ↓ sensitivity of feeding center to hypoglycemia).

-Basic electrical rhythm (gastric slow waves) :

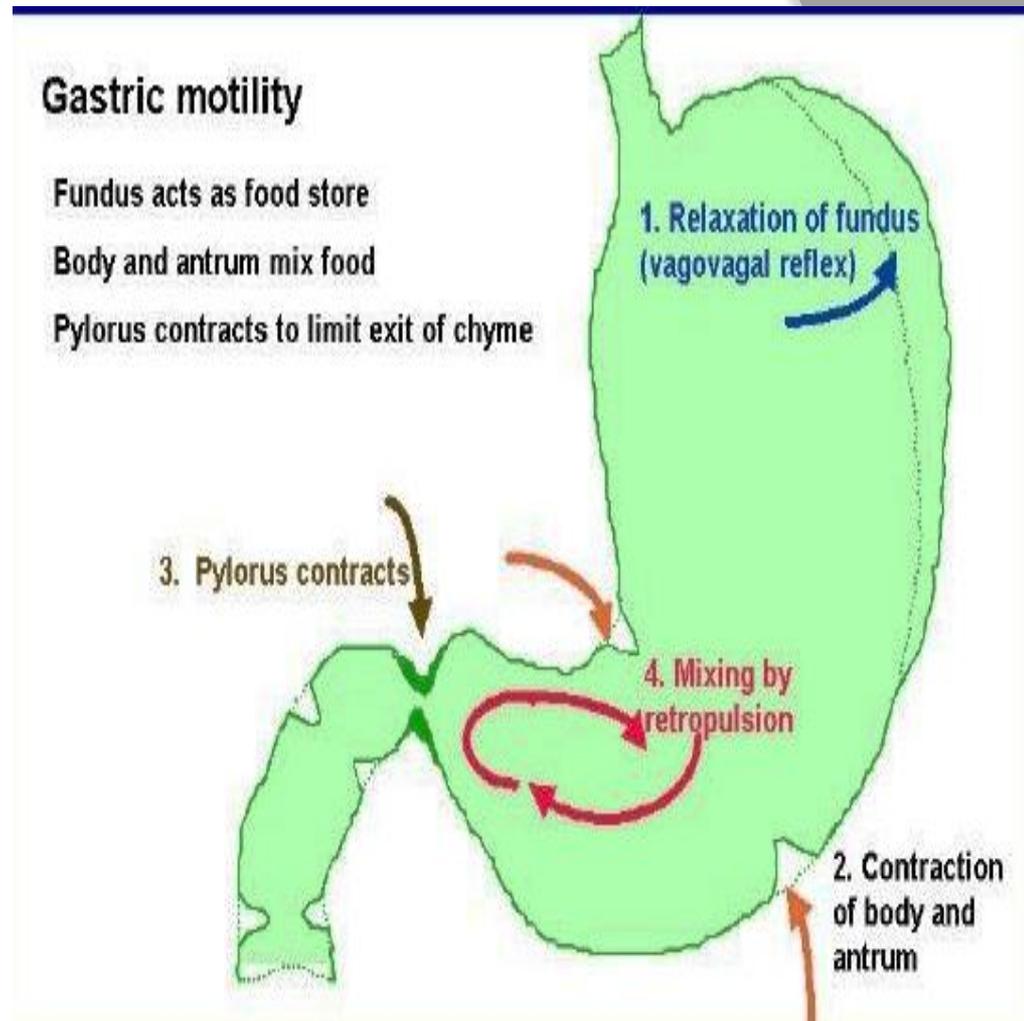
- 3-5 cycles/min. due to partial depolarization of circular smooth muscle cells in the stomach wall.

- Some lead to spike potential → peristalsis.

- Start at midpoint of greater curvature (pace maker of the stomach).

- Vagal and gastrin → ↑ spike pot. rate.

- Sympathetic & secretin → ↓ spike pot. rate.



- **Nervous regulation of gastric motility:**

- a- Vagal (parasympathetic) :**

- Inhibitory purinergic to proximal unit (not blocked by Atropine).
 - Excitatory cholinergic to distal unit.

- b-Sympathetic:**

- Inhibitory (noradrenergic) to proximal unit.

- c- Myenteric plexus:** (as before) short & long reflexes.

- *Factors affecting gastric emptying :**

- With a mixed meal the stomach usually empty in about 3 hours through the pyloric pump (50-70 cm. water) which regulate the rate of gastric emptying .The rate of emptying is controlled by:

- A. Factors in the stomach:**

- 1.Type of food: carbohydrate is the most rapid. Then proteins followed by fats.
 - 2.Consistency of food: liquids more rapid which depends on type of food, degree of mastication and the strength of gastric peristalsis.
 - 3.Volume of food:
 - Moderate volume of chyme →↑ emptying via vago-vagal reflex and release of gastrin hormone.
 - Large volume → over distension →↓ emptying.

- B. Factors in the duodenum:** the same role of the duodenum in the control of gastric secretion .

- C. Emotional factors:**

- 1.Pain: visceral and somatic pain→ reflex inhibition of gastric emptying.
 - 2.Depression & sudden fear → reflex sympathetic inhibition.
 - 3.Anxiety & anger → reflex parasympathetic stimulation of emptying.

Response : → vomiting.

Mechanism of vomiting :

1-Nausea: with salivation, ↑ H.R, sweating, stomach wall is relaxed, and antiperistalsis may occur in duodenum.

2-Retching: intermittent contraction of diaphragm and abdominal muscles against closed L.E.S, glottis, and diaphragmatic opening is also contracted.

3- Gastric evacuation :

- Strong contraction at the incisura separating the body from the pylorus.
- The cardiac sphincter relaxes and the stomach wall is completely relaxed (passive stomach).
- Powerful contraction of the diaphragm, abdominal muscle and pelvic floor muscle →↑ intra abdominal pressure → squeezing the relaxed stomach and expulsion its contents to the mouth (anti peristalsis may occur in oesophagus).
- During vomiting the soft palate elevated, closure of glottis and inhibition of respiration to prevent the vomitus to pass to respiratory passages (as in swallowing).
- When the stomach is empty, antiperistalsis waves may drive the intestinal contents into the stomach (as bile juice).

N.B : in denervated stomach vomiting may occur by central stimulation of the CTZ or reflexely from oropharynx.

N.B : Effect and complications of vomiting :

a-Dehydration (loss of secretion).

b-Alkalaemia : due to loss acid and the resynthesis of acid is associated with ↑ alkaline tide in plasma.

c-Alkalaemia →↓ ionized Ca^{+2} → tetany.

d-Potassium loss.(hypokalaemia)

Thank You