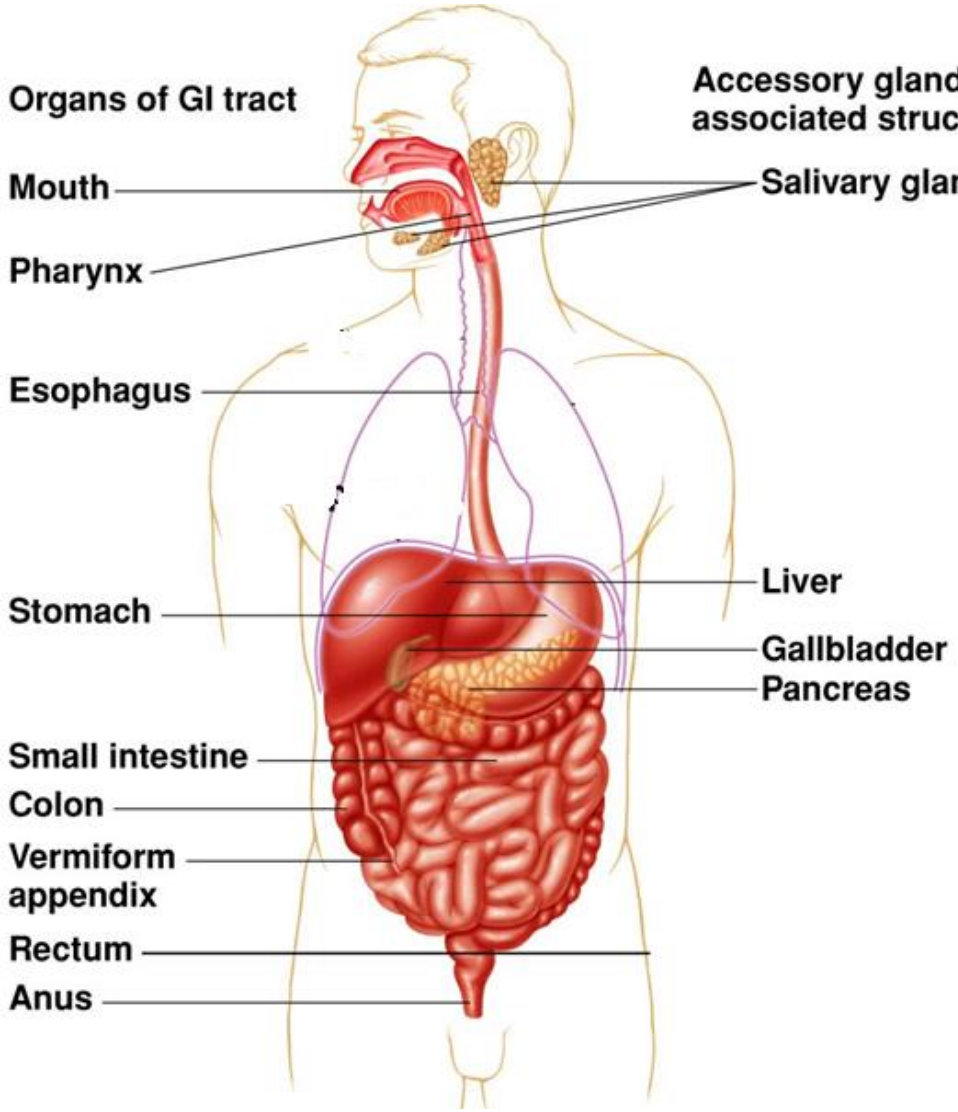
Basic Structure of Digestive Tract

Objectives

- Describe the general structure of the digestive tract
- Describe the basic differences in the structure of various regions
- State the basic functions of the digestive tract in relation to its structure

Parts & Functions of the digestive system



- *Ingest the food*
- *Transport the food*
- *Digest the food into smaller usable components (Mechanical & Chemical digestion)*
- *Absorb the necessary nutrients & water into the bloodstream*
- *Expel the waste products from body*

Parts of the digestive tract

- Gastrointestinal (GI) tract (Alimentary canal)
  - Tube like structure
  - Direct link/path between organs
  - **Structures**
    - Mouth /Oral Cavity
    - Pharynx
    - Esophagus
    - Stomach
    - Duodenum
    - Jejunum
    - Ileum
    - Cecum
    - Ascending colon
    - Transverse colon
    - Descending colon
    - Sigmoid colon
    - Rectum
    - Anus

- **Accessory structures or associated glands**
  - Not in tube path
    - Salivary glands
    - Liver
    - Gall bladder
    - Pancreas

General structure -GIT

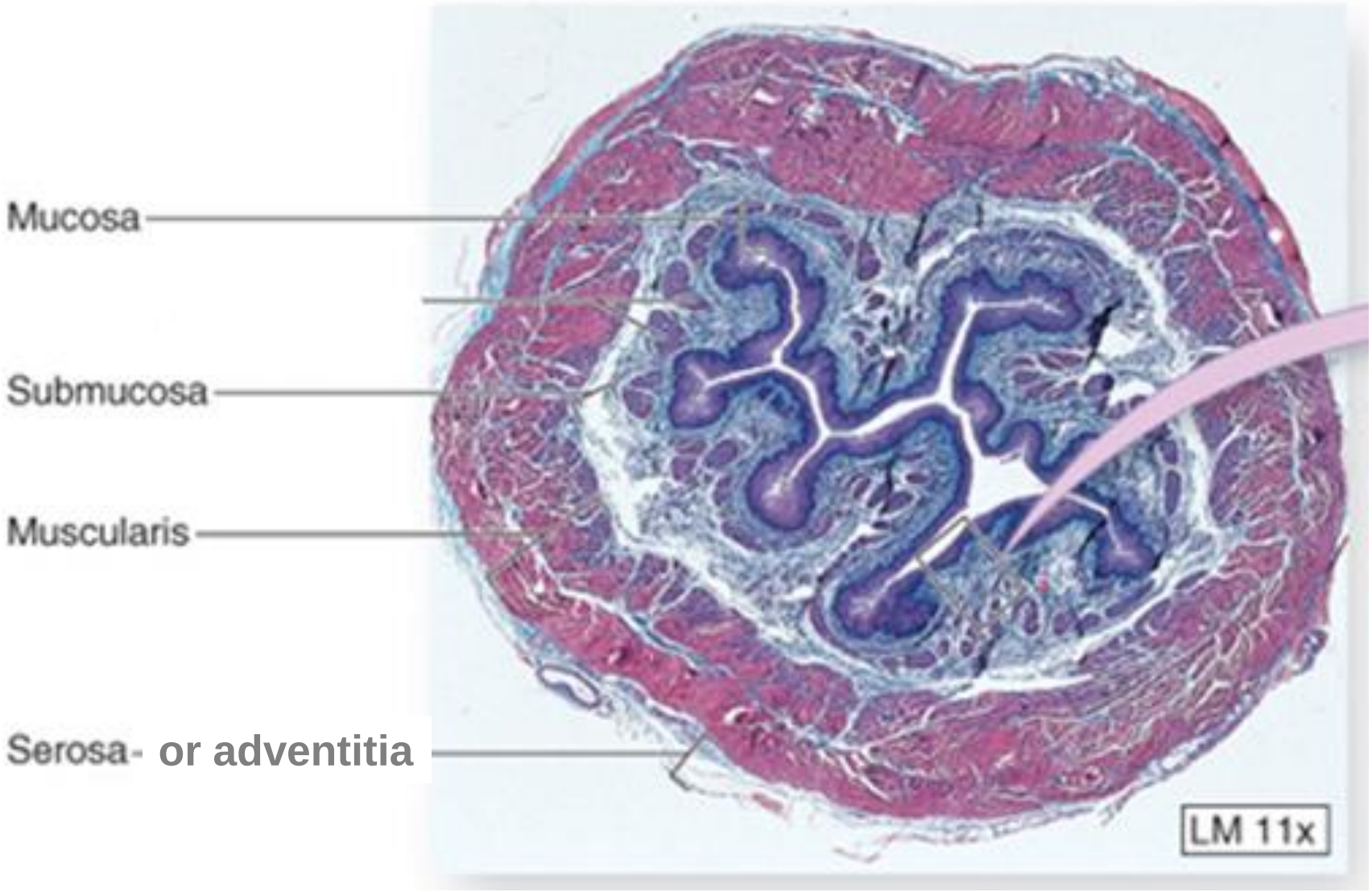
- *Fibromuscular tube : upper end of oesophagus up to lower end of anal canal*

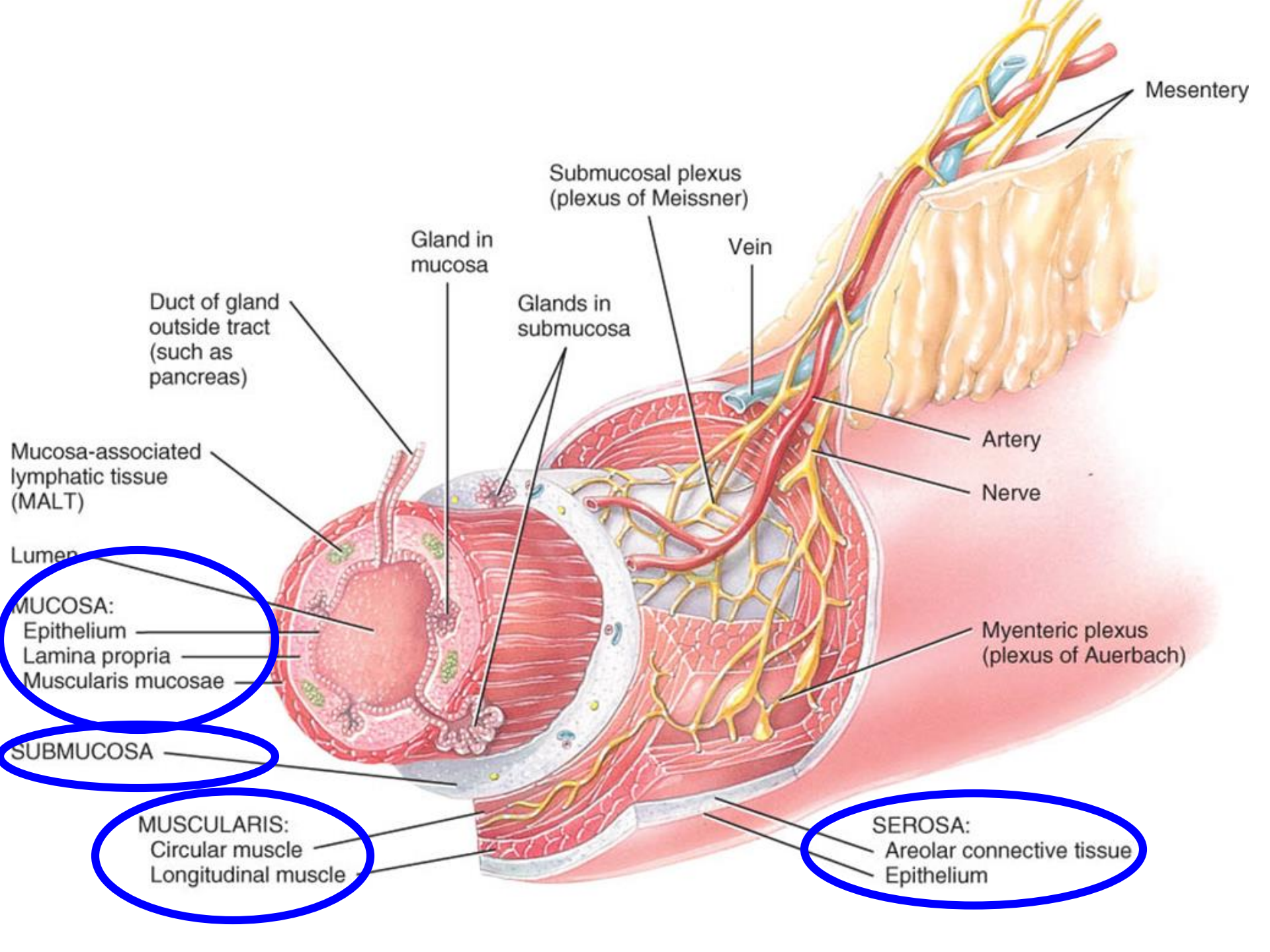
- *4 layers (from inner to outer side)*

General structure -GIT

- Mucosa
  - epithelium
  - lamina propria
  - Muscularis mucosae
- Submucosa
- Muscularis externa
- Serosa / Adventitia

4 concentric layers of the GI tract




Mesentery
Submucosal plexus
(plexus of Meissner)
Gland in
mucosa
Vein
Duct of gland
outside tract
(such as
pancreas)
Glands in
submucosa
Artery
Nerve
Mucosa-associated
lymphatic tissue
(MALT)
Lumen
MUCOSA:
Epithelium
Lamina propria
Muscularis mucosae
Myenteric plexus
(plexus of Auerbach)
SUBMUCOSA
MUSCULARIS:
Circular muscle
Longitudinal muscle
SEROSA:
Areolar connective tissue
Epithelium

Mucosa

- Epithelium
  - Lines the luminal surface of the mucosa
- lamina propria
- Muscularis mucosae

Epithelium

- Wet surface epithelium lubricated by mucus, lying on the basal lamina or basement membrane
- It varies in the different parts of the GI tract: adapted to the specific functions performed by each part of digestive tube
- Invaginates into underline connective tissue to form glands

Epithelium

- At some sites epithelium is entirely **protective**- stratified squamous epithelium
- At other sites it is **secretory** – mucus secreting epithelium of stomach
- **Absorptive** simple columnar epithelium in small intestine
- *Individual mucus secreting cells of epithelium- goblet cells scattered throughout the epithelial lining*

Lamina propria

- Loose areolar connective tissue (variable thickness) present beneath the epithelium
- Collegen & reticular fibres + glucosaminoglycan matrix
- contains mucosal glands, blood v., lymph v., GALT, macrophages, eosinophils, fibroblasts , nerves
- diffuse lymphatic tissue (lymphocytes + plasma cells)
- nodular lymphatic tissue & lymphoid follicles
- blood capillaries - fenestrated type: the absorbed products of digestion diffuse into the circulation through these capillaries.

Villi

- Finger like projections of the mucosa into lumen of gut
- Surface epithelium + connective tissue core
- Seen only in the small intestine
- ↑ Surface area for absorption
- Microvilli : luminal surface

Muscularis mucosae

- Forms the boundary between the mucosa & submucosa

- Thin, double layer of smooth muscle

  Inner circular

  Outer longitudinal

- Contraction of smooth muscle causes an independent local moments - propulsion of food

Basic types of mucosa in GIT

- Protective
- Secretory
- Absorptive
- Absorptive/Protective

Protective type

- **Mouth, pharynx, oesophagus and anal canal**

Stratified squamous non keratinzed epithelium

Secretory type

- **Stomach**
- Long, closely packed tubular glands in mucosa
- Glands – simple / compound

Absorptive type

- **Entire SI**
- Finger like villi with intervening cypts.
- Duodenum has submucous glands (Brunner's glands).

Absorptive/Protective type

- **Entire large intestines**
- Closely packed straight glands.
- Glands – mucus secreting goblet cells.
- Epithelium adopted for water reabsorption

General structure -GIT

- ✓ Mucosa
  - epithelium
  - lamina propria
  - Muscularis mucosae
- Submucosa
- Muscularis externa
- Serosa / Adventitia

Submucosa

- Lies between mucosa & muscularis externa
- Coarse areolar CT : higher number of collagen fibres
- Thicker than lamina propria
- Elastic fibres ↑↑
- Lymph tissue ↑↑
- Comparatively large blood vessels
- No glands except duodenum (brunner's gland)
- Nerves plexus: Meissner's plexus (part of enteric nervous system)

  network of neuron + interconnecting unmyelinated nerve fibres

  → **motor neurons** + sensory neurons + interneurons

  Innervate Muscularis mucosae & intestinal glands

General structure -GIT

- Mucosa
- Submucosa
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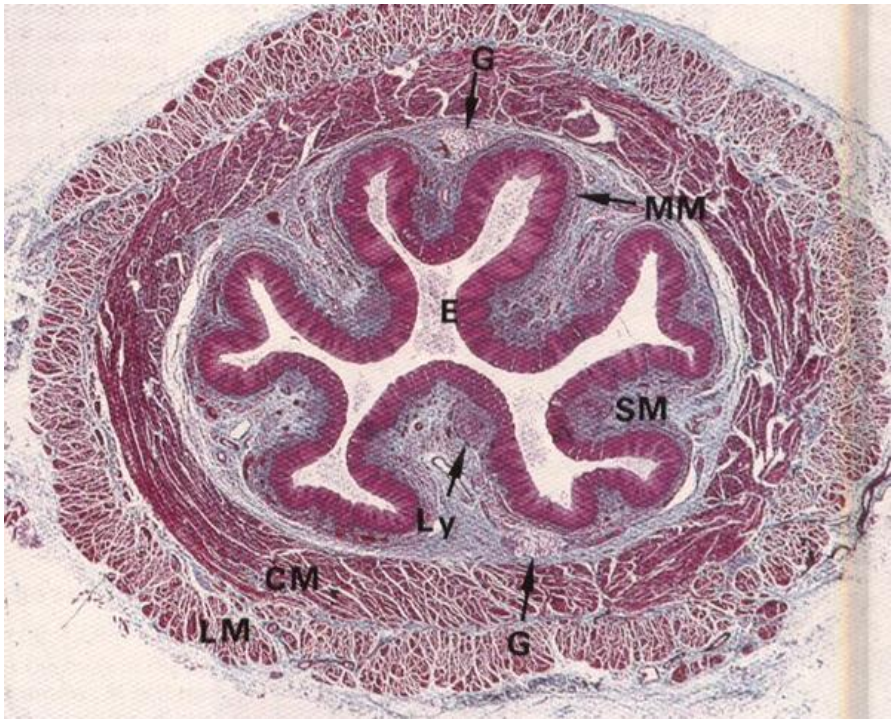


Muscularis externa

- 2 concentric layers
  - Inner circular layer
  - Outer longitudinal layer
- Help - mix & propel the content of GIT
- Relatively thick layers of smooth muscle (***except oesophagus + anal canal***)
- Rhythmic contraction produce peristalsis
- Taenia coli & sphincters

Muscularis externa

- Outer longitudinal layer

↓

Contraction shortens gut and ↑ diameter of lumen

- Inner circular layer

↓

Contraction constricts and narrows the lumen

Muscularis externa

- Between the 2 layers - Vascular plexus
  - **Nerve plexus**

Myenteric / Auerbach's plexus ←

second component of the enteric nervous system

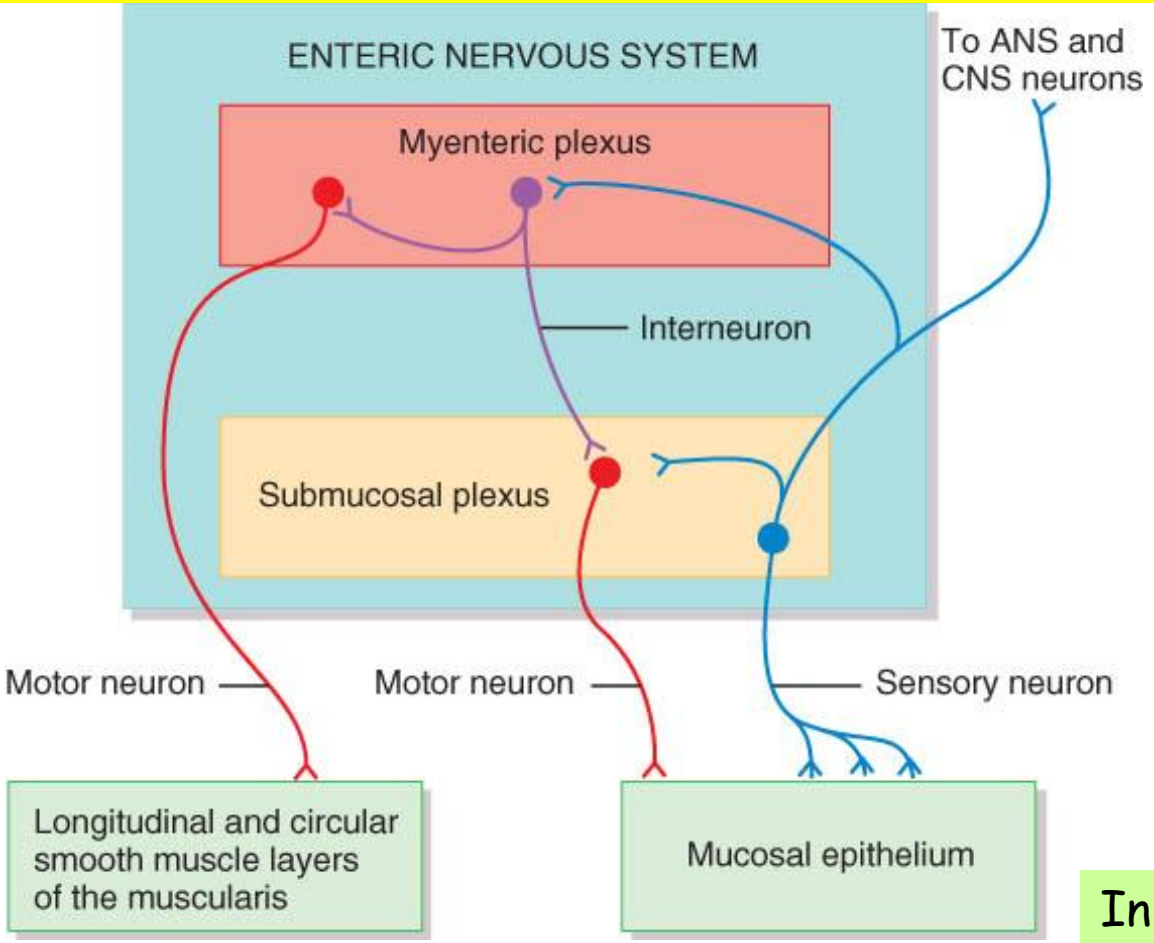
motor neurons + sensory neurons + interneurons

innervate the smooth muscle of muscularis externa

- Interstitial cells of Cajal : pacemaker

Close contact with nerve terminal, numerous gap junctions with each other & smooth mm

Enteric Nervous System



Inhibitory effect

- 100 millions of neurons
- Functioning aspect : self –sufficient but influenced by **sympathetic** & **parasympathetic system** ⇨ Stimulatory effect

- can function autonomously even if sym & parasym is completely cut

General structure -GIT

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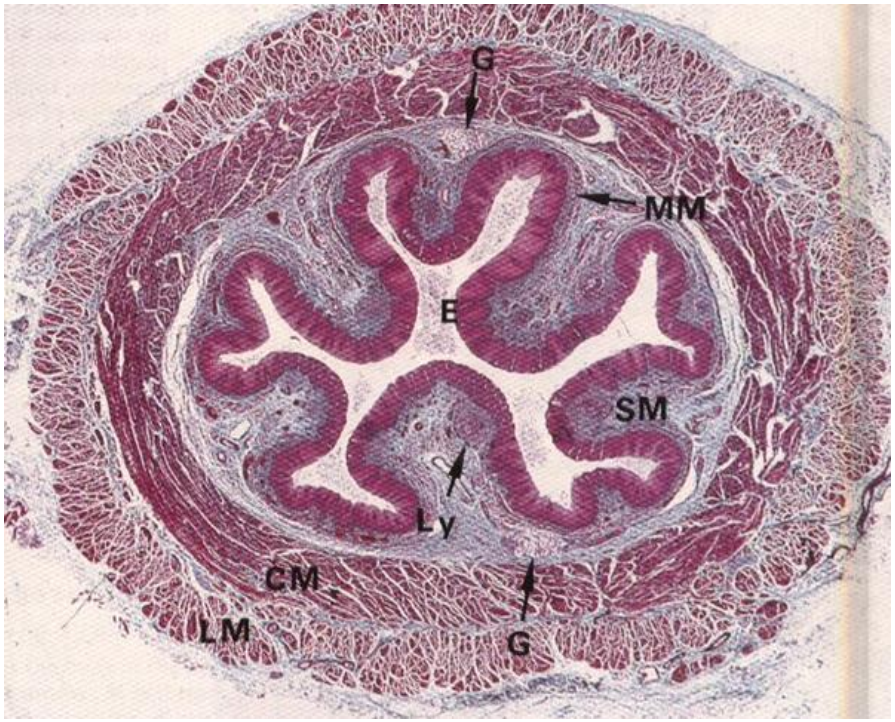
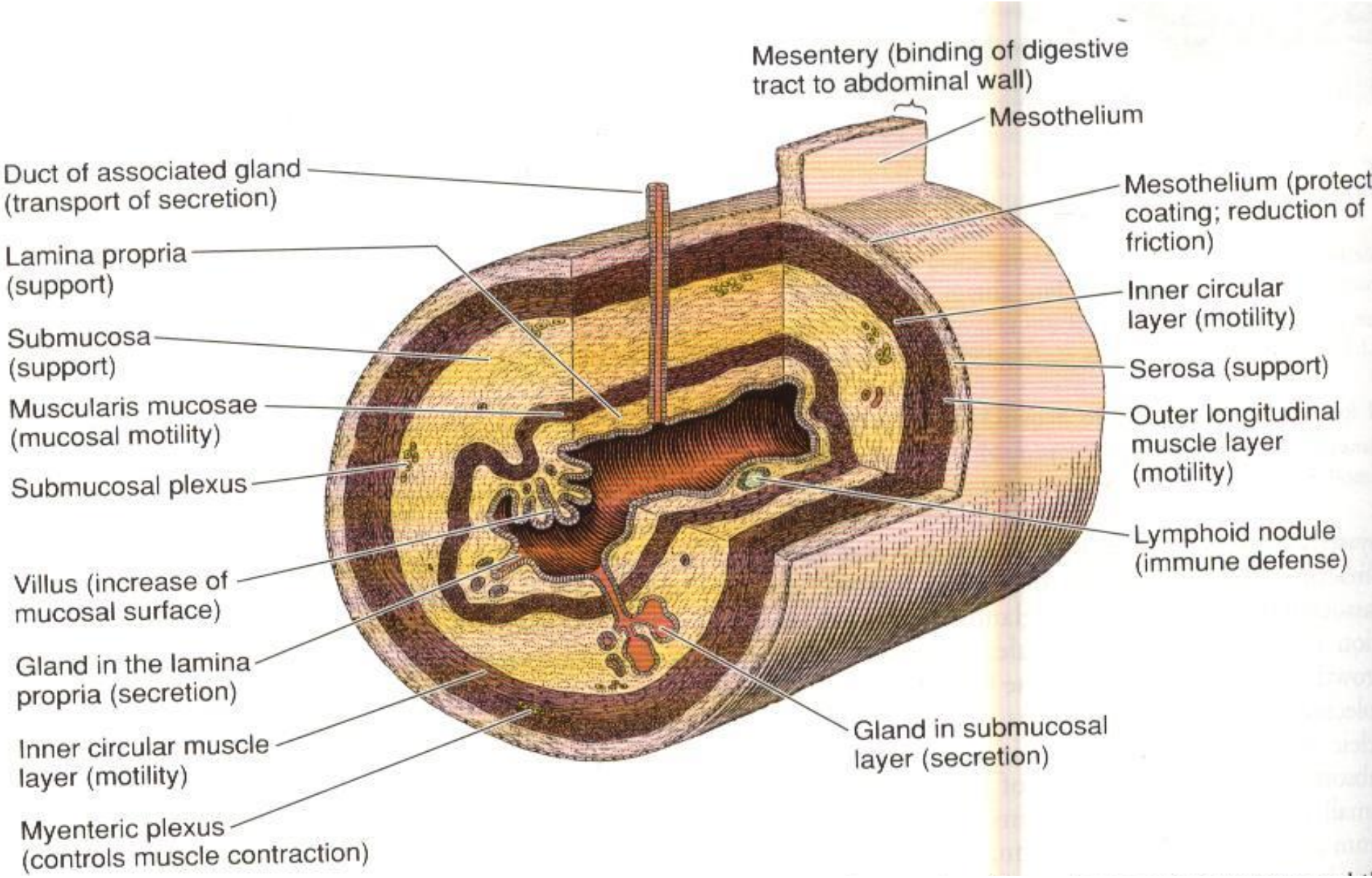


Serosa / Adventitia

- Outermost thin layer of connective tissue
- Dense elastic fibres ↑ ↑
- Large blood vesseles , lymphatics & Adipose tissue
- On intraperitoneal parts: simple squamous epithelium (mesothelium) is present outer to the connective tissue layer
- Connective tissue + mesothelium = Serosa
- On retroperitoneal parts : no mesothelium covering & is called advantitia
- Adventitia blends with the connective tissue of the body wall

Summary


Mesentery (binding of digestive tract to abdominal wall)
Mesothelium
Duct of associated gland (transport of secretion)
Mesothelium (protect coating; reduction of friction)
Lamina propria (support)
Inner circular layer (motility)
Submucosa (support)
Serosa (support)
Muscularis mucosae (mucosal motility)
Outer longitudinal muscle layer (motility)
Submucosal plexus
Lymphoid nodule (immune defense)
Villus (increase of mucosal surface)
Gland in the lamina propria (secretion)
Inner circular muscle layer (motility)
Gland in submucosal layer (secretion)
Myenteric plexus (controls muscle contraction)

References

Basic Histology - L.U.Junqueira

Wheater's Functional Histology


THANK YOU