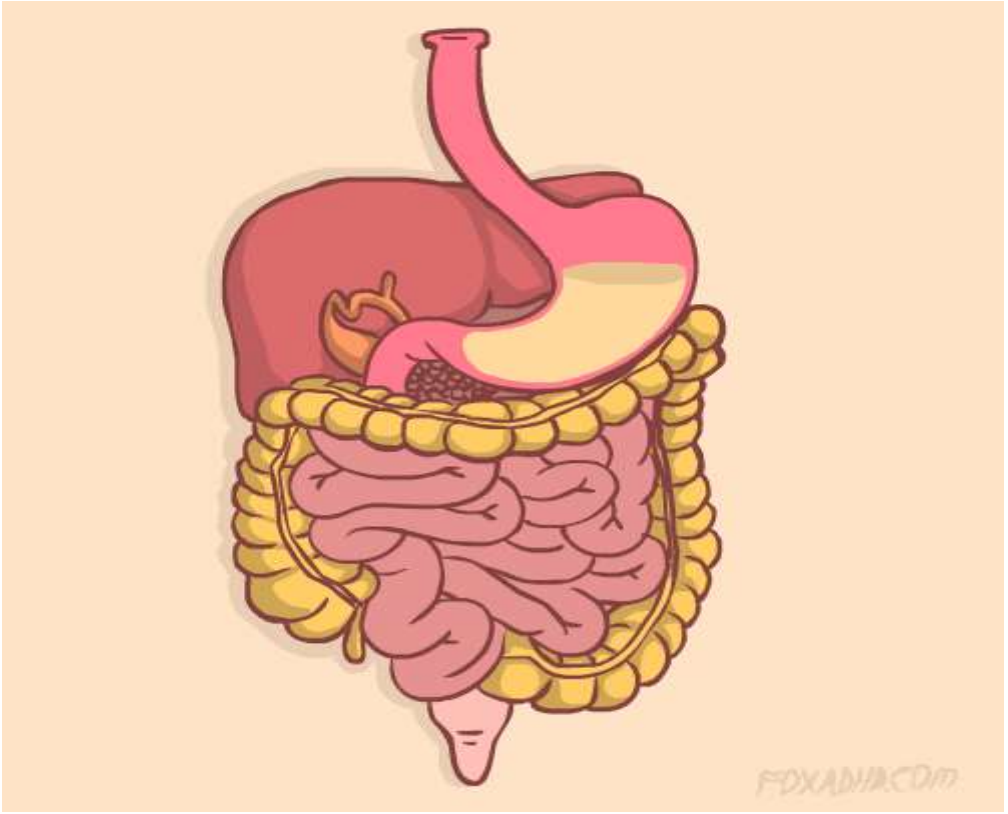
Gastric Motility

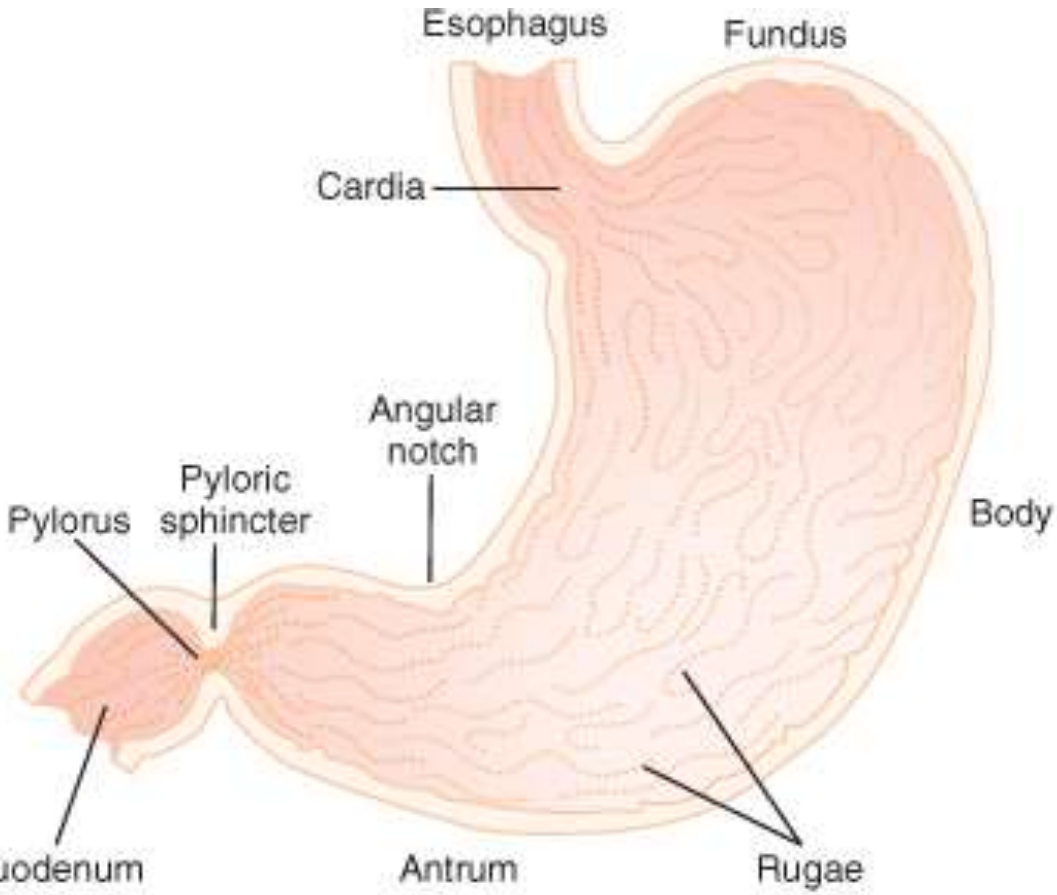


- **The motor function of stomach is inclusive of three things:**

1. Storage of food

2. Mixing of food with gastric secretions- Chyme formation

3.Emptying of chyme into small intestine



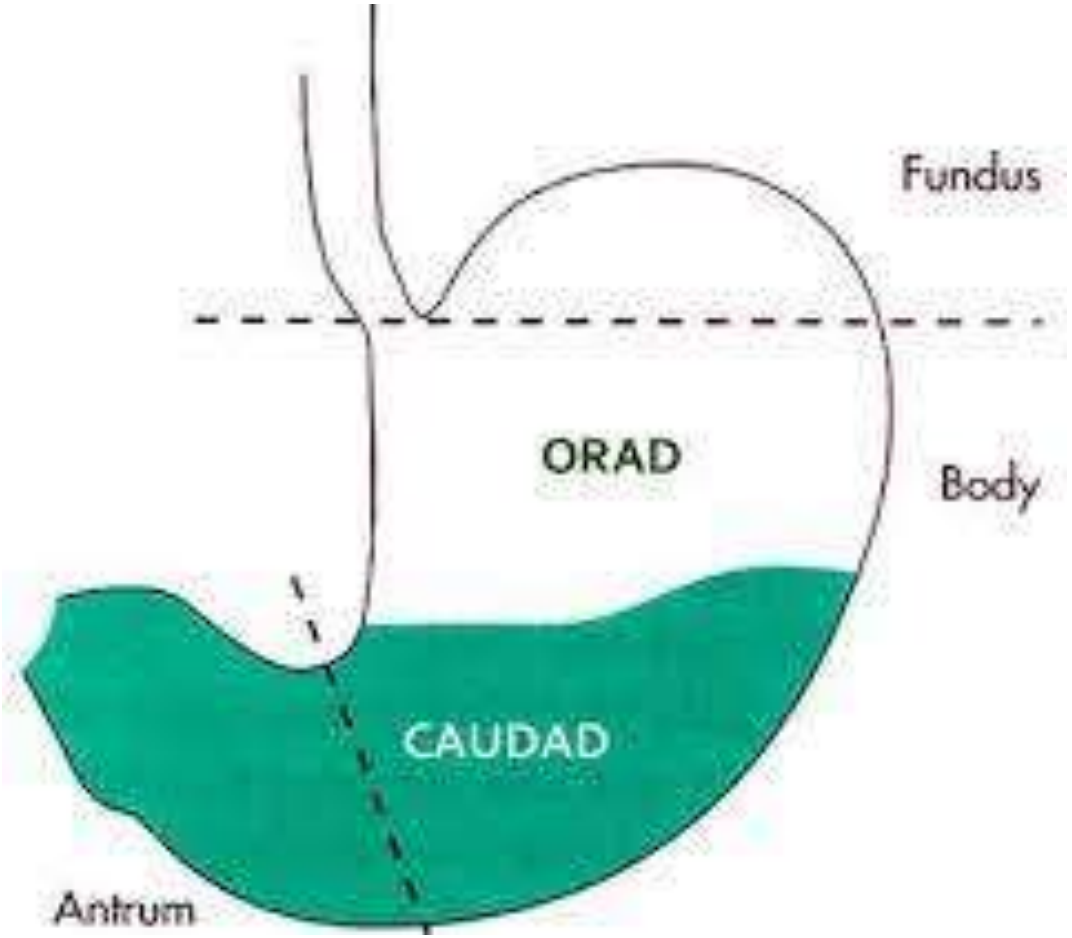
Movements of Stomach

A. Storage of Food

B. Mixing of food with gastric juices to form semifluid -CHYME

C. Emptying of chyme into small intestine for digestion & absorption

Physiologic divisions of stomach



A. Storage Function

Food enters the stomach

Concenteric circle formed around food in orad portion of stomach

New food enters remains close to esophageal opening

Old one is near outer wall of stomach

this stretching causes VAGOVAGAL REFLEX

Decrease tone of muscle wall of body of stomach

Stomach wall bulges outwards

Accomodation of greater quantity of food is made possible

Normal quantity of food stored in a completely relaxed stomach- 0.8 to 1.5 L

B. Mixing of food with gastric juices to form semifluid -CHYME

As food mixes with gastric juices in stomach (walls of stomach)

Weak peristaltic contractions begin *(MIXING WAVES)*

Mixing waves, **begin at the mid portion of stomach go little upwards of stomach wall towards antrum every 15 to 20 seconds**

These constrictor waves progress from body to antrum

Keep growing stronger & intensify to form *Strong peristaltic ACTION POTENTIAL*

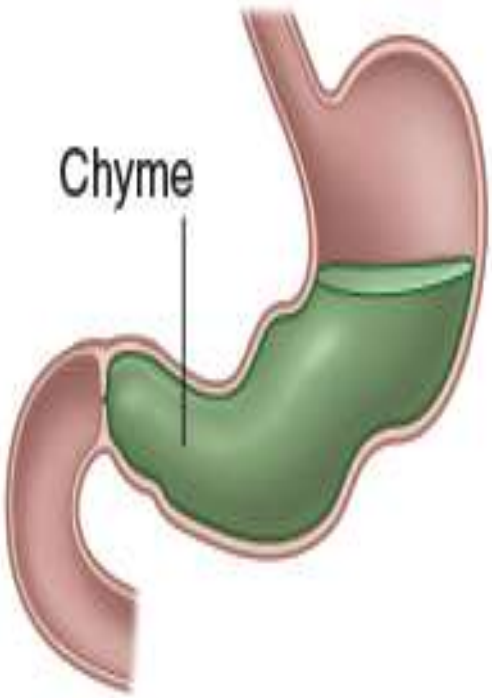
Sweep against pylorus with high pressure try to push contents of antrum to pylorus

These constrictor ring cause proper mixing in stomach

Peristaltic constrictive ring
+ Upstream squeezing action
= RETROPULSION

The CHYME

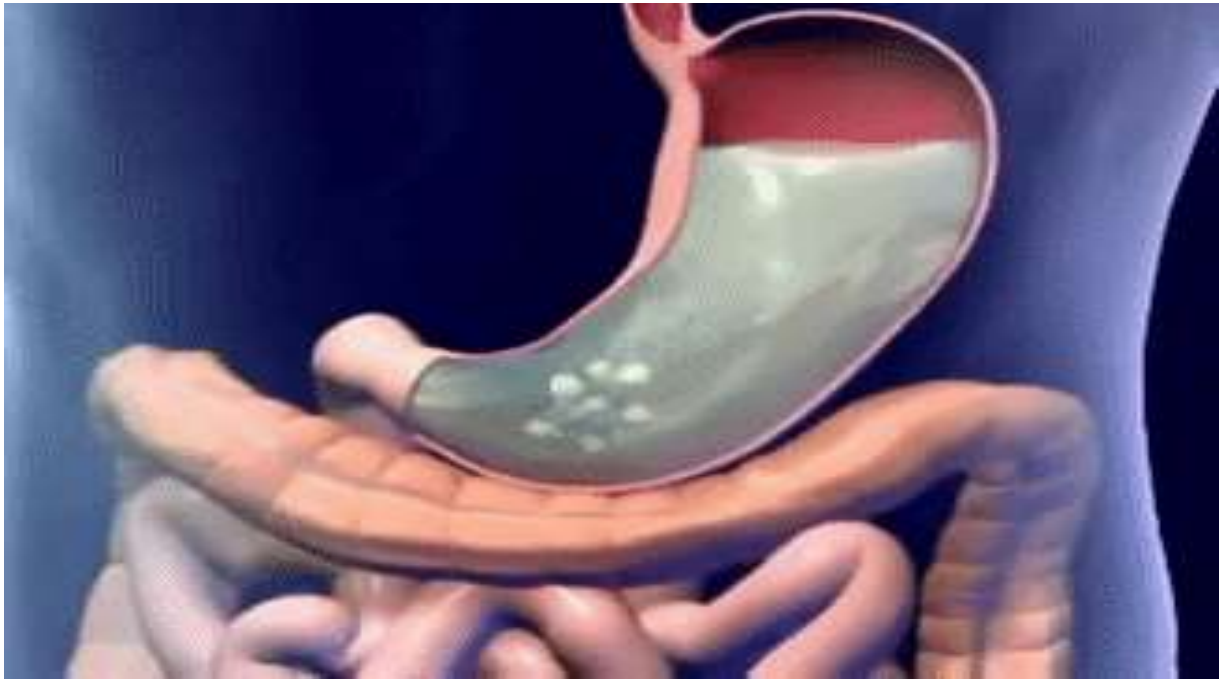
- **It's a murky semifluid paste leaving the stomach to enter duodenum**



C. Hunger Contraction

- **These are the intense rhythmic contractions occurring in body of stomach when its empty for several hours**
- **Sometimes become extremely strong convert to TETANIC CONTRACTION (Lasting for 2-3 mins)**
- **HUNGER PANGS- pain in pit of stomach (fasting for more than 12 to 24 hrs)**

STOMACH EMPTYING



Stomach Emptying begins as the intense peristaltic contractions in antrum sweep the liquid gastric contents towards the pylorus and duodenum

The whole mechanism is explained by *pyloric pump* action (another type of peristaltic wave)

20 % times the contractions in stomach become a little stronger (80% they are mixing wave- BER)

Begin in mid portion go to caudad portion- *tight ring like contractions*

Lead to stomach emptying

As the emptying increases- these contraction goes farther up towards body adding more food to chyme in antrum (pressure exerted is around 50 to 70 cm of water pressure- 6 times more than mixing wave)

- **The distal opening of stomach is thick circular muscle wall which remains tonically contracted- *PYLORIC SPHINCTER***

- **Usually open enough for water & other fluids to pass from stomach to duodenum but constricted at the same time to not allow passage of food particles until they get mixed in chyme**

Factors affecting STOMACH EMPTYING

- **Gastric factors promote emptying:**

1. **Volume of food- cause stretching of stomach- elicit local myenteric reflexes- activate pyloric pump**

1. **Hormone GASTRIN- secreted from G cells of antrum-enhance activity of pyloric pump**

- **Duodenal factors inhibit stomach emptying:**

Increase in volume of chyme in duodenum- initiates following reflexes to inhibit pyloric pump:

1. **Enteric nervous system reflex- directly from duodenum to stomach (inhibitory)**

2. **Extrinsic nerves- prevertebral symp. Ganglion- inhibitory sympathetic nerves to stomach**

3. Vagovagal (vagus nerves- brainstem-stomach via vagi)

These enterogastric reflexes are initiated by following factors:

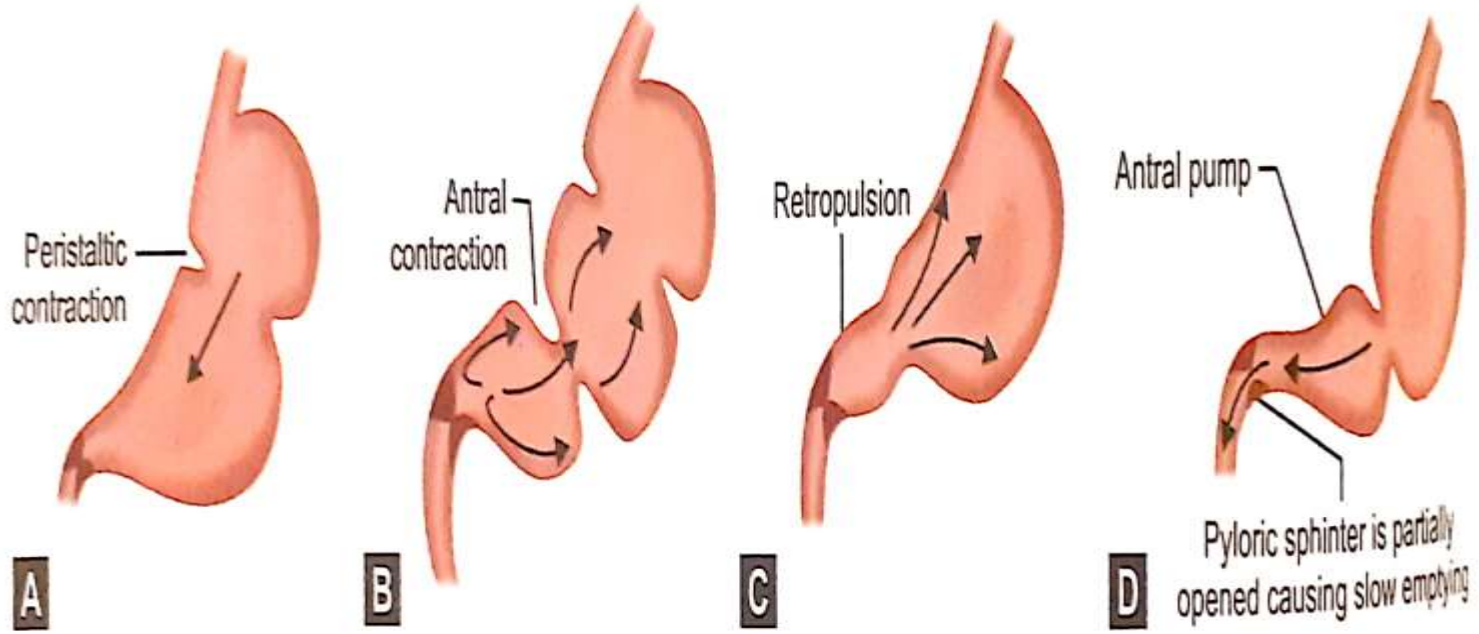
- **Distention of duodenum**
- **Presence of irritant in mucosa**
- **Acidity of duodenal chyme (Presence of irritants and acids (fall in pH below 3.5 to 4) activates enterogastric inhibitory reflexes blocks further release of acidic stomach contents into duodenum)**

- **Osmolality of chyme** **(Hypotonic and hypertonic fluids also elicit inhibitory reflexes)**

- **Presence of breakdown products of protein, fats** **(Breakdown products of protein digestion also elicit inhibitory reflexes)**

➢ Hormonal feedback from duodenum

(fat extracts bind to receptors on epithelial cells causing release of hormones like Cholecystokinin (CCK) which block stomach motility, other such hormones are- Secretin, Glucose-dependent insulinotropic peptide (GIP)



Figs. 48.5A to D: Mechanisms of gastric emptying. Note, pyloric sphincter is closed in step A, B, and C during which thorough mixing and grinding of food occurs and the food material is converted into chyme. In stage D, sphincter is partially opened that causes slow emptying of gastric content into duodenum.

Clinical Application

1. Delayed gastric emptying-

causes are: autonomic neuropathy (like in Diabetes mellitus), post vagotomy

2. Rapid gastric emptying-

causes are: increased vagal activity, hyperthyroidism, increase in fluid diet

3. Vomiting:

It is a reflex the expulsion of gastroduodenal contents from GI tract to outside via the passage of mouth

Vomiting is usually preceded by the feeling of nausea, tachycardia, pallor, sweating, dizziness, dilatation of pupil

Center – Brainstem (area postrema)

Stimulus for initiation of vomiting reflex:

Distention of stomach

Tickling of back of throat

Drugs (morphine, apomorphine, digitalis derivatives- stimulate chemoreceptor trigger zone)

Mechanism of vomiting:

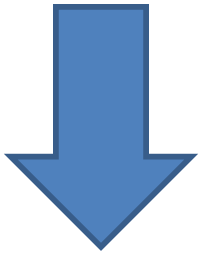
Initiation of antiperistalsis wave by stimulus

Initiated in ileum goes up to duodenum within 3-5 mins

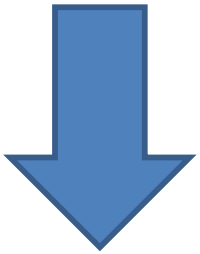
Relaxation of pyloric sphincter (intestinal contents enter stomach)

Forced inspiration against closed glottis increases intra-abdominal pressure

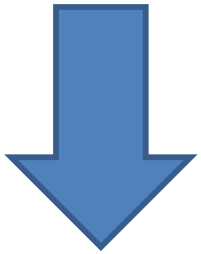
Forces gastric contents to enter esophagus (as LES relaxes)



Strong rise in intra-abdominal pressure relaxes UES as well



Chyme enters Pharynx then to mouth



Vomitus is expelled out

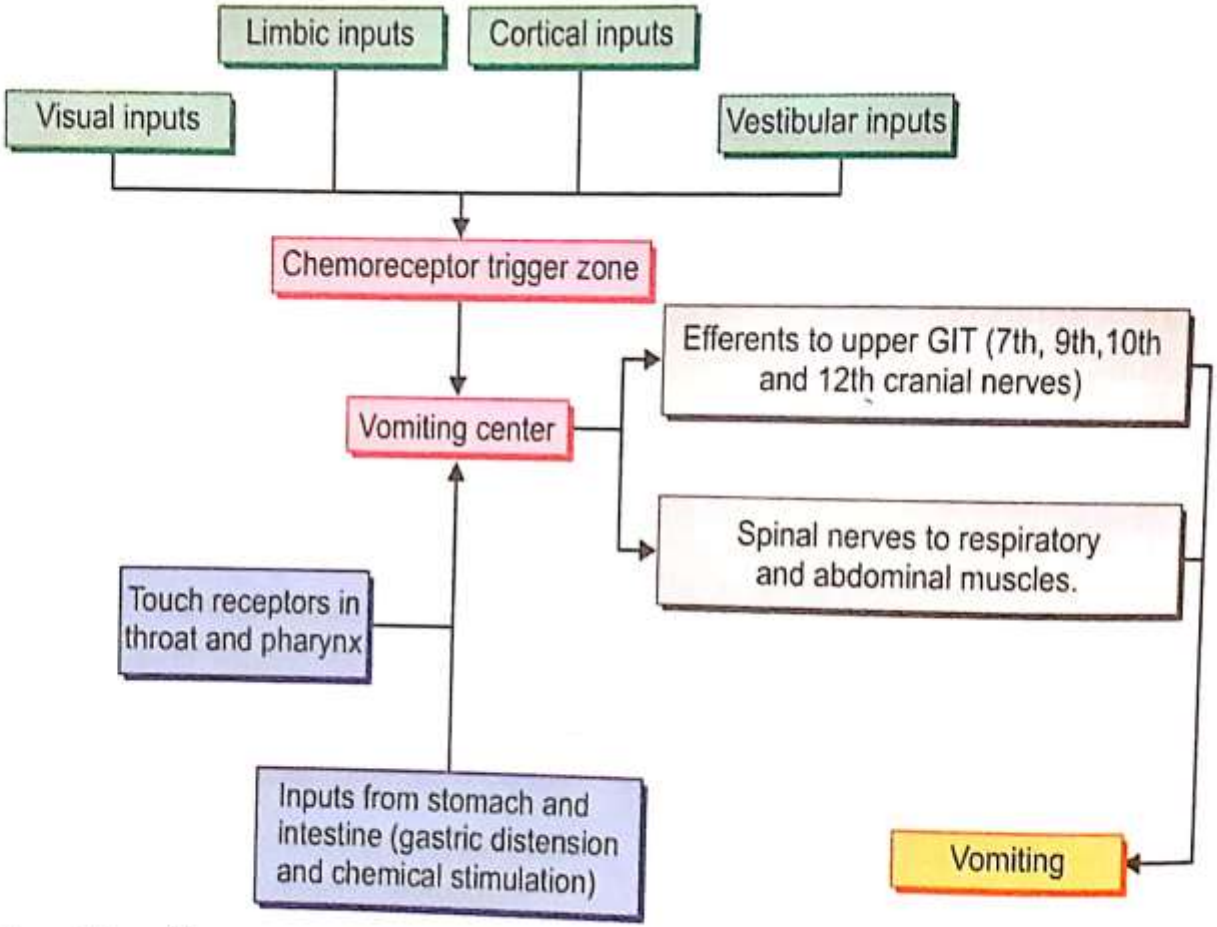


Fig. 48.6: Mechanism of vomiting reflex.

4. Dumping Syndrome: (observed in people who have underwent gastrectomy)