



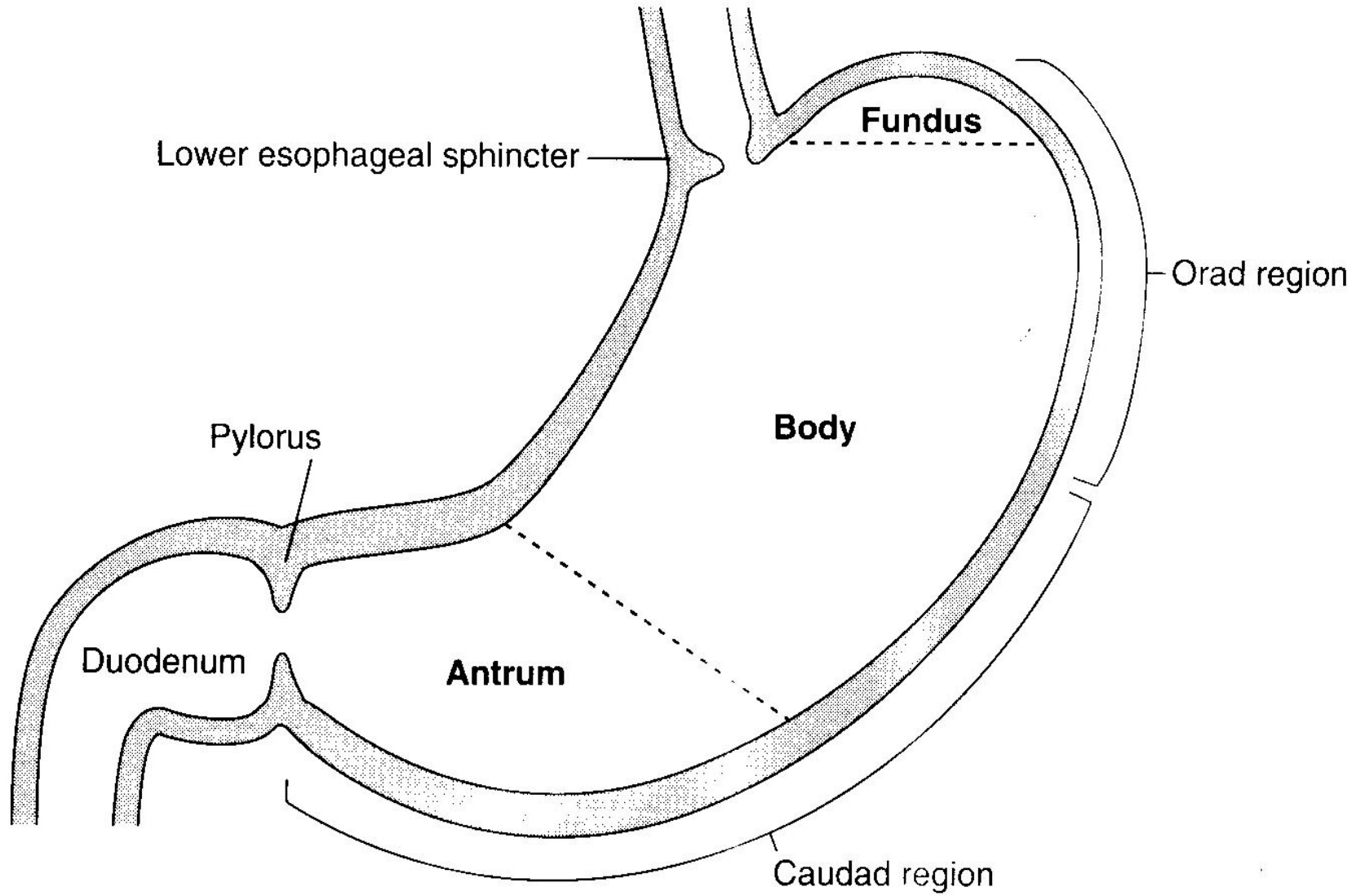
Gastric Motility & Secretion

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Stomach

❖ Main Functions

- Storage
 - Preparing the chyme for digestion in the small intestine
 - Absorbs water and lipid-soluble substances (alcohol and drugs)
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Stomach

- Types of Glands (located in gastric mucosa):
 - ❖ Cardiac Glands
 - ❖ Pyloric glands (many G cells)
 - ❖ Oxyntic glands (most abundant, found in fundus and corpus)
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Types of Cells

❖ Parietal cells

- most distinctive cells in stomach (HCl & intrinsic factor)

❖ Chief cells

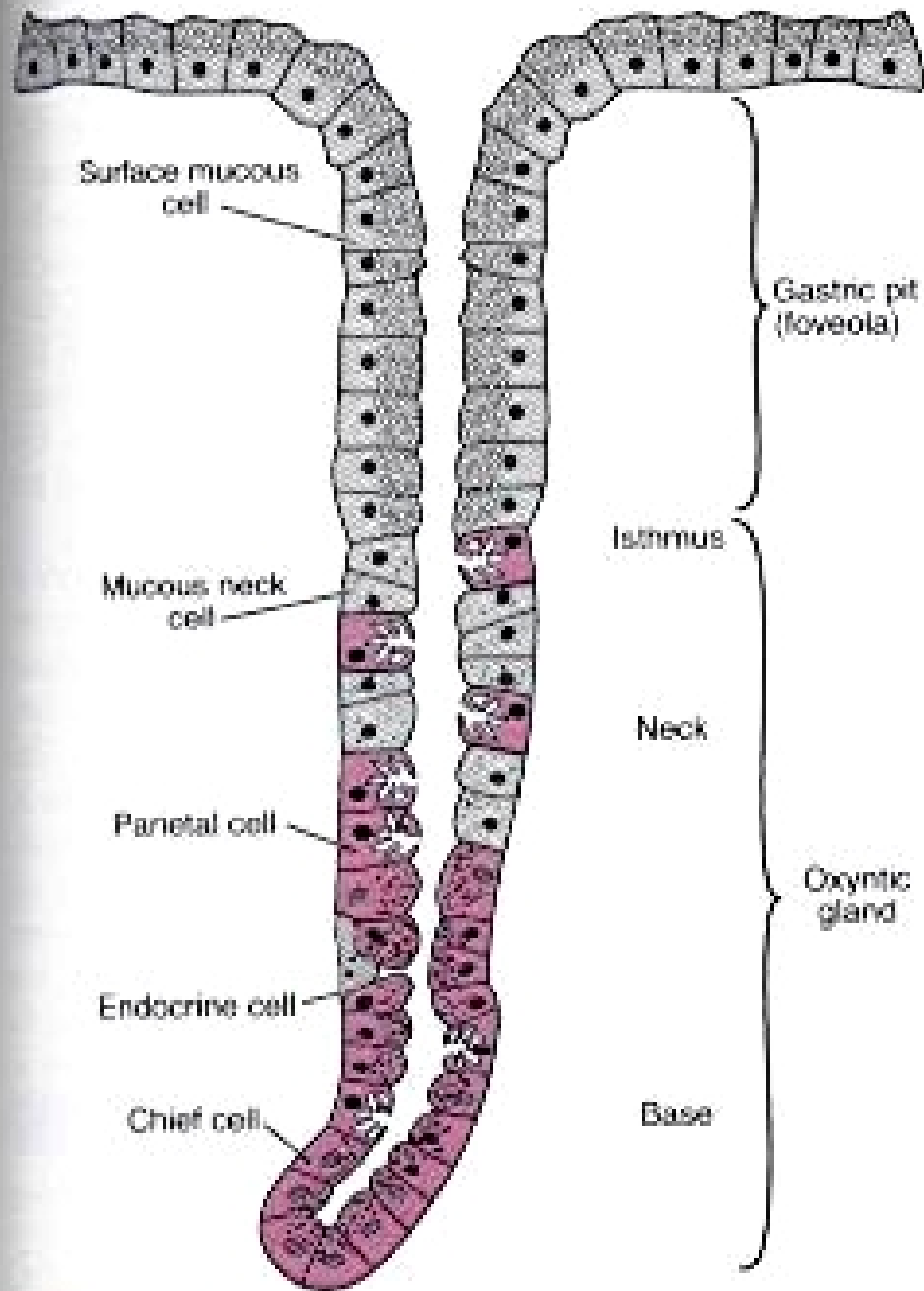
- pepsinogen

❖ Mucus neck cells:

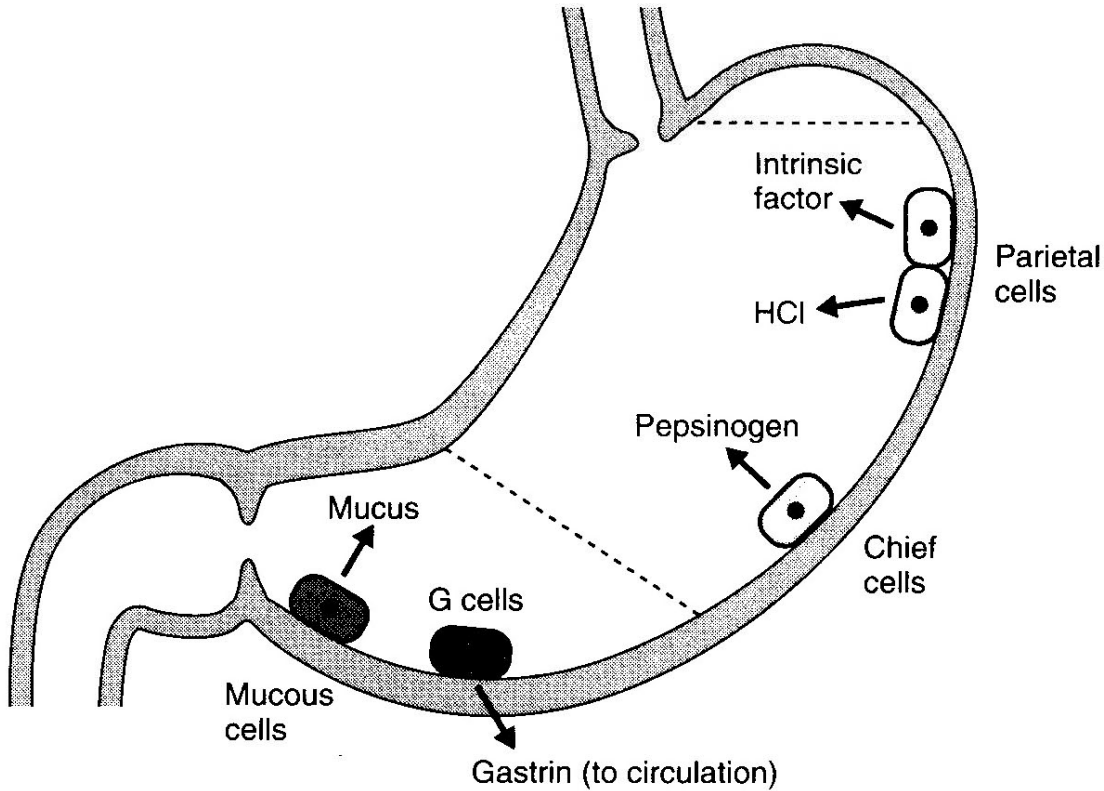
- HCO_3^-
- Mucus

Types of Cells

- ❖ G Cells: Gastrin (hormone) --->↑ HCl secretion
 - ❖ D Cells: Somatostatin (antrum)
 - ❖ Enterochromaffin-like cell: Histamine
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A simplified diagram of the gastric gland



Cell Type	Location	Secretion
Parietal cells	Body	HCL Intrinsic factor
Chief cells	Body	Pepsinogen
G cells	Antrum	Gastrin
Mucous cells	Antrum	Mucus Pepsinogen

Gastric motility

- Functions

1. allows the stomach to serve as reservoir

2. breaks food to small particles and mix it with gastric juice

3. empties gastric contents at a controlled rate

Gastric motility

- Reservoir part

fundus + 1/3 corpus

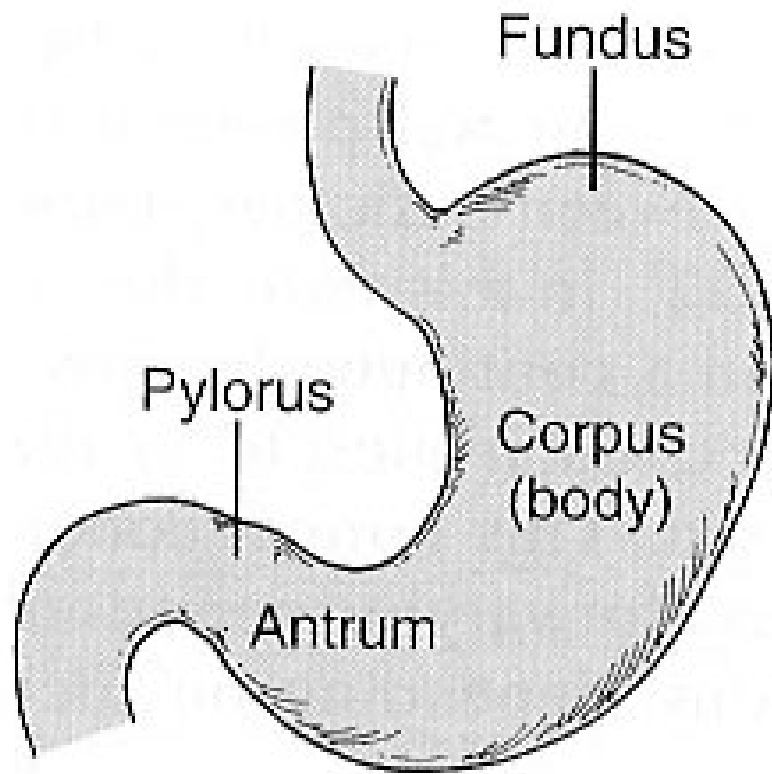
(tonic contraction)

- Antral pump

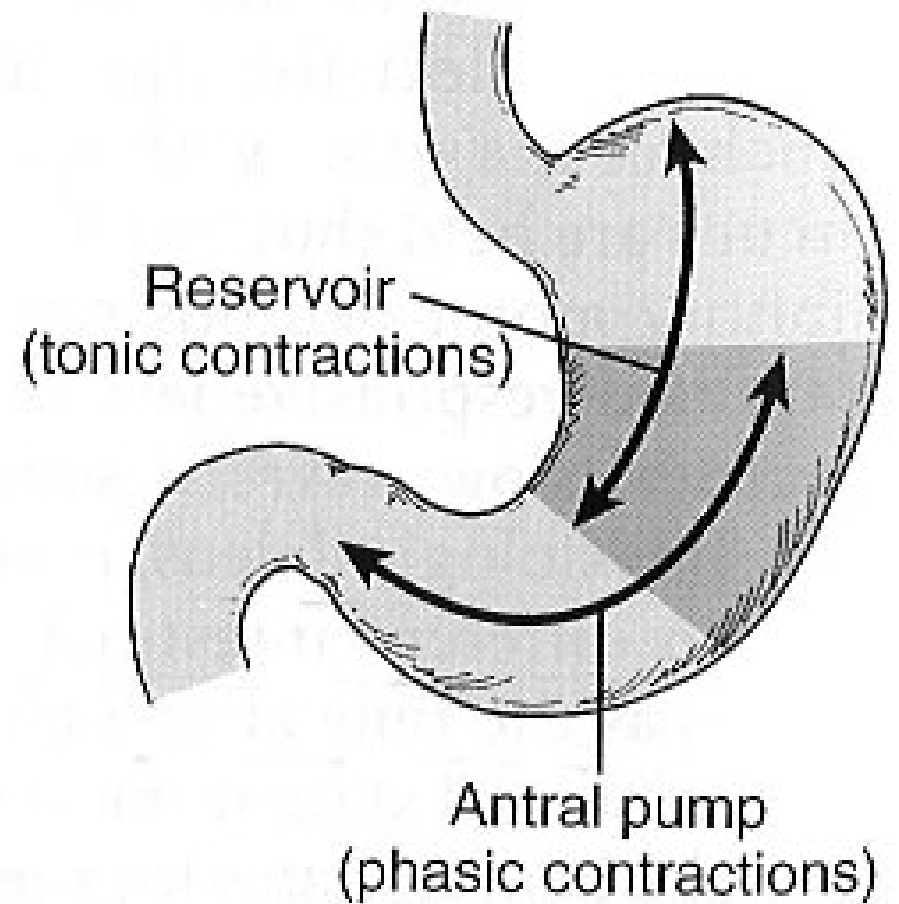
2/3 corpus + antrum & pylorus

(phasic contraction)

Anatomic regions

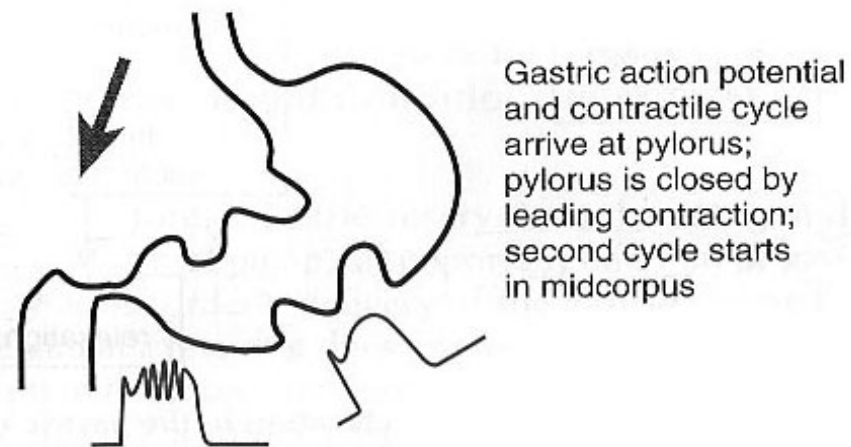
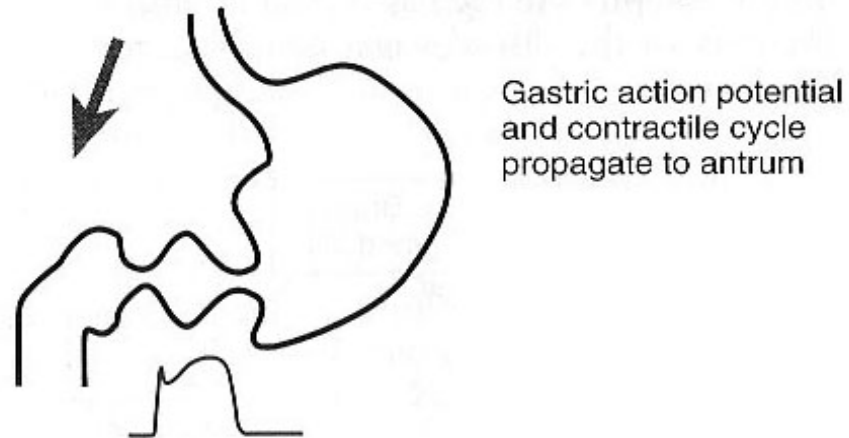
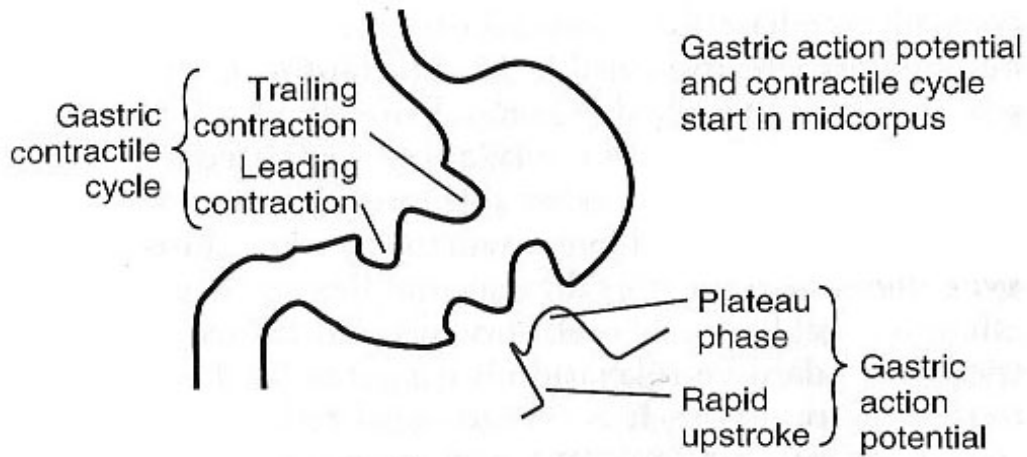


Functional motor regions

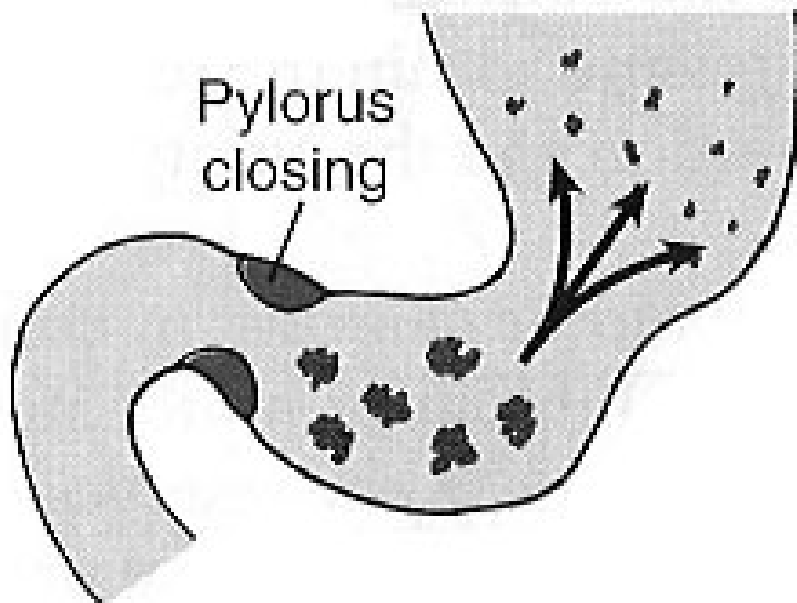


Mixing & emptying of gastric contents

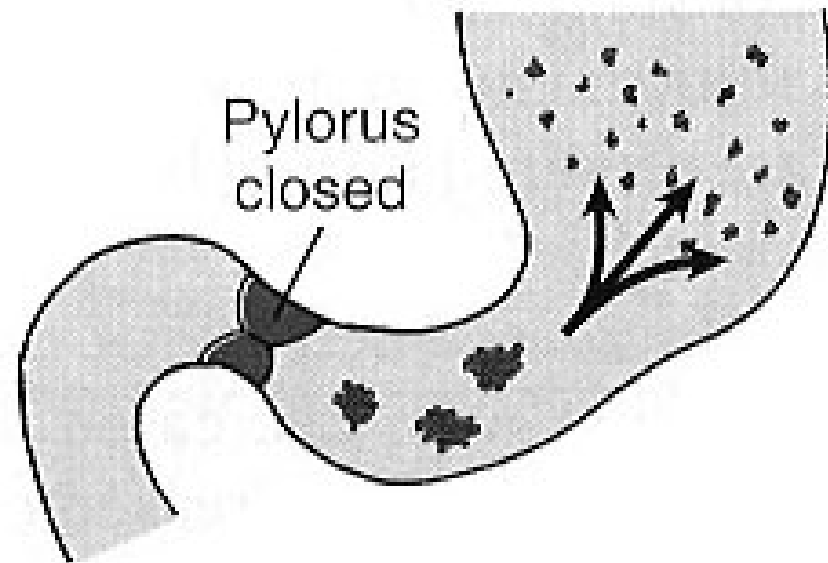
- Gastric contents may remain unmixed (1h)
 - Fat takes longer time for empty than other
 - Liquids are emptied easier and first
 - Major mixing activities in the antrum
 - Retropulsion
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Onset of terminal antral contraction



Complete terminal antral contraction



Constriction of pyloric sphincter

- Hormones promote constriction
 1. CCK
 2. Secretin
 3. Gastrin
 4. GIP
 - Sympathetic innervation
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Regulation of gastric emptying

- ❖ ↑ Acidity (stomach) → ↑ Secretin → ↑ antral contraction
- ❖ Fat (monoglycerides) → ↑ CCK, GIP → ↓ gastric emptying
- ❖ Hyperosmotic solutions → ↓ gastric emptying
- ❖ Amino acids → ↑ G cells → ↑ Gastrin → ↑ contraction of sphincter

Gastric reservoir

- Functions:

- ❖ To maintain a continuous compression
 - ❖ To accommodate the received food without significant gastric wall distention or pressure
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Relaxation in gastric reservoir

- Receptive relaxation
 - triggered by swallowing reflex
 - Adaptive relaxation
 - triggered by stretch receptors (vago-vagal reflex)
 - lost in vagotomy
 - threshold of fullness and pain
 - Feedback relaxation
 - triggered by chyme in small intestine
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Gastric juice

- HCL
 - Pepsinogen
 - Electrolytes
 - Intrinsic factor
 - Mucus (mucus gel layer)
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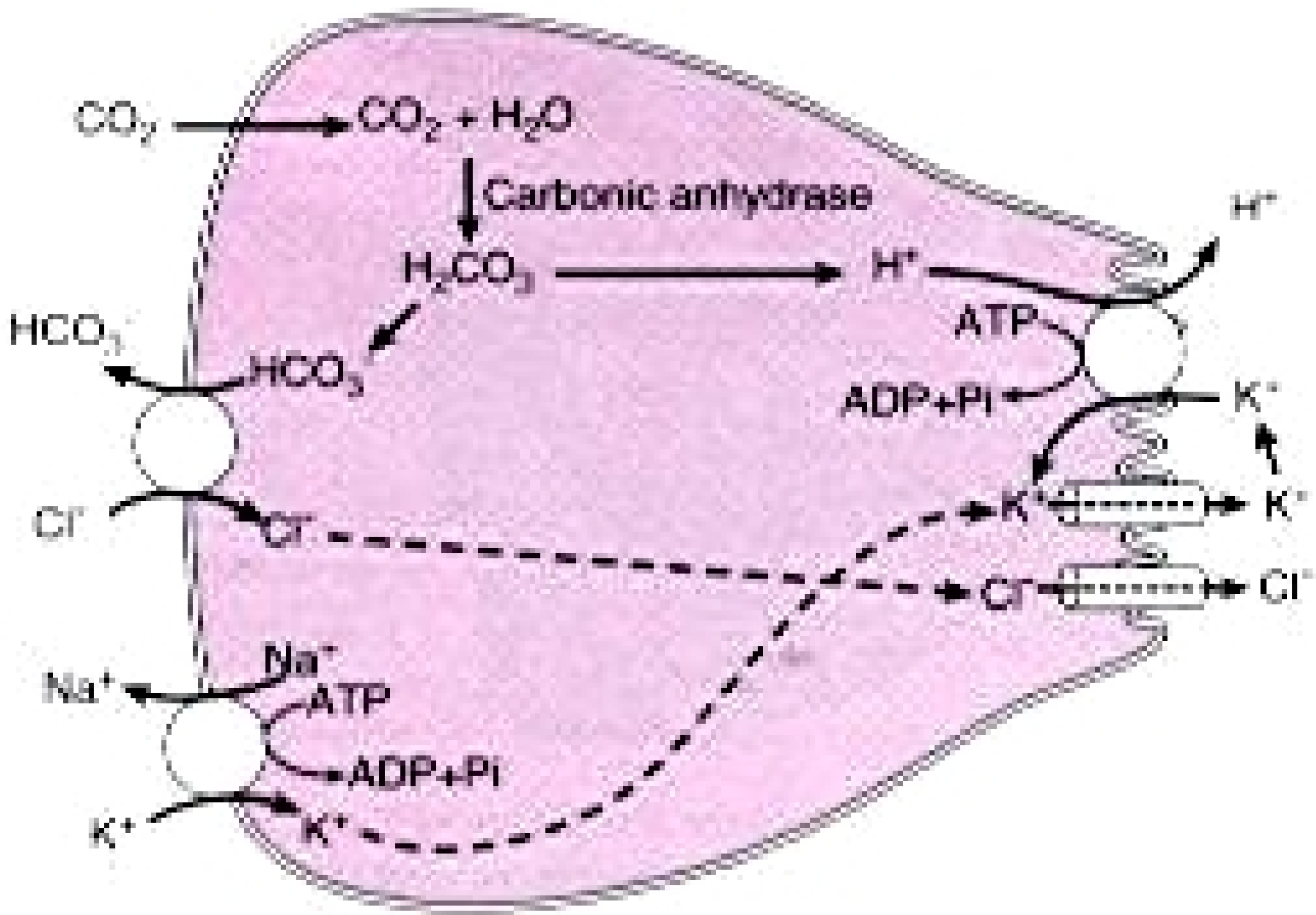
HCL Secretion

- Secreted by parietal cells
 - Fundus
 - Body
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Plasma

Pancreal cell

Lumen



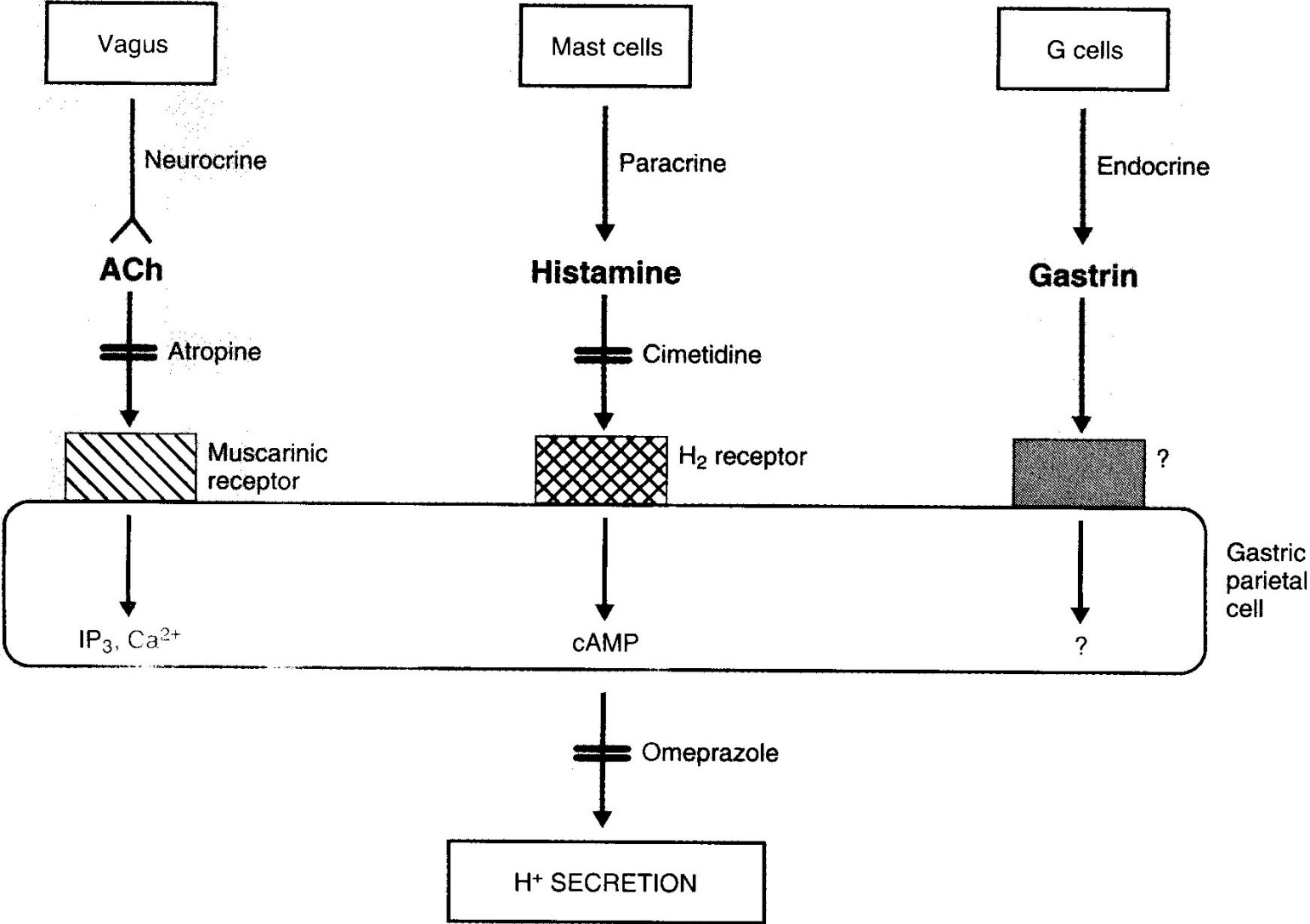
HCL Secretion

- Mechanism of HCl production:
 - H/K ATPase
 - ❖ Inhibited by: omeprazole
 - H/K pump depends on $[K]_{out}$
 - [HCl] drives water into gastric content to maintain iso-osmolality
 - During gastric acid secretion:
amount of HCO_3^- in blood = amount of HCl being secreted
 - Alkaline tide

Neural & Hormonal Control of Gastric Secretion

- ❖ Vagus nerve (neural effector)
 - ❖ Gastrin (hormonal effector)
 - ❖ Enterochromaffin-like cells → Histamine ---
→ H₂ receptor (parietal cells) → acid secretion
 - ❖ Cimetidine (H₂ receptor blocker) → ↓ peptic ulcer and gastroesophageal reflux disease
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REGULATION OF H⁺ SECRETION



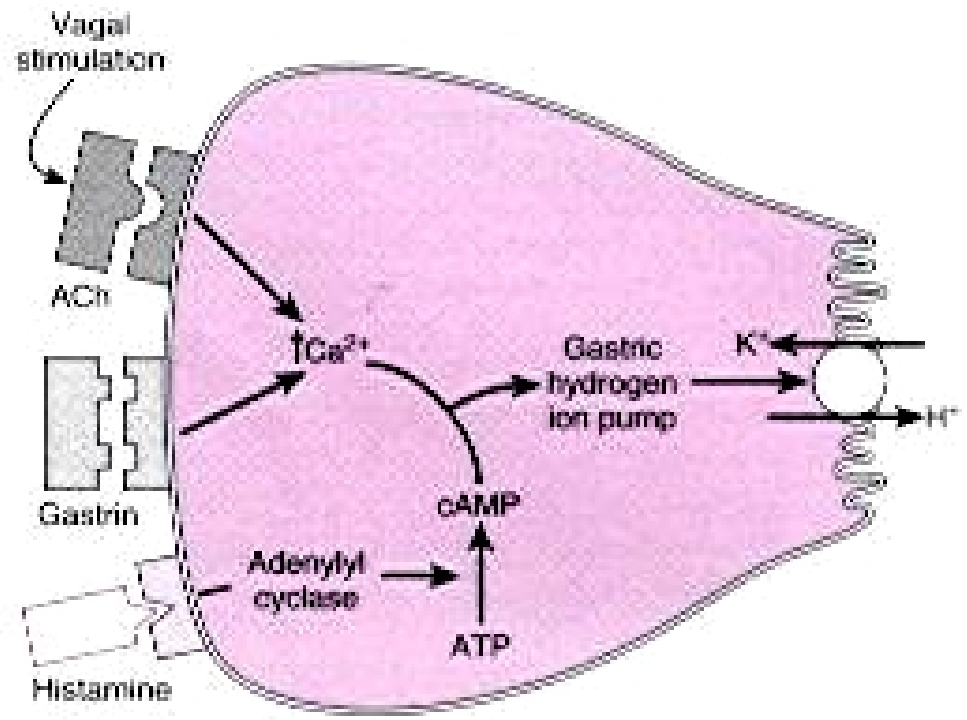
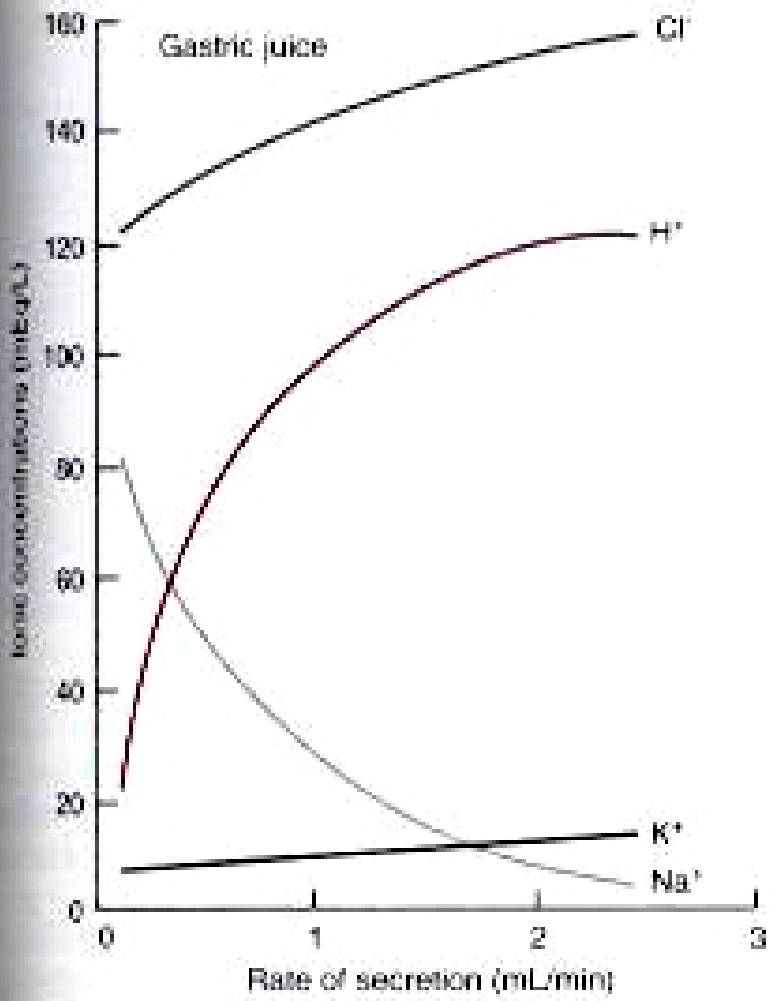


FIGURE 27.8 The stimulation of parietal cell acid secretion by histamine, gastrin, and acetylcholine (ACh), and potentiation of the process.

Phases of Acid Secretion

❖ Cephalic phase(30%):

- Smelling, Chewing and swallowing
- Stimulates parietal G-Cells
- GRP

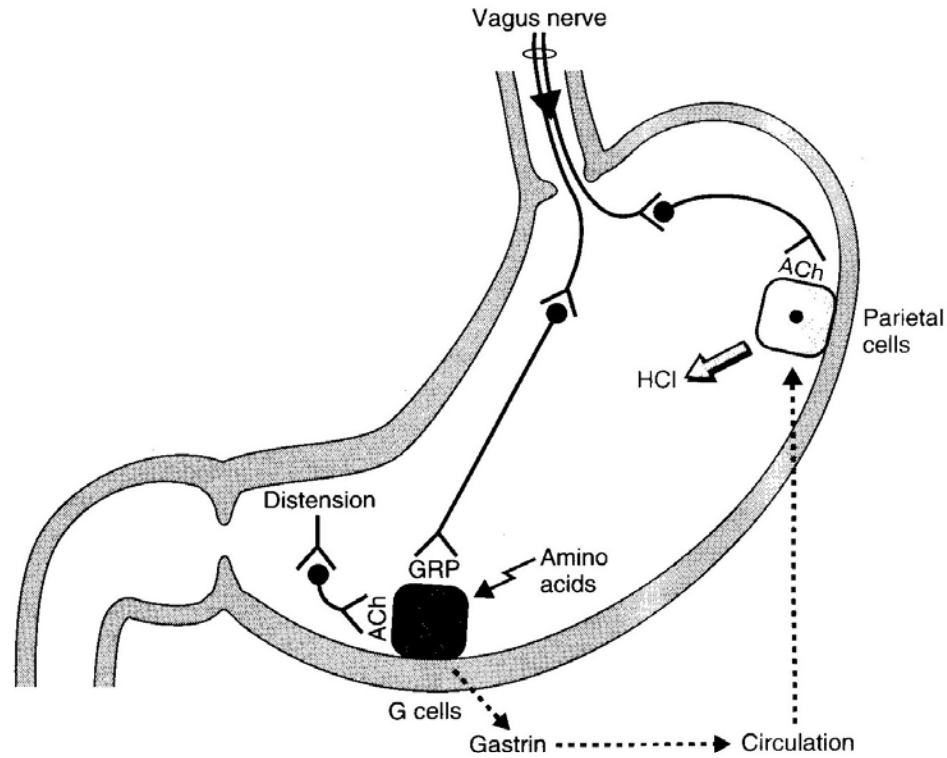
❖ Gastric phase:

- gastric distention
- proteins

❖ Intestinal phase

- digested proteins

REGULATION OF HCl SECRETION



Phase	% of HCl Secretion	Stimuli	Mechanisms
Cephalic	30%	Smell, taste, conditioning	Vagus → parietal cell
			Vagus → gastrin → parietal cell
Gastric	60%	Distension	Vagus → parietal cell Vagus → gastrin → parietal cell
		Distension of antrum	Local reflex → gastrin → parietal cell
		Amino acids, small peptides	Gastrin → parietal cell

Inhibition of Acid Secretion

- ❖ Inhibitory hormones (**enterogastrones**):
 - Somatostatin (D-cells) in antrum
 - Secretin (S-cells) in duodenum
 - Gastric inhibitory peptide (GIP) in duodenum
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