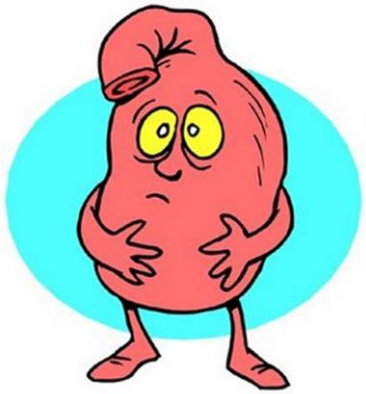
Histology of the Stomach



Lanka Ranaweera

Department of Anatomy

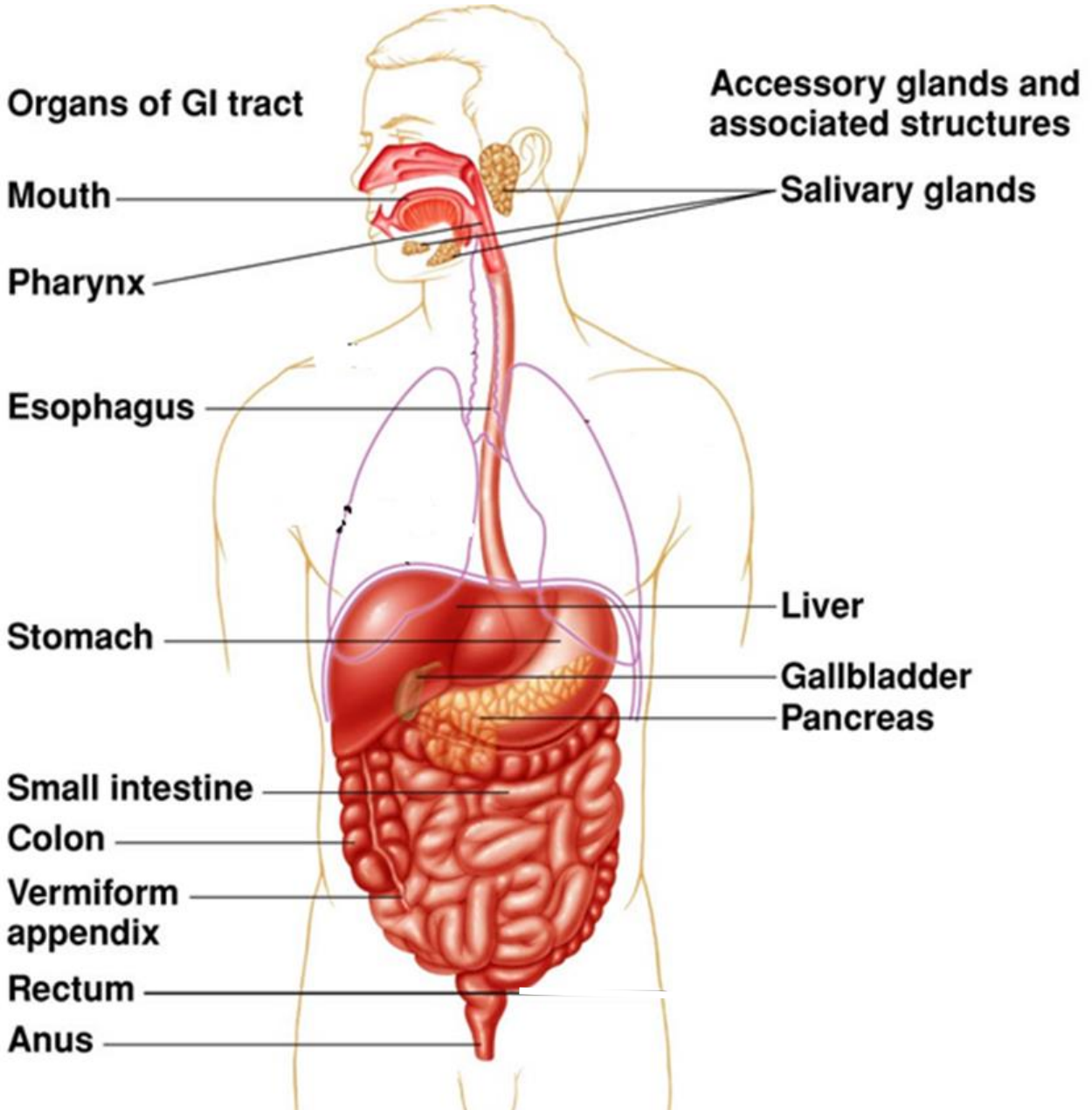
Faculty of Medicine,

University of Kelaniya

Objectives

- List the layers of the stomach.
- State how the different layers of the stomach correspond to the general histological pattern of GIT.
- Briefly describe the structure of the gastric gland.
- Briefly describe the structural adaptations of the stomach.

Parts of the digestive tract

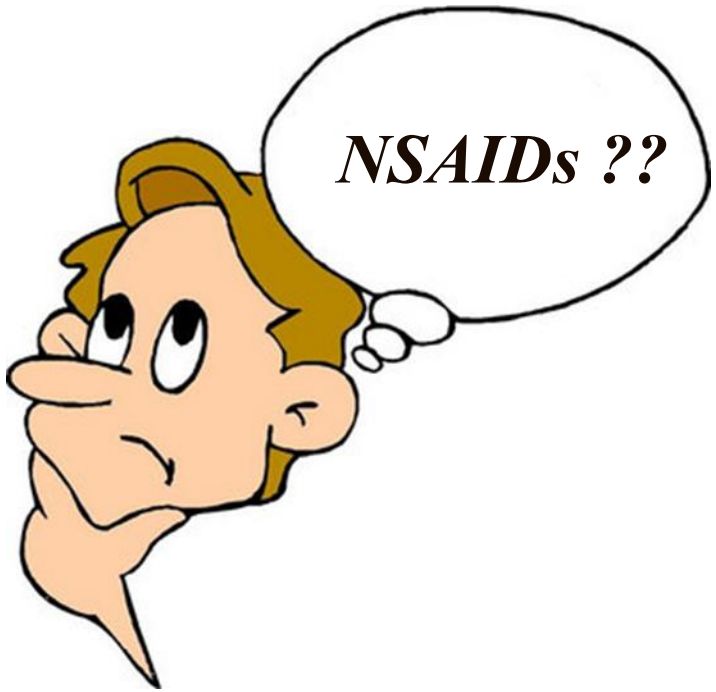


Stomach – Structure

Rugae

Temporary folds- longitudinally directed

mucosa & submucosa


NSAIDs ??

Aspirin
Celecoxib
Diclofenac
Ibuprofen

COX enzymes ✗

Prostaglandins ↓

Ulcers in the stomach
&
Promote bleeding

Helicobacter pylori infection

- Burning pain in your abdomen
- Abdominal pain that's worse when your stomach is empty
- Nausea
- Loss of appetite
- Frequent burping and bloating

Inflammation/irritation –stomach lining (gastritis)
Ulcers
Stomach cancer

Aspirin
Celecoxib
Diclofenac
Ibuprofen

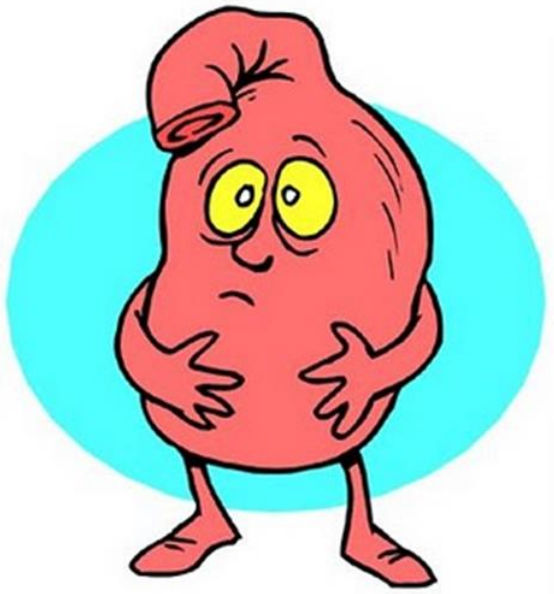
COX enzymes ✗

Prostaglandins ↓

Ulcers in the stomach
&
Promote bleeding

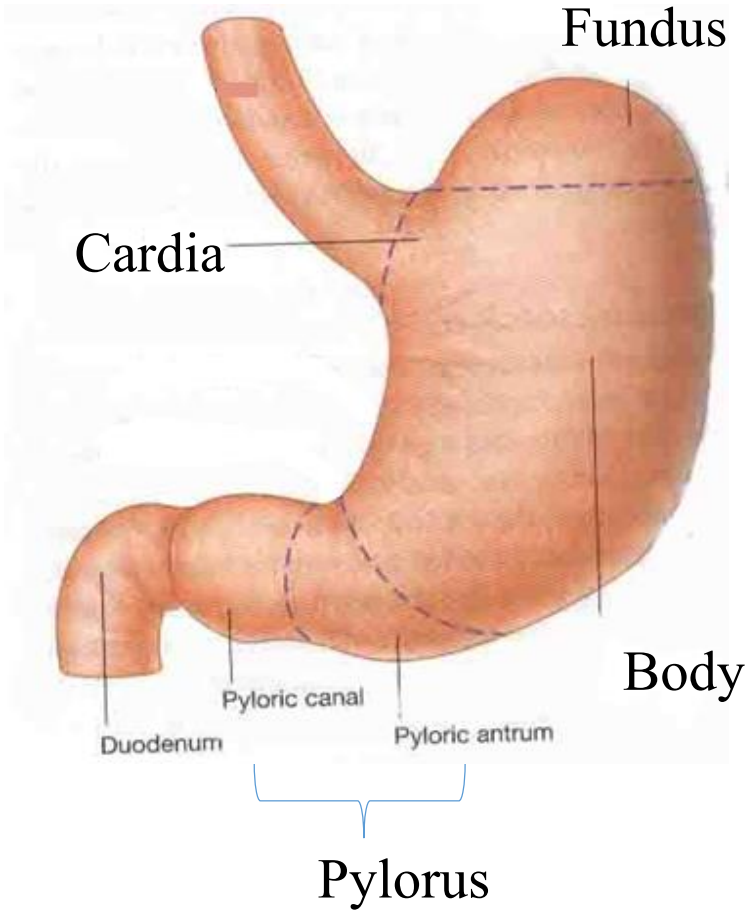
Stomach – Functions

- Storage of ingested food
- Add an acidic fluid to the ingested food & form chyme
- Proteins digestion……
- Triglycerides digestion ….
- Continue digestion of carbohydrate…



Stomach – Structure

Gross anatomy



Histology

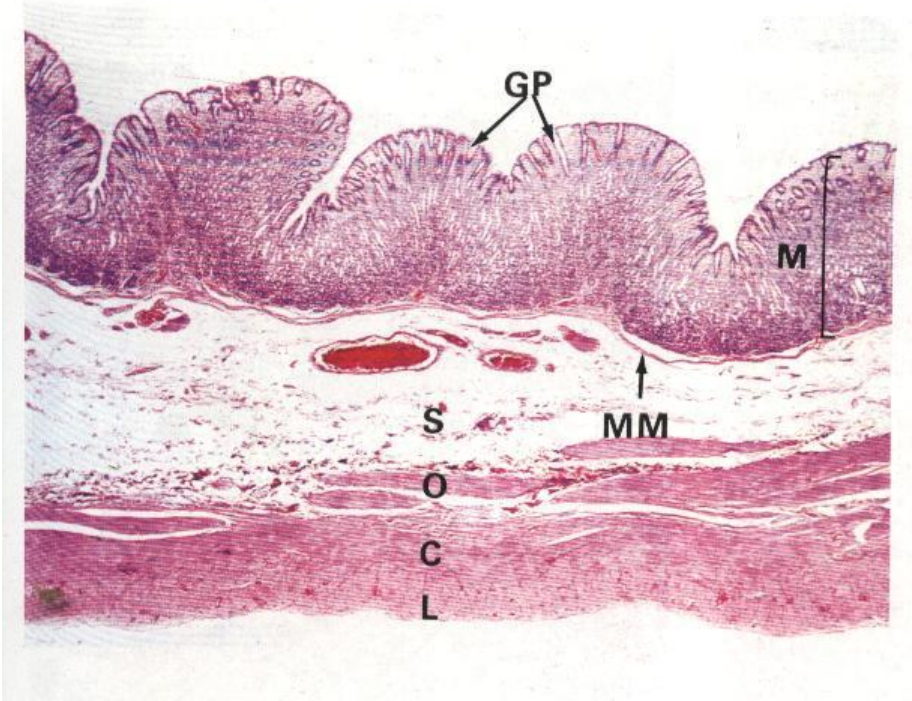
- Cardia
- Fundus / body
- Pylorus

GIT – General Structure

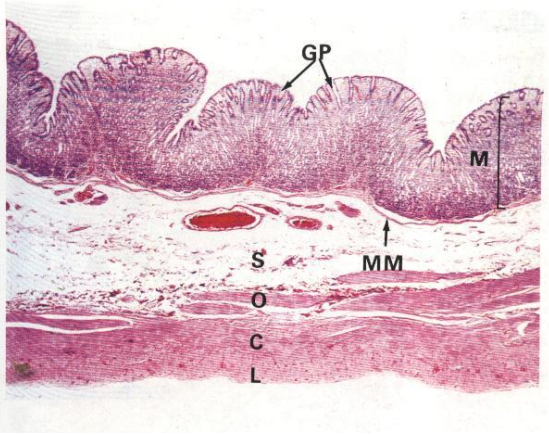
- Mucosa
  - Epithelium
  - Lamina propria
  - Muscularis mucosae
- Submucosa
- Muscularis externa
- Serosa

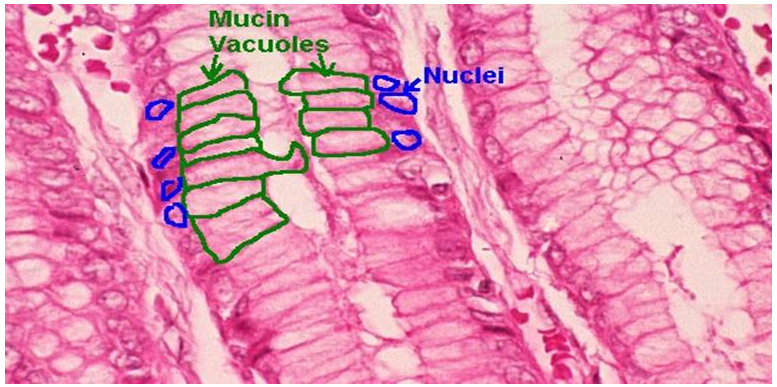
Stomach - Histology

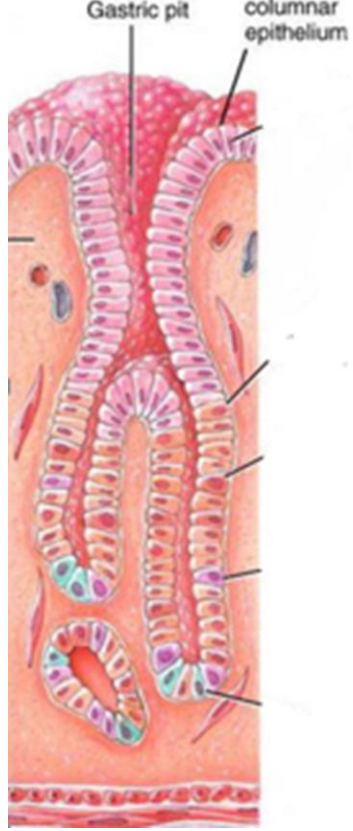
- Mucosa ☛ ***Secretory type***
  - Epithelium
  - Lamina propria
  - Muscularis mucosae
- Submucosa
- Muscularis externa
- Serosa



Stomach - Epithelium





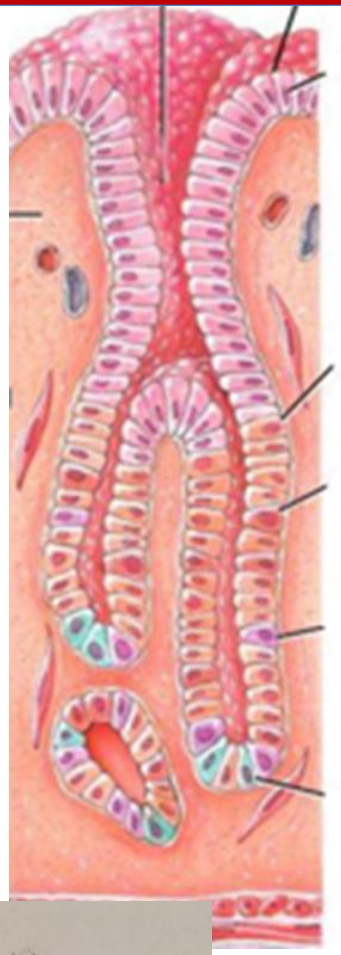


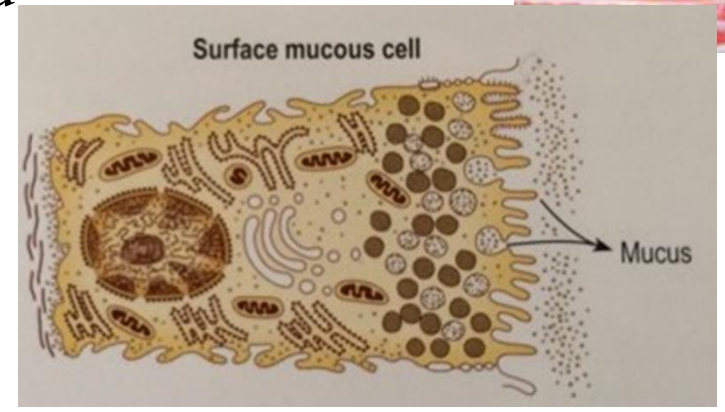
- Simple columnar epithelium covers the surface
- Lines the pits: surface mucous cells-viscous mucous (rich in bicarbonate ions)
- All epithelial cells secrete mucus ☞ protects epithelium from acid
- Insoluble mucus – not mixed with chyme

Tight junctions in epithelial cells ☞ barrier to acid

Stomach - Epithelium

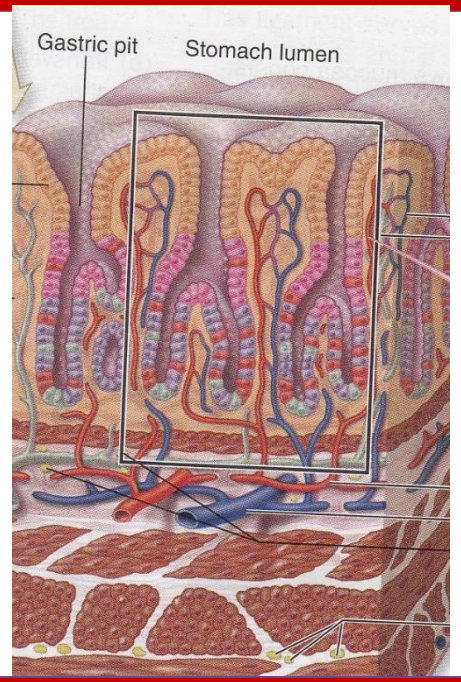
- Simple columnar epithelium covers the surface
- All epithelial cells **secrete mucus** ➡ protects epithelium from acid
- Surface mucous cells ➡ **insoluble mucus**: not mixed with chyme
- Mucous cells lines the pits: **viscous mucous** (rich in bicarbonate ions)
- **Tight junctions** in epithelial cells ☞ barrier to acid





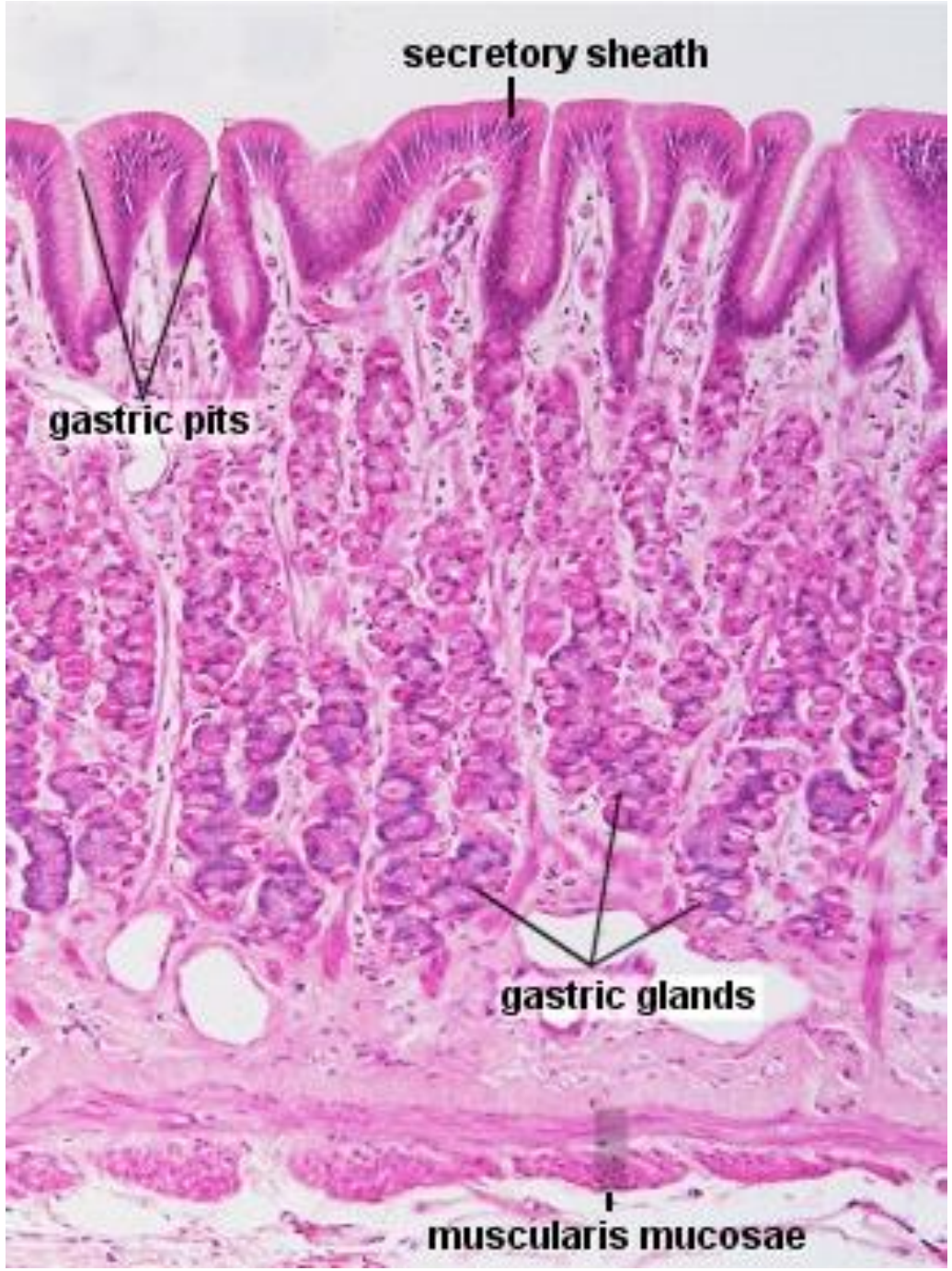
Stomach - Lamina propria

- *Supports mucosal glands*
- *Loose connective tissue*
- *Vascularized*
- *Smooth muscle fibers*
- *Lymphoid cells & lymphatics*



Stomach - Muscularis mucosae

- *Smooth muscle layer*
- *Inner circular & outer longitudinal layers*
- *Contraction : **expels gastric secretions** into the stomach lumen*
- ***Thin strands extend between gastric glands***

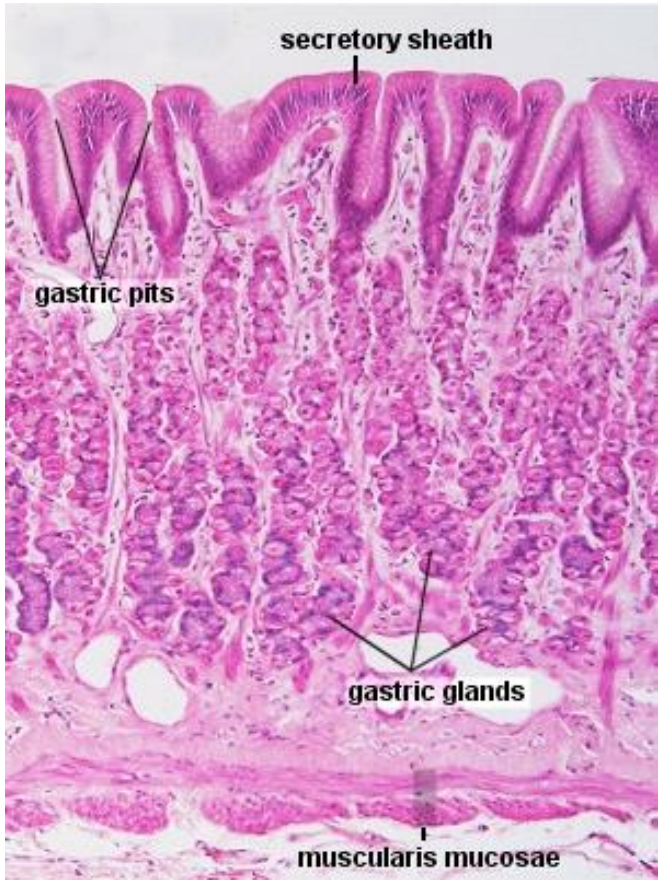

secretory sheath
gastric pits
gastric glands
muscularis mucosae

Epithelium

Lamina propria

Muscularis mucosae

Mucosa



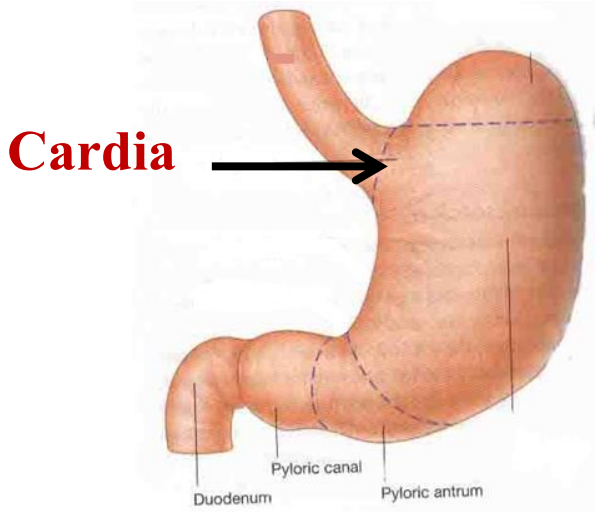
common feature of 3 regions

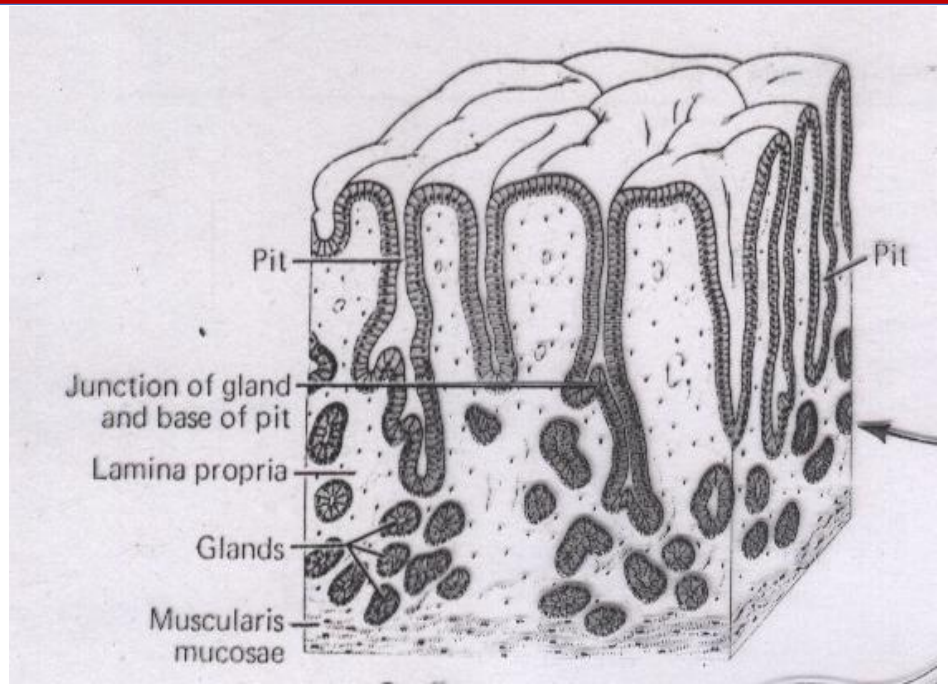
Gastric pits

Surface epithelium invaginates into lamina propria

cardiac glands	gastric glands	pyloric glands

Cardiac gland





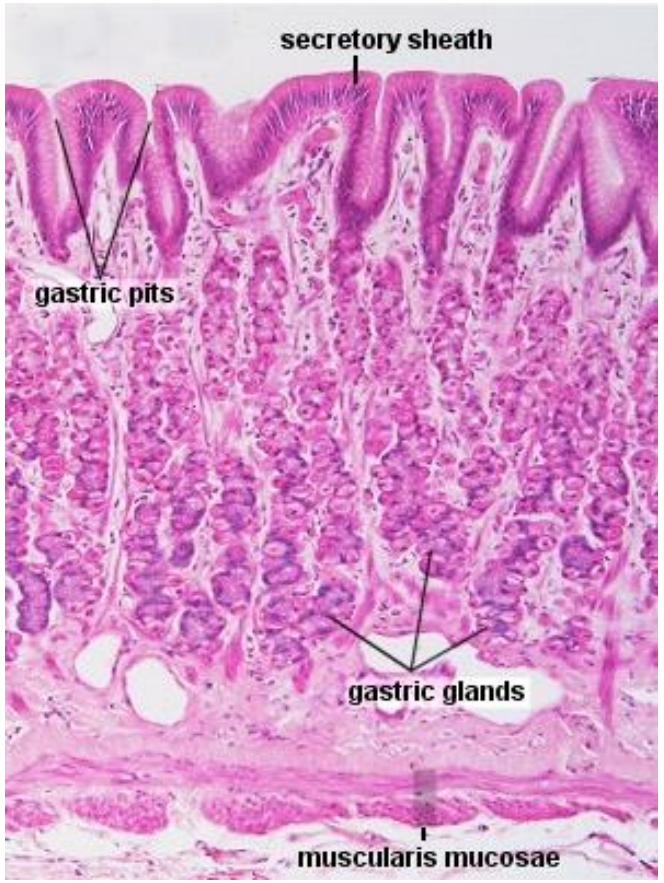
- *Shallow gastric pit*
- *Mainly simple tubular (occasionally branched glands).*
- ***Secrete mucous & lysozymes (attacks bacterial walls)***
- ***Mucus secretary cells+ Few parietal cells : secrete H+ and Cl-***
- ***Few enteroendocrine cells***

Epithelium

Lamina propria

Muscularis mucosae

Mucosa



common feature of 3 regions

Gastric pits

cardiac glands	gastric glands	pyloric glands

Gastric gland

- *Fundus & body*
- *Shallow gastric pit* ☚ *several glands (3-7)*
- *Branched tubular glands*
- *Gland : Isthmus, Neck & Base*
- *Varieties of cells*

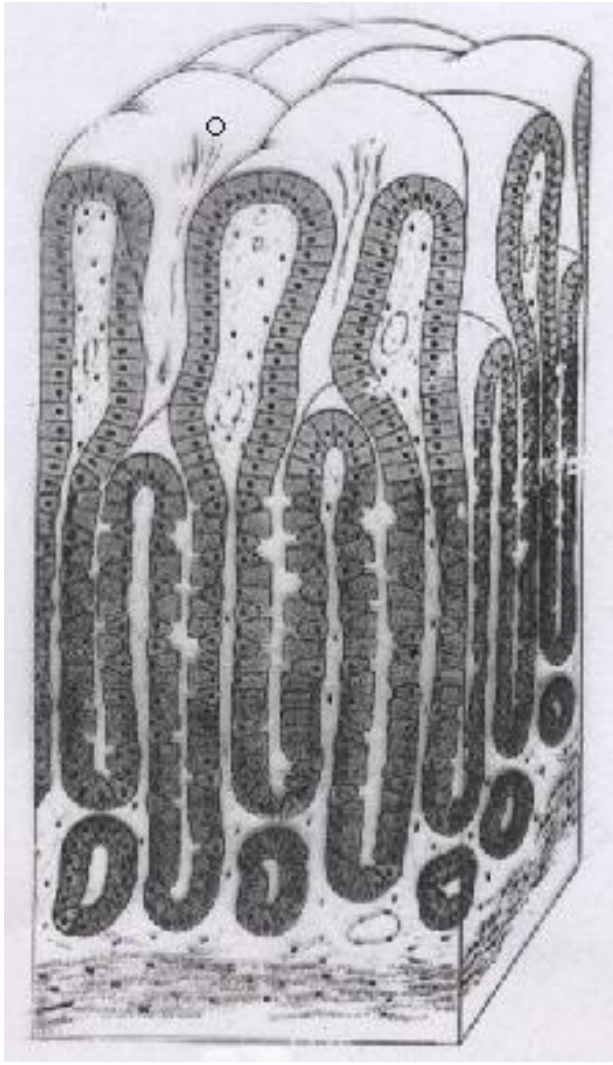
  Chief / peptic / zymogen cells

  Oxyntic cells / parietal cells

  Mucous neck cells

  enteroendocrine cells

  Stem cells



No uniform distribution- epithelial cells

Gland : Isthmus + Neck + Base

stem cells

surface mucous cells

few parietal cells

Mucous neck cells

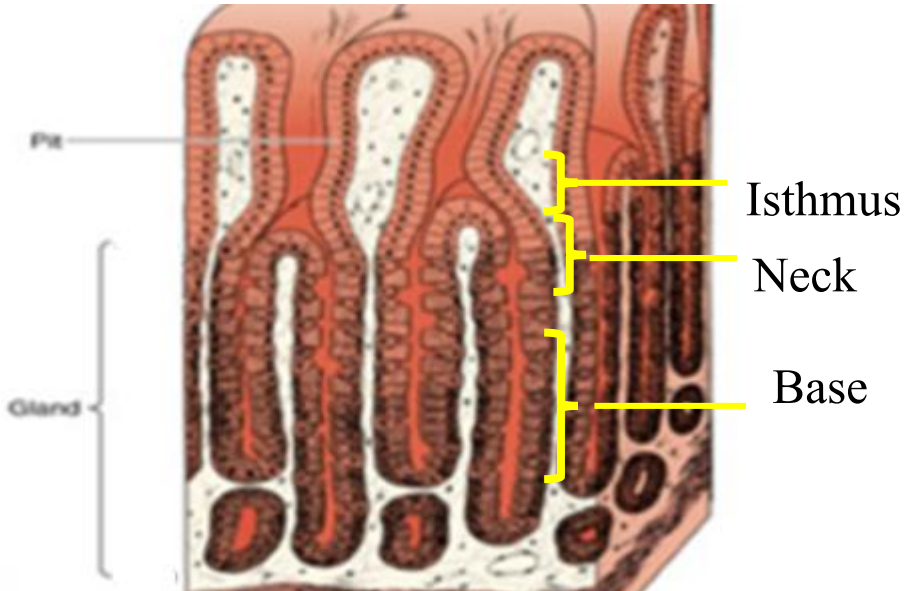
more parietal cells

Stem cells

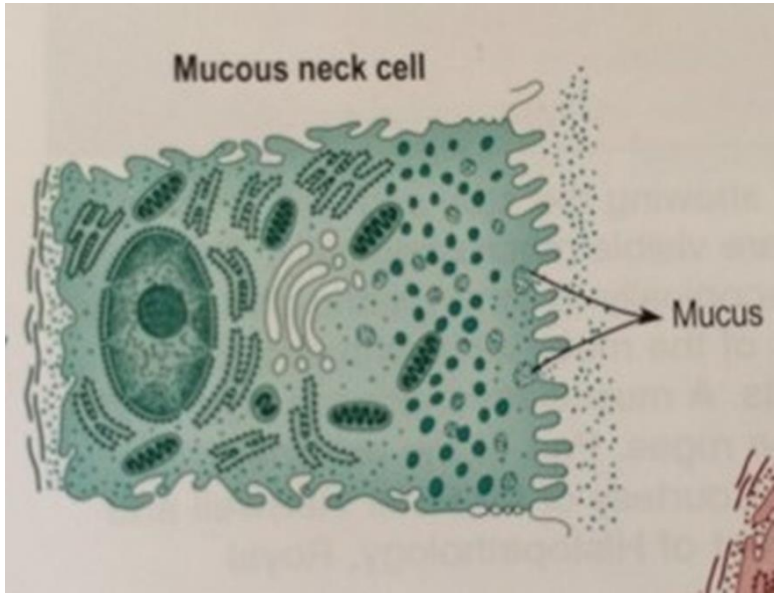
chief cells

Few parietal cells

entero-endocrine cells



Mucus neck cells

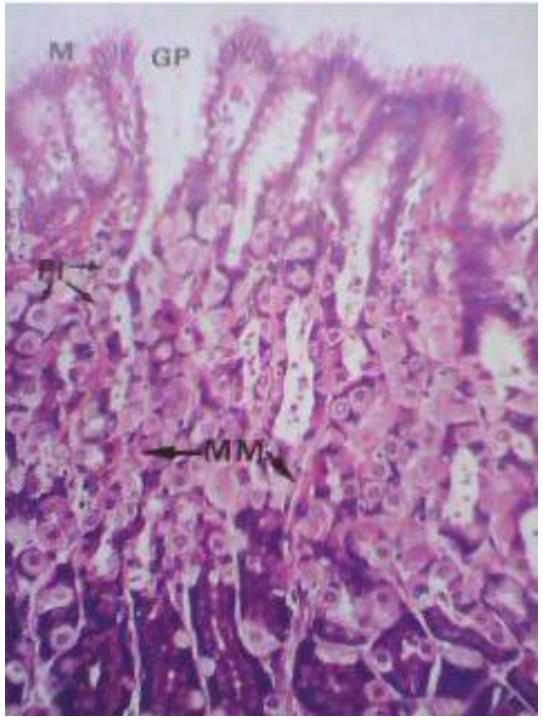


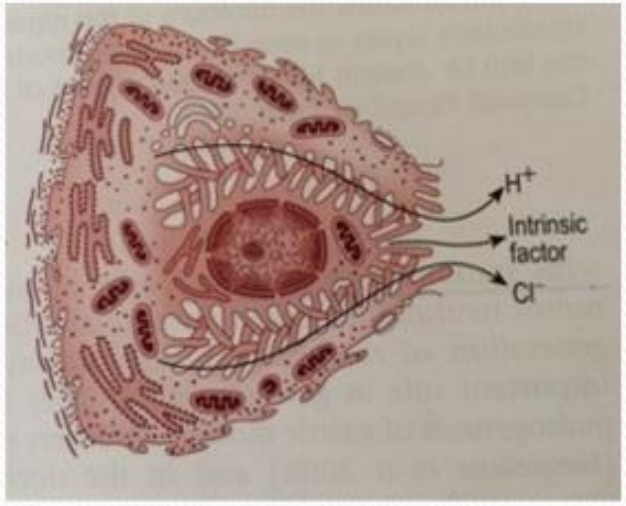
- *Location : near the upper end of the gland*
- *Cluster or Singly between parietal cells*
- *Irregular shape , large cells ,clear cytoplasm*
- *Flattened nuclei – basal location*
- *Secretion : less viscous mucous , less alkaline*

Protect autodigestion

Different chemical structure

Parietal / oxyntic cells





- *Location : along the length of the gland*

  numerous in upper part

- *Ovoid / polyhedral shape , Central nuclei*

- *Cytoplasm : mitochondria – eosinophilic*

- *Resting stage: tubulovesicular structures*

- *Invaginations of apical plasma membrane*

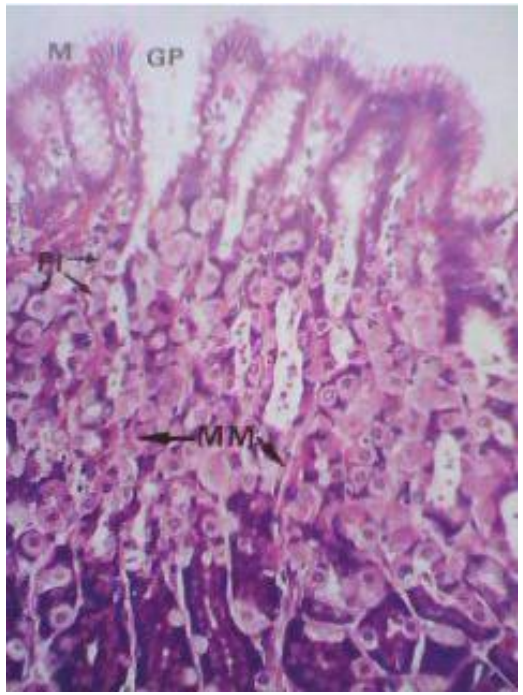
  Intracellular canaliculi ⮠

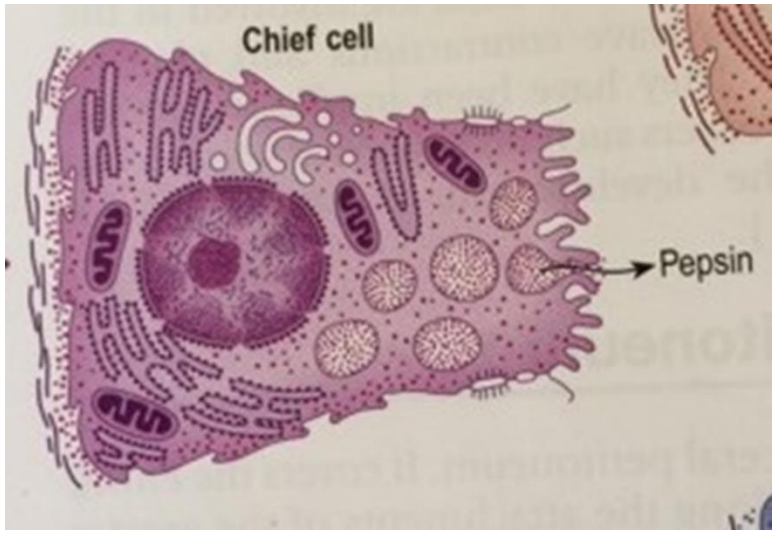
- *Secretion of **HCl** , K, **intrinsic factor***

  ↓ + **vitamin B12**

  Erythrocyte formation

Chief / peptic / zymogen cells





- *Location : basal part of the gland*
- *Cuboidal shape*
- *Features of protein synthesizing & exporting cells*
- *Basally located nuclei + granules in cytoplasm*
- *Cytoplasm : rER , Rhibosome – basophilic*
- *Synthesis : pepsinogen* ***(precursor form)***

Lipase

Entero-endocrine cells

- *Location : near the bases of the gastric gland + neck*
- *Example : Serotonin*
- *Tumors : overproduction of Serotonin*

↓

Mucosal vasoconstriction

↓

damage

Stem cells

- *Location : isthmus + neck region of the gastric gland*
- *Low columnar cells with oval nuclei*
- *Replace all the type of cells*
- *High rate of mitosis, migrate upwards & downwards*

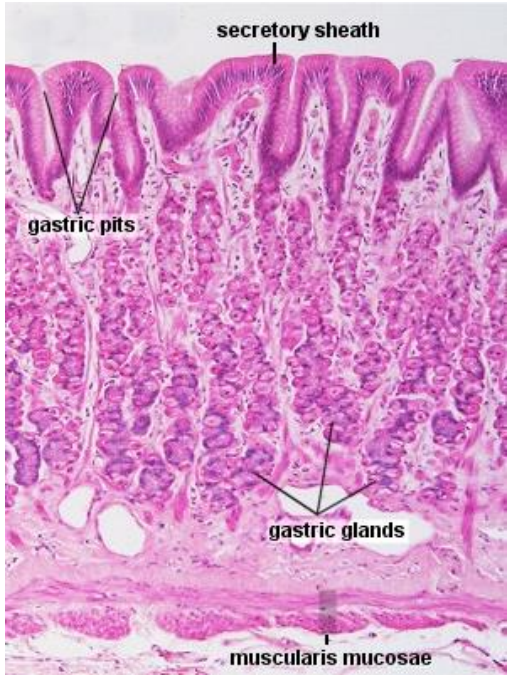
Epithelium

Lamina propria

Muscularis mucosae

Mucosa

common feature of 3 regions



Gastric pits

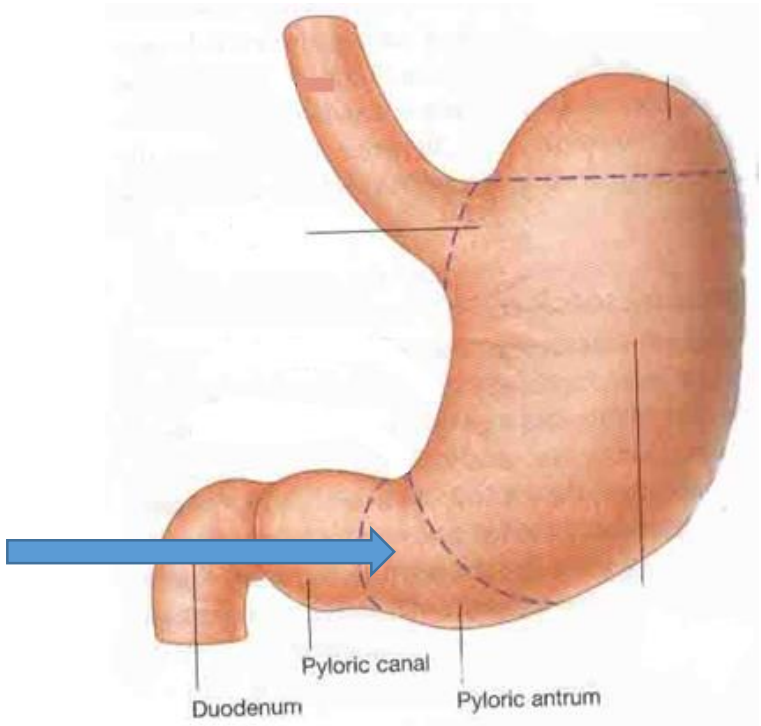
cardiac glands

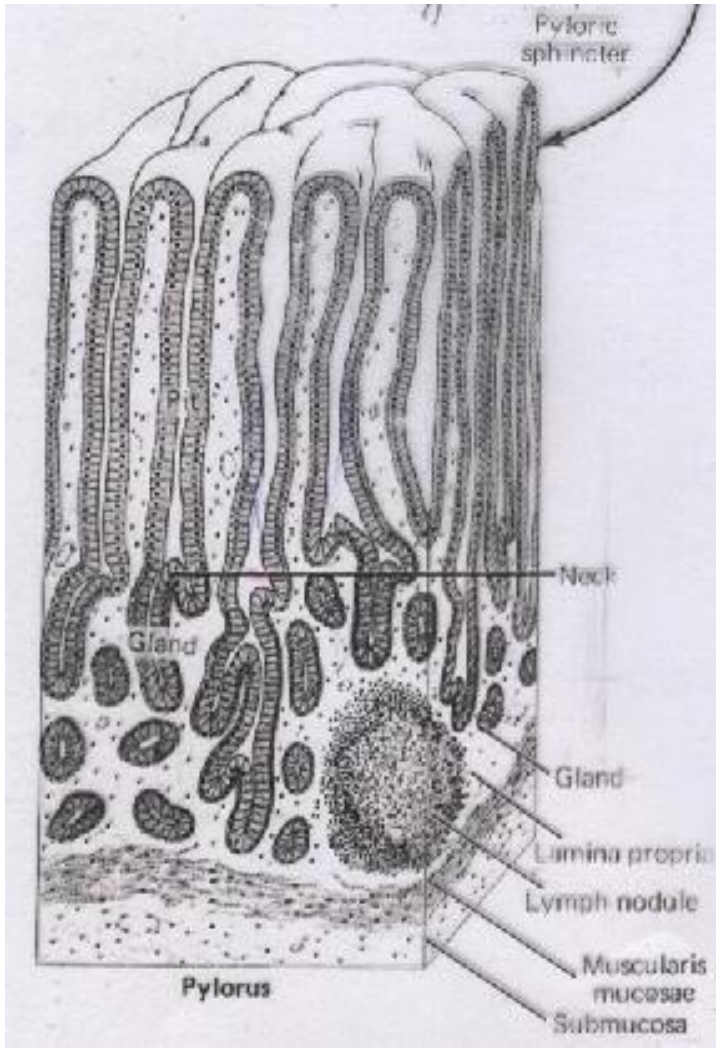
gastric glands

pyloric glands

Pyloric gland

Pylorus



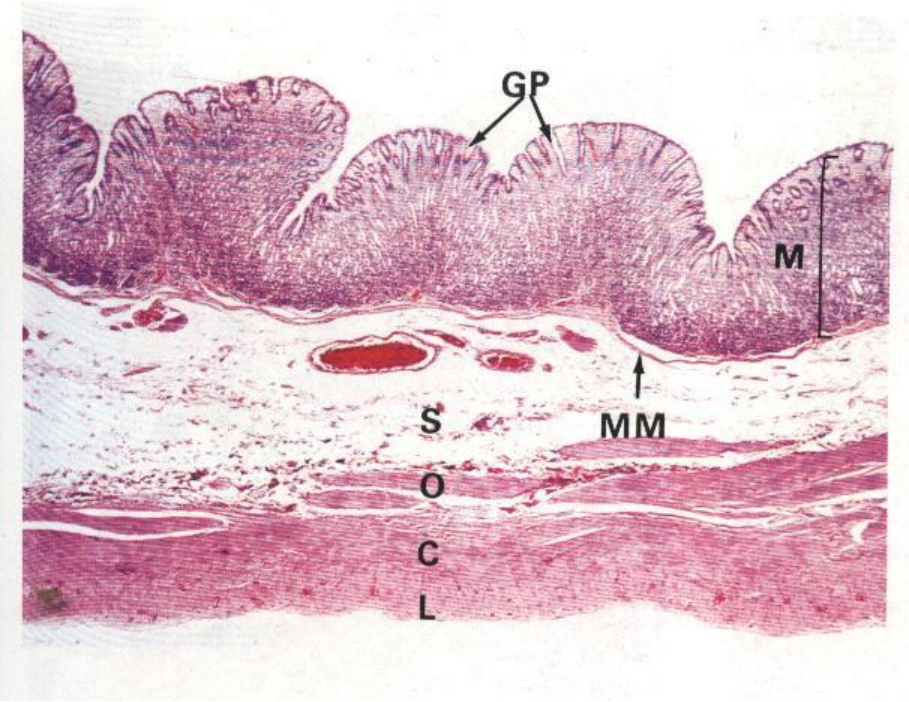


Pyloric gland

- *Deep/long gastric pit (2/3 of mucosa)*
- *Branched tubular glands, coiled*
- *Short glands*
- *Exclusively mucus secretory cells , parietal cells*
- *Secrete Gastrin – 'G' cells : stimulate parietal cells*
- *Somastostatin – D cells : inhibit release of other hormones (gastrin)*

Stomach

- Mucosa
  - Epithelium
  - Lamina propria
  - Muscularis mucosae
- Submucosa
- Muscularis externa
- Serosa

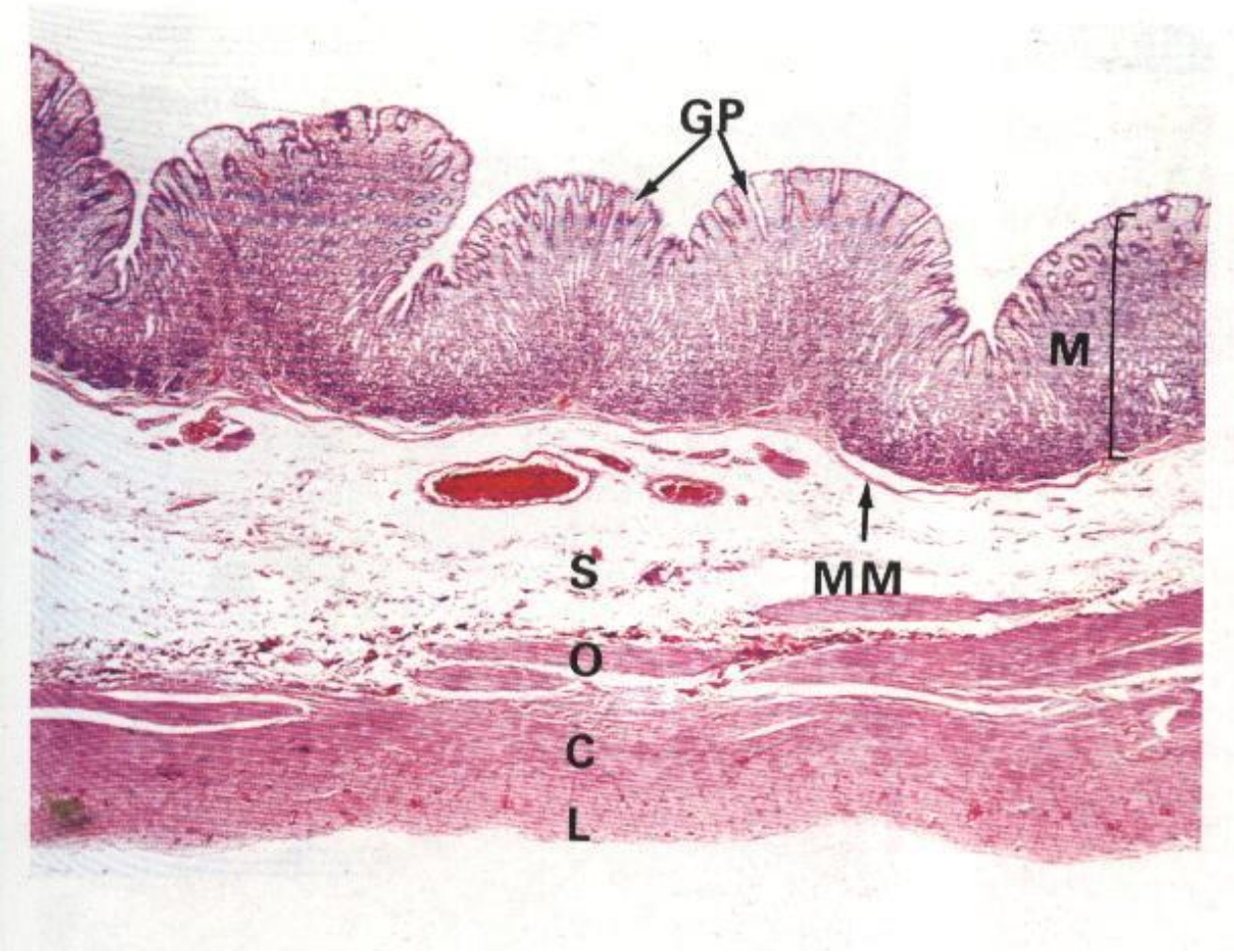


Submucosa

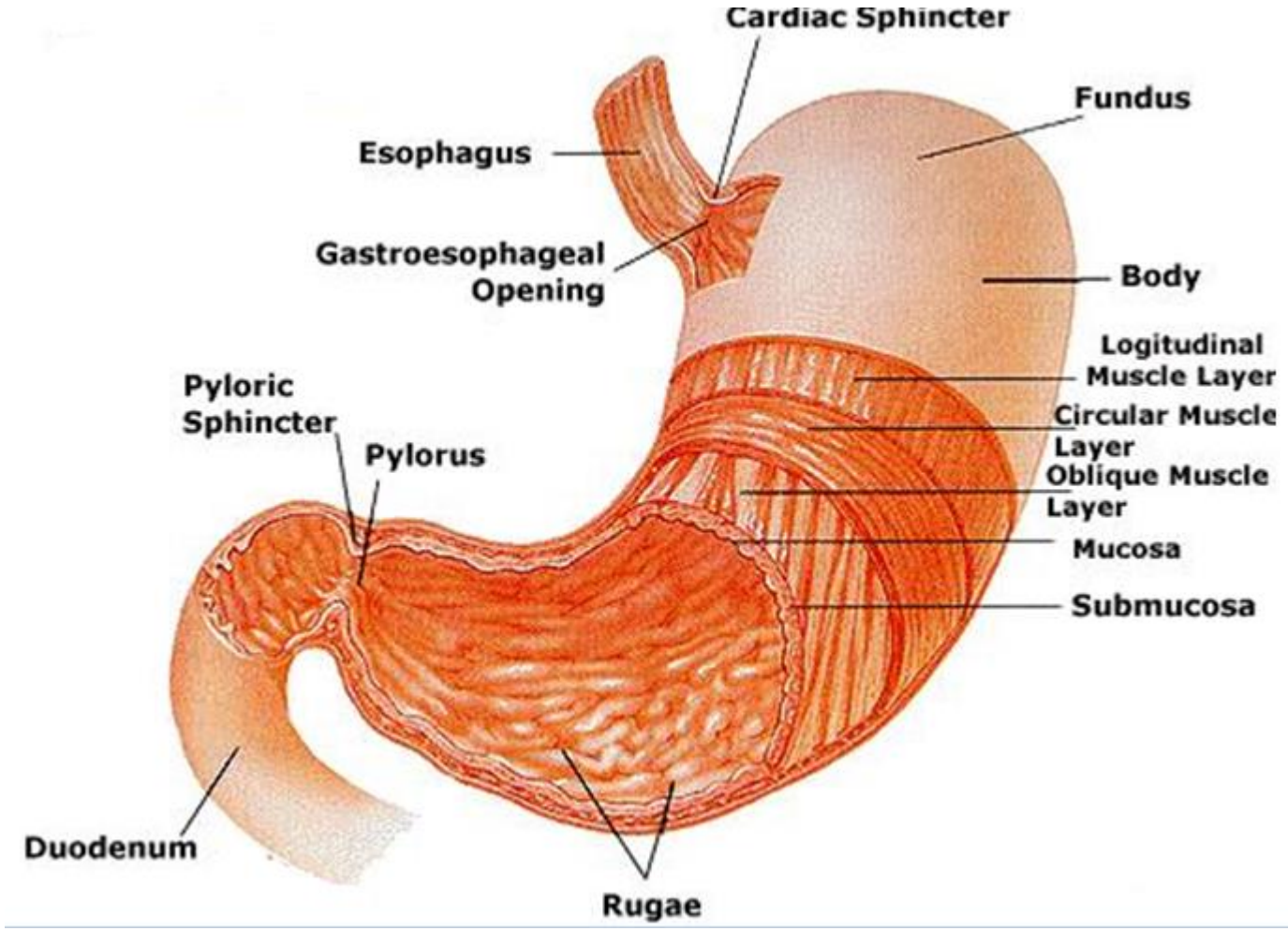
- Dense connective tissue
- Macrophages
- Lymphocytes
- Plasma cells
- Large blood vessels
- Large lymph vessels
- Nerve plexus - meissner's plexus

Stomach

- Mucosa
  - Epithelium
  - Lamina propria
  - Muscularis mucosae
- Submucosa
- Muscularis externa
- Serosa



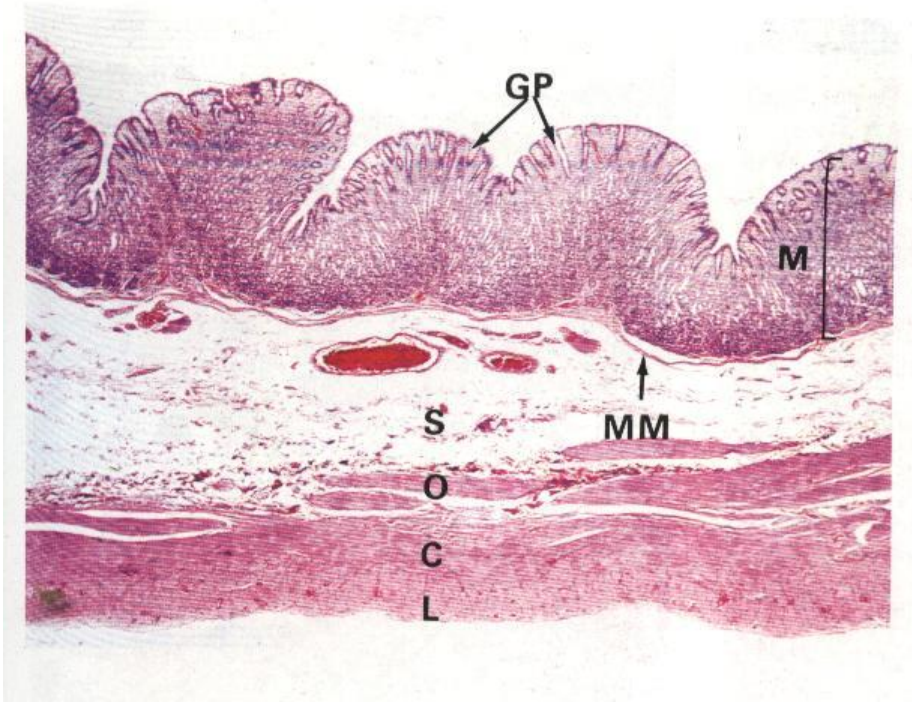
Muscularis Externa



- *at pylorus :**thick circular layer forms pyloric sphincter***
- ***Nerve plexus : myenteric plexus (Auerbach's plexus)***

Stomach

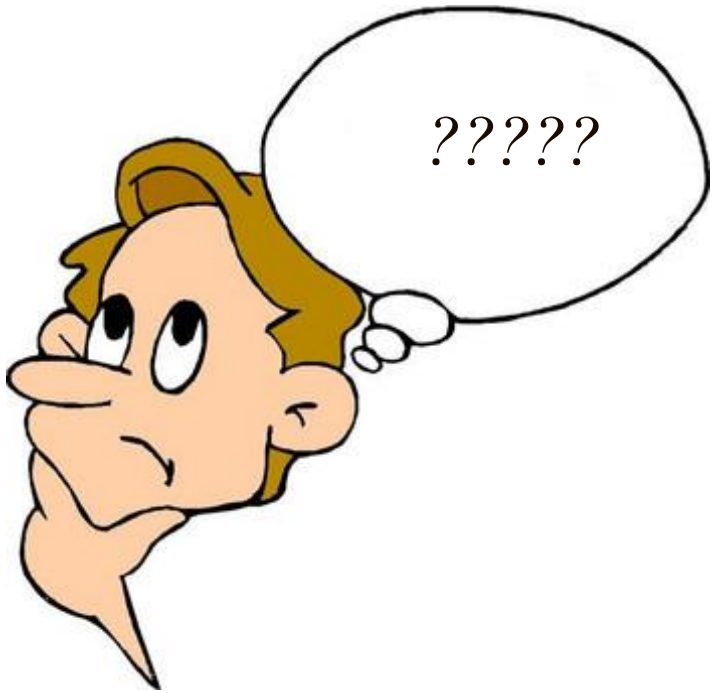
- Mucosa
  - Epithelium
  - Lamina propria
  - Muscularis mucosae
- Submucosa
- Muscularis externa
- Serosa



Serosa

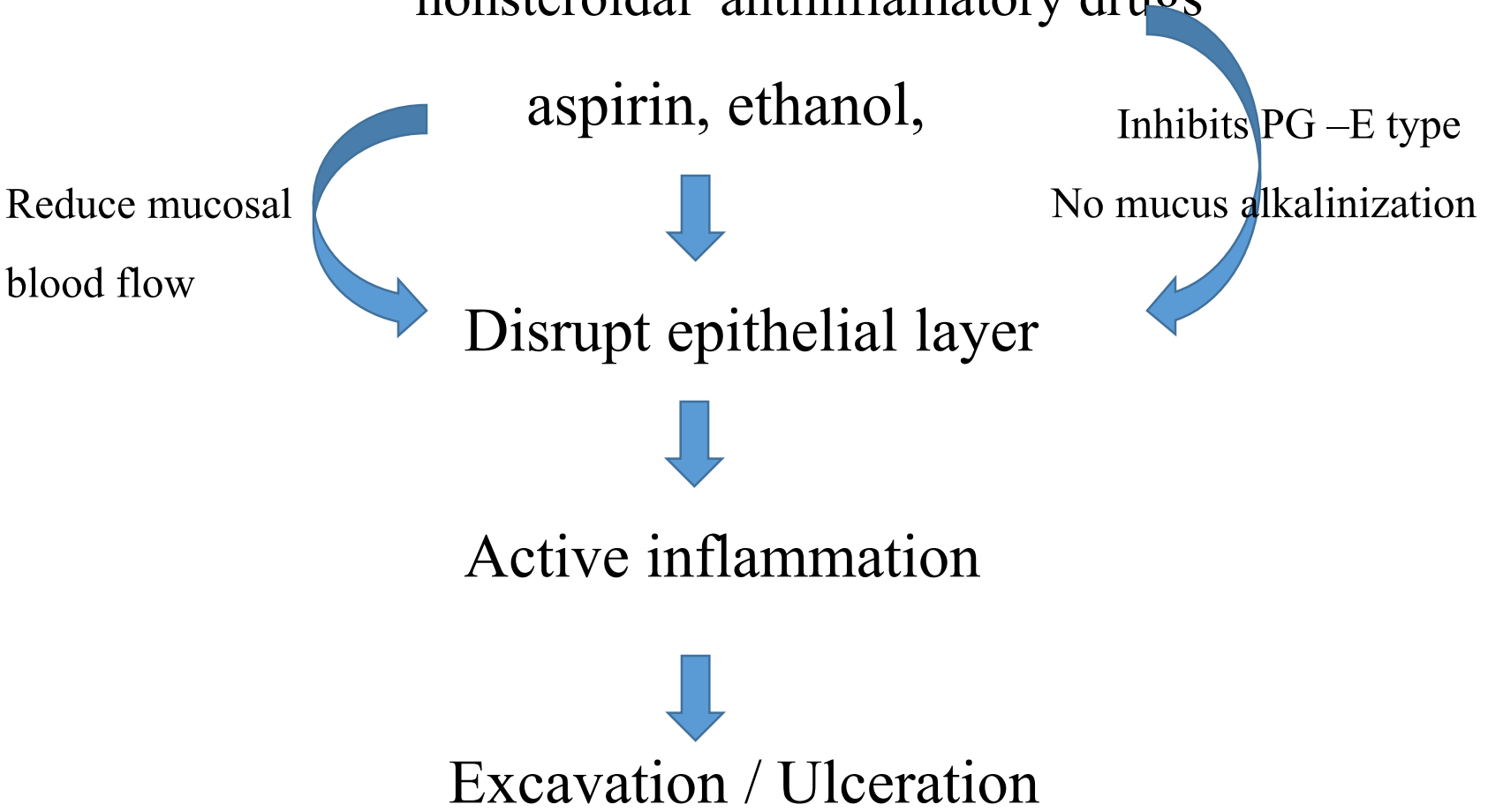
- Outermost layer
- Thin connective tissues
- Major vessels & nerves
- Adipose tissue

What are the protective mechanisms/ measures of mucosa ??



Clinical Applications

Gastric ulcers: stress, microorganisms, hyperosmolality of meals, nonsteroidal antiinflamatory drugs aspirin, ethanol,



Clinical Applications

Gastroeophageal reflux disease

Decrease in lower oesophageal sphincter tone

↓

Incompetent barriers at the Gastroeophageal junction

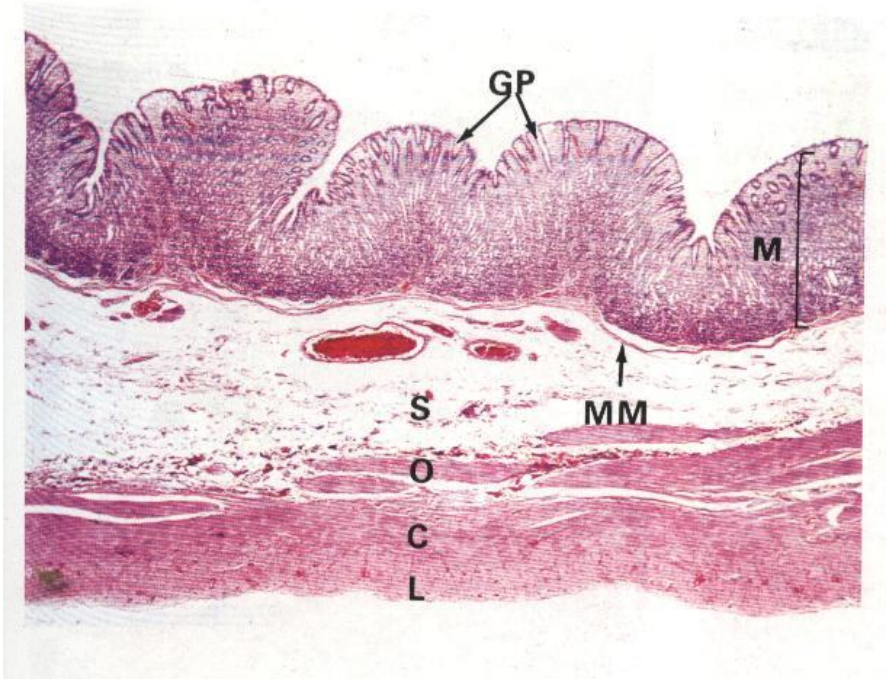
↓

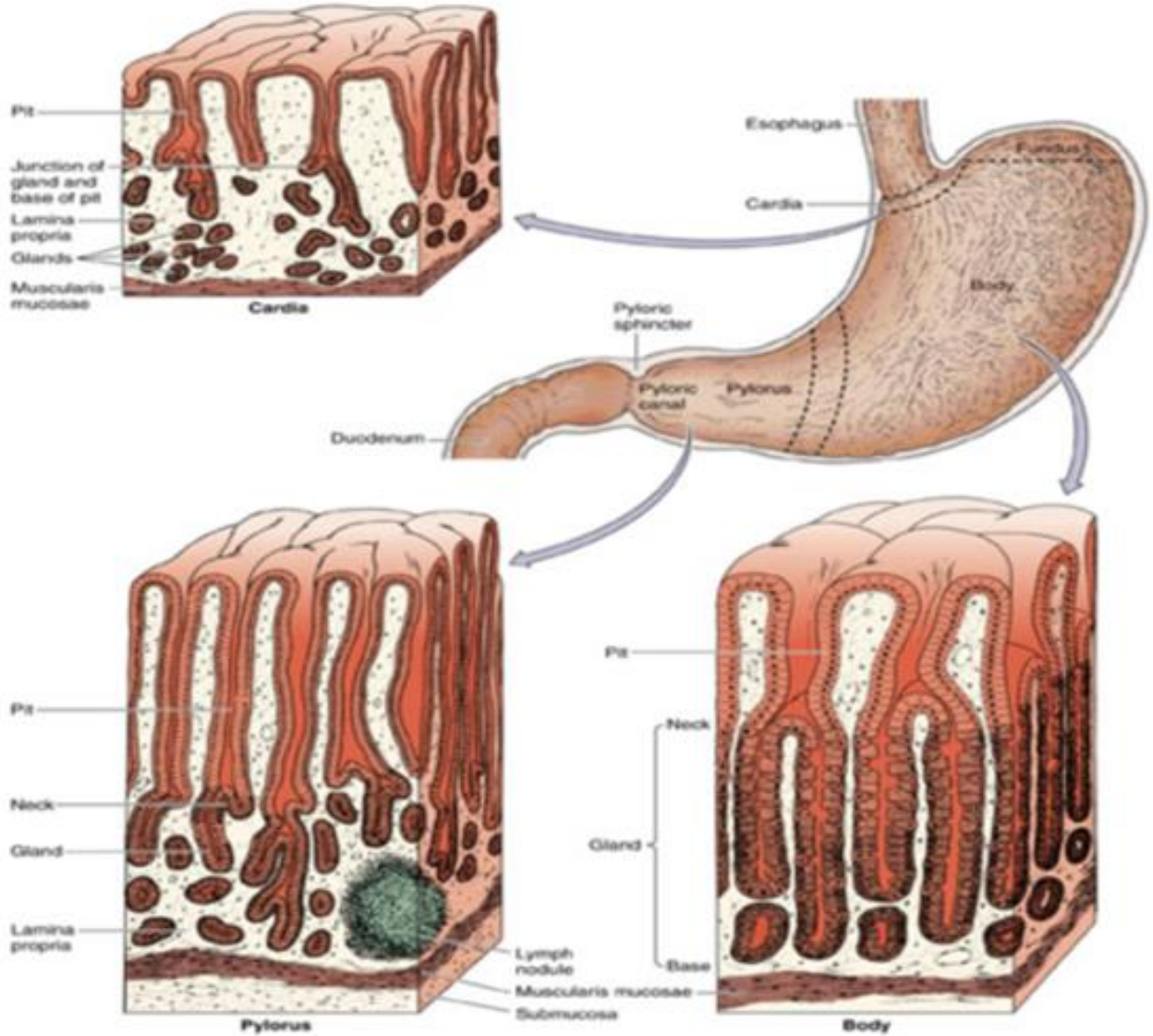
Poor mucosal defenses to acid, pepsin, bile….

↓

Symptoms : heartburn + atypical chest pain

Summary


GP
M
MM
S
O
C
L


Pit
Junction of gland and base of pit
Lamina propria
Glands
Muscularis mucosae
Cardia
Esophagus
Fundus
Cardia
Body
Pyloric sphincter
Pyloric canal
Pylorus
Duodenum
Pit
Neck
Gland
Lamina propria
Lymph nodule
Muscularis mucosae
Submucosa
Pylorus
Pit
Neck
Gland
Base
Body

References

- **Basic Histology - L.U.Junqueira**
- **Wheater’s Functional Histology**


THANK YOU