**-Elementary tract :**esophagus , stomach , intestine..

**- Layers of elementary tract (digestive tract):**

**1)Mucosa :**

consists of epithelium , lamina propria , muscularis mucosa.

### 2)Submucosa :

### connective tissue, nerve plexus (submucosal plexus/ [Meissner's plexus](https://www.google.jo/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&sqi=2&ved=0CCgQFjAA&url=http%3A%2F%2Fen.wikipedia.org%2Fwiki%2FMeissner%27s_plexus&ei=mdAhU8r_EeSP7AaG5IGoCQ&usg=AFQjCNFFl7w9B6j-Me9F1MhZhvFL4ady8w&sig2=uQpx7oulesM2vwR7Szd5ig&bvm=bv.62922401,d.Yms)).

**3)Muscularis externa :** **Two layers:**

**\*inner circular layer.**

**\*outer longitudinal layer.**

Between the inner and outer layers there is **myenteric (Auerbach) nerve plexus.**

**4)Serosa or Advintitia** : **according to the structure:**

**\*Intraperotoneal :** outer longitudinal layer is covered by **serosa (simple squamous epithelium).**

\***Extraperotoneal : advintitia (loose connective tissue).**

**-Esophagus:**

**Fibromuscular** tube extending from the pharynx at the level of cervical vertebra number six **(C6)** to stomach at the level of thoracic vertebra number twelve **(T12)**.

Enters **the superior mediastinum** between the trachea and the vertebral column (posterior to trachea & anterior to vertebral column).

**-Layers of esophagus:**

**1-Mucosa:**

\*Epithelial cover of the esophagus is stratified **squamous epithelium non-keratinized.**

\*The epithelium contains **langerhans cells** (Antigen presenting cells in prickle layer).

\*The epithelium **distends** during swallowing.

\*Under the epithelium there is lamina propria.

\*Lamina propria in the esophagus contains **esophageal cardiac glands in the upper and lower parts only**.

\* Esophageal cardiac glands are **mucus** glands.

**(They are called cardiac according to the lower part of the esophagus which makes junction with the cardiac part of the stomach -The upper part was given the same name also-).**

\*Under lamina propria there is **muscularis mucosa (part of mucosa)** : usually one layer of **smooth muscles fibers which run longitudinally** with the direction of esophagus.

\*The muscularis mucosa becomes **thicker** near the stomach.

**2-Submucosa:**

\***Dense fibroblastic** connective tissue.

\*It contains **esophageal gland proper**.

- **Esophageal gland proper :**

They present in submucosa of **all** parts of the esophagus.

They are **mixed glands but mainly mucus**.

**Mucus cells** in esophageal gland proper produce mucus.

**Serous cells** in esophageal gland proper produce pepsinogen and some lysozymes.

\*\*Note : Pepsinogen is mainly secreted in stomach but esophageal gland proper contributes in pepsinogen secretion.

**3-Muscularis externa** **: two layers:**

-inner circular layer.

-outer longitudinal layer.

\*between the inner and outer layers there is **myenteric (Auerbach) nerve plexus.**

**\*\*Muscles in esophagus (muscularis externa) :**

-Upper part completely **skeletal** (**All the nuclei are peripheral** ).

-Mid part **skeletal & smooth (mixed nuclei , peripheral & center).**

-Lower part completely **smooth** (**All nuclei are center)**.

**4-Serosa or Advintitia :**

-All parts of the esophagus are **extraperotoneal** covered with advintitia **except** the junction between it and the stomach is intraperotoneal covered with serosa.

\*\*Note: in the histological sections, the ducts staining property is similar to the basal layer of epithelium but the blood vessels are lighter.

-**Stomach**

**Regions of the stomach:**

Cardiac , Fundus , Body , Antrum , Pyloric.

There is a cardiac sphincter and a pyloric sphincter.

**Histologically** , the stomach can be divided into three regions:

1-Cardiac region.

2-Fundus & Body(same histology).

3-Antrum & Pyloric(same histology).

**Layers of stomach:**

**1-Mucosa:**

-Epithelial cover of the stomach is **simple columnar epithelium**.

-**Cells** that cover the stomach are:

**A-Surface mucus cells** (the main type of the cells):

\*columnar cells secret mucus that traps hydrogen carbonate to maintain neutrality.

{Hydrogen carbonate reacts with hydrochloric acid to neutralize the acid}.

**B-Stem cells** (less than surface mucus cells):

\*columnar cells, they are numerous in pit (invagination ) areas (mainly present in basal parts of the gastric pits)

Under epithelium there is lamina propria which is **highly vascularized** loose connective tissue infiltrated with white blood cells, plasma cells,fibroblasts, occasionally smooth muscles and occupied by gastric glands.

**\*\*Note: There is a mistake in a slide: We say gastric glands not fundic glands because it is more general.**

-After lamina propria there is muscularis mucosa:

(2-3) layers of smooth muscles (**thicker** than esophagus which have one layer only).

**Gastric pit will lead to gastric gland..**

-Invaginations in the surface: **gastric pits**.

-In **basa**l part of the gastric pits we find stem cells.

-Other cells in the gastric pits and on the surface are **surface mucus cells**.

-When the **parietal** cells start appearing, this means that we are in the gastric gland.

**-Gastric glands are divided into three main parts:**

**\*Main types of cells are:**

**1-Mucus neck cells.**

**2-Parietal(oxyntic)cells*.***

1-Esthmus.

2-Neck.

3-Base.

**\*Main type of cells in the basal part are Chief(zymogenic)cells.**

**\*Enteroendocrine cells(type of DNES cells, alport cells), but less than chief cells*.***

**\*Most of the cells are chief cells**: we are in the in the basal part.

\*It is **hard** to distinguish between isthmus and neck because they have the same type of cells, **BUT generally the beginning of the gastric pit is isthmus and the rest is neck**.

\***Enteroendocrine** cells can be found in the neck but **mainly** in the base.

\***Parietal cells** can be found in the basal part but **mainly** in isthmus & neck.

**Mucous neck cells**

-They resemble mucus surface cells.

-They are columnar in shape.

-They secret mucus but it is **watery** in nature (It is more watery than mucus of mucus surface cells which is more viscous , thicker and more glycosylated {carbohydrates}).

-Nucleus **is basally** located.{Any mucus cell it's nucleus is basally located}.

-Cytoplasm has **well developed** golgi,RER,basal mitochondria.

-Apical cytoplasm is filled with secretory granules which contain **mucin protein {glycosylated}.**

-There mucus secretions are **water soluble**.

-They show **tight junction** with nearby cells.

**Stem cells**

-Few in number but with high regenerative power.

-Mainly present in **basal** part of the pit.

-Organs are few except for many ribosomes.

-Nuclei are **heterochromatic and basally located with prominent nucleolus.**

-Form **tight junctions** with nearby cells.

-They replace all other cell types in the gland and on the surface**, so stem cells are the source of all the cells on the surface, in the gland and in the pit.**

**Parietal(oxyntic) cells**

-Located in the **upper half of fundic glands**.

-They are large and occupy peripheral position.

-Secret **hydrochloric acid** and gastric intrinsic factors.

-They have **rounded** basal nuclei.

**-Cytoplasm is eosinophilic (pink in color)**..

-They have intracellular canaliculei with microvilli.

-In light microscope, intracellular canaliculei appeare like areas with the **white color** (parietal cells features).

**\*\* tubulovasicular system=intracellular canaliculei (vesicles & tubules connected together, and acids are secreted toward it and then exit the cell toward the lumen of the gastric pit).**

**Resting(low acid production):**

Microvilli decrease in size/Tubulovasicular system is more extensive.

**Active(high acid oroduction):**

Microvilli increase in size/ Tubulovasicular system is less extensive.

**The histological appearance of parietal cells in light microscope:**

They have rounded nucleus.

Pink cytoplasm(eosinophilic).

“We use this to differentiate between (isthmus,neck) and (pit,base). “

-**The general shape of parietal cells is described as fried egg appearance.**

**Chief cells**

-They produce enzymes so they are called "**zymogenic cells**".

-Enzymes that they secret are: pepsinogen (gives pepsin), gastric lipase, rennin.

-They are in the base of the gastric gland.

-Form most of the cells in the basal part of the gland.

-Nucleus is basally located.

-Cytoplasm is **basophilic (blue in color),** not like parietal cells, with apical secretory granules (zymogenic granules contain pepsinogen, gastric lipase or rennin).

-They have many microvilli, many RER, many golgi, few lysosomes, and apical granules.

**DNES cells (Enteroendocrine cells):**

-Widely scattered among other cells.

-**Immunologically** they can be classified into many types according to their **hormonal secretions**.

-All cells release their secretions to the lamina propria (not to the lumen of the gland).

-Their secretions are either **paracrine** (local effect on nearby cells), or **endocrine** (go to the blood affect distant cells).

-Some cells reach the lumen (**opened type**), some cells do not reach the lumen (**closed type**).But secretions of both cells go to lamina propria.

\*\* Note:The table with the types of endocrine cells “DNES” is excluded you don’t have to memorize it

