



# LECTURE 1: ESOPHAGUS & STOMACH

## ❑ Objectives:

At the end of this lecture, you should describe the microscopic structure and the function of:

1. **Esophagus**
2. **Stomach**

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# Alimentary Canal

- It is the tubular portion of the digestive system.
- It is subdivided into:
  1. **Esophagus**
  2. **Stomach**
  3. **Small intestine** (duodenum - jejunum - ileum)
  4. **Large intestine** (cecum - colon - rectum - anal canal - appendix)

- General Structure of Alimentary Canal:

1. **Mucosa**
2. **Submucosa**
3. **Muscularis externa**
4. **Adventitia OR serosa**

Notes:

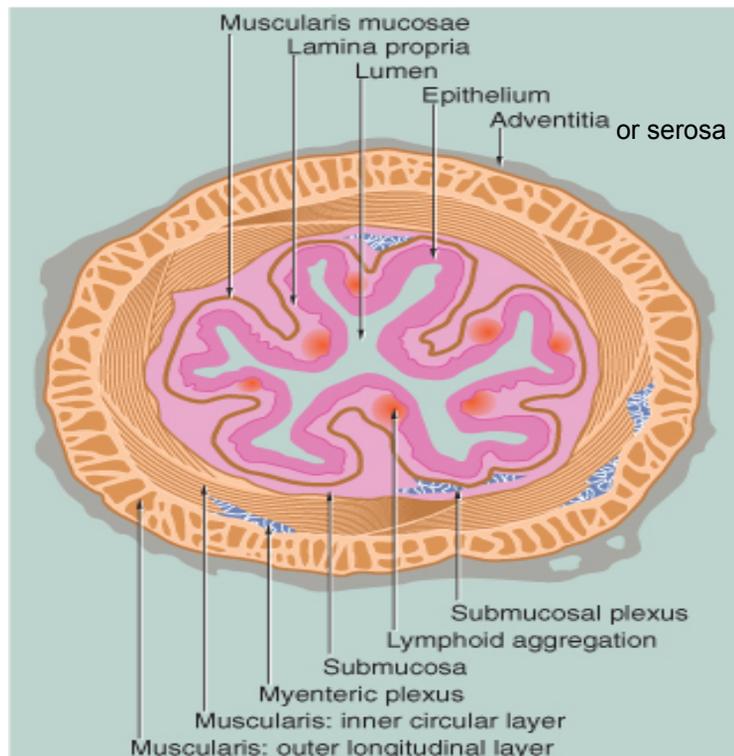
-In the Mucosa, there is a thin muscular layer called "Muscularis Mucosae" = Muscle of mucosa. It is responsible for the folding of the lumen.

-Serosa: covered by visceral peritoneum.

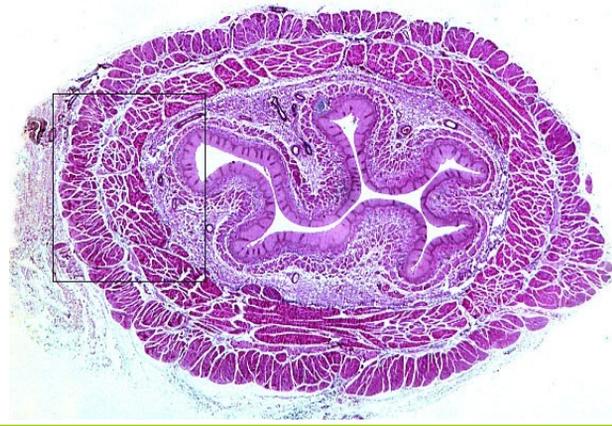
-Adventitia: NOT covered by visceral peritoneum.

-Organs like transverse colon are covered by retro-peritoneum so it will be adventitia not serosa

-Esophagus is mainly thoracic so it will mainly be covered with adventitia.



# ESOPHAGUS



## Mucosa

- **1) Epithelial Lining:** Non-Keratinized stratified squamous epithelium
- **2) Lamina propria:** C.T.
- **3) Muscularis mucosae:** Few layers of smooth muscle fibers.

## Submucosa

- C.T. containing:
  - blood vessels
  - **GLANDS**
  - Meissner's plexus of *nerve fibers* & nerve cells.

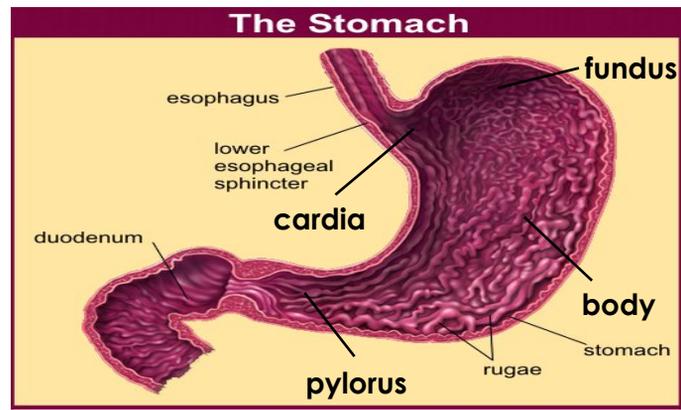
## Muscularis Externa

- Inner **circular** layer
- Outer **longitudinal** layer
- Auerbach's (myenteric) plexus in between the 2 layers

## Adventitia OR Serosa

- **Serosa** is C.T. covered by mesothelium (simple squamous epithelium) in the **abdominal part** of the esophagus
- **adventitia** if there is no mesothelium, in the **thoracic part** of the esophagus (covers most of the esophagus)

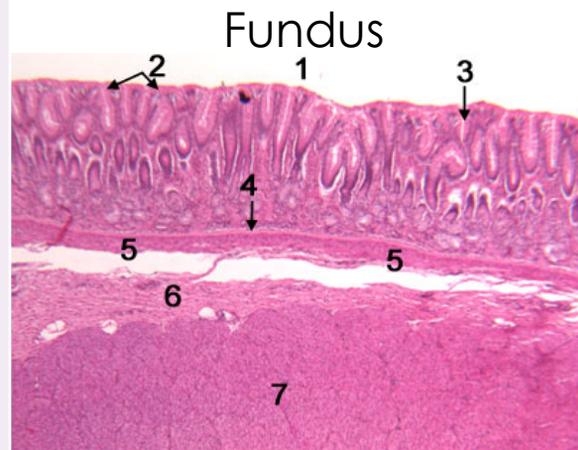
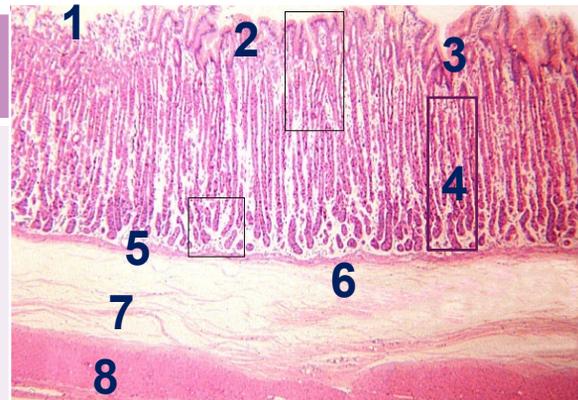
# STOMACH



- It has 4 regions:
  - Cardia**
  - Fundus**
  - Body**
  - Pylorus**
- Mucosa has folds known as **Rugae**. They disappear in the distended stomach.

## The layers of:

<u>Fundus (or body)</u>	<u>Pylorus</u>
1. Lumen.	1. Lumen
2. Surface columnar epithelium.	2. Surface epithelium
3. Pits of fundic glands.	3. Pits of pyloric glands
4. Fundic glands.	4. Lamina propria
5. Lamina propria.	5. Muscularis mucosae
6. Muscularis mucosae.	6. Submucosa
7. Submucosa.	7. Muscularis externa
8. Muscularis externa.	



Pylorus

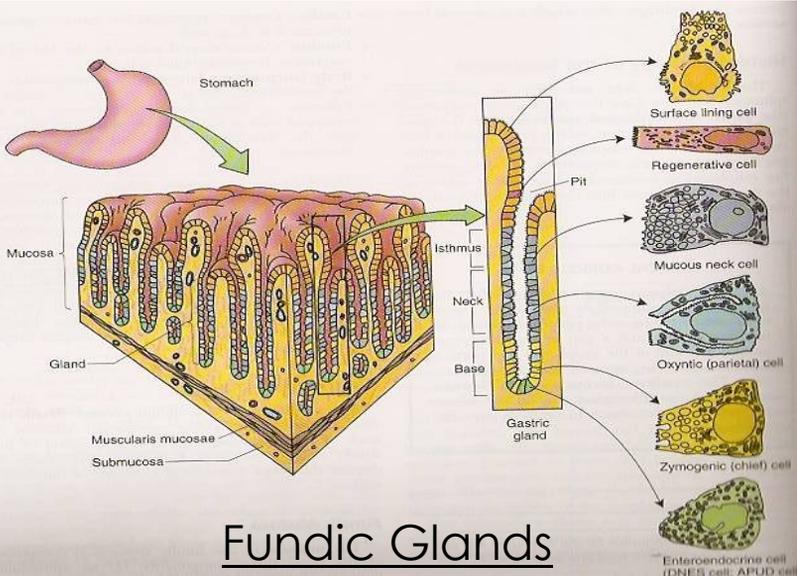
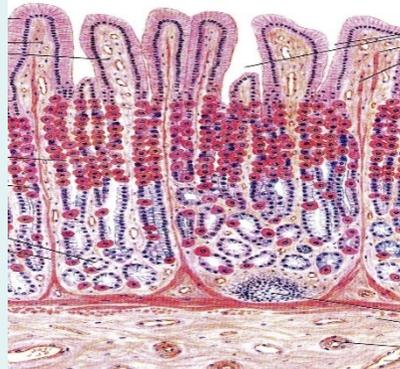
# Components:

	<u>FUNDUS OF STOMACH</u>	<u>PYLORUS OF STOMACH</u>
<u>MUCOSA</u>	<p>I. surface epithelium: <u>simple columnar mucus-secreting cells</u></p> <p><b>II. Fundic glands</b></p> <p>III. Lamina propria: invaded by numerous fundic glands</p> <p>IV. Muscularis mucosae</p>	<ul style="list-style-type: none"> <li>Modified to form: <b>Pyloric Glands</b></li> <li>Surface epithelium: <u>Simple columnar mucus-secreting cells</u></li> </ul>
<u>SUBMUCOSA</u>	<p>Connective tissue containing:</p> <ol style="list-style-type: none"> <li>1) blood vessels</li> <li>2) <b>Nerves</b></li> <li>3) <b><u>NO GLANDS</u></b></li> </ol>	
<u>MUSCULARIS EXTERNA</u>	<p><b>3</b> smooth muscle layers:</p> <ol style="list-style-type: none"> <li>1) <u>Inner</u> oblique</li> <li>2) <u>Middle</u> circular</li> <li>3) <u>Outer</u> longitudinal</li> </ol>	<p><b>2</b> smooth muscle layers:</p> <ol style="list-style-type: none"> <li>1) <u>Inner</u> Circular</li> <li>2) <u>Outer</u> longitudinal</li> </ol>
<u>SEROSA</u>	<p>C.T. covered by mesothelium [<u>NO adventitia</u>]</p>	

# GLANDS

	<u>Fundic Glands</u>	<u>Pyloric Glands</u>
<b><u>Pit length</u></b>	Short (1:4 of mucosa)	Deep (1:2 of mucosa)
<b><u>Branching</u></b>	Simple or branches tubular glands	Branched and convoluted (many cross sections)
<b><u>Features</u></b>	Rich in parietal & chief cells	The predominant cells are mucous neck cells that secrete mucus

**Cross section**



Notes (from the next page):

- Chief cells are Basophilic
- Oxyntic cells are Acidophilic

- Chief cells secrete the digestive enzymes
- Oxyntic cells secrete HCl which activate enzymes once they enter the lumen

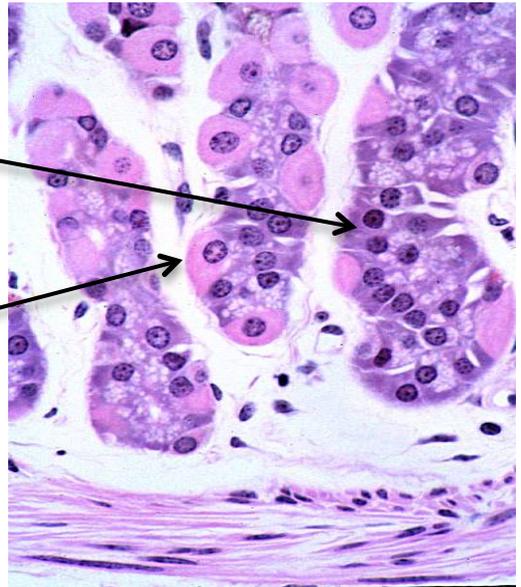
- The hormones maintain motility + activate pancreas & gallbladder to maintain their secretions

# FUNDIC GLANDS

❖ Composed of 5 cell types:

1) Peptic (Chief) Cells\*:

- Secrete Pepsinogen



2) Parietal (Oxyntic) Cells\*:

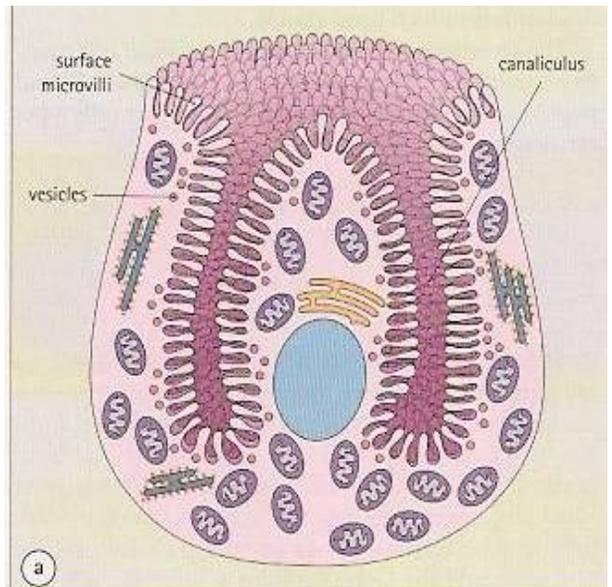
- Secrete HCL & Gastric intrinsic factor that helps absorption of vitamin B<sub>12</sub>

3) Mucous Neck Cells:

- Secrete mucus

4) Enteroendocrine (DNES) Cells:

- Secrete hormones\* (e.g. Serotonin)



5) Stem Cells:

- Regenerative cells

# Summary

## **What are the parts of alimentary canal?**

esophagus, stomach, small intestine (duodenum, jejunum and ileum), and large intestine (cecum, colon, rectum, anal canal, and appendix).

## **What are the light microscopic Structures of Alimentary Canal?**

- 1- Mucosa.
- 2- Submucosa.
- 3- Muscularis externa.
- 4- Adventitia OR serosa.

## **What are the epithelial linings of esophagus, fundus and body of the stomach?**

- Esophagus → Non-Keratinized Stratified Squamous epithelium
- Fundus and body of stomach → simple columnar epithelium

## **Where can you find glands in GIT submucosa?**

- 1- Upper third of esophagus
- 2- Lower third of esophagus
- 3- Duodenum

## **Where can we find enteric nervous system plexuses in esophagus?**

- Submucosal (Meissner's) plexuses in submucosa
- Myentric (Auerbach's) plexuses between circular and longitudinal smooth muscles of muscularis externa layer

## **How many types cells in the fundic glands?**

- Five types of cells

## **What is the outer most layer of esophagus [most appropriate answer]?**

- Adventitia (because it covers most parts of esophagus)

# Summary

## **What are the types of muscles in muscularis externa of esophagus ?**

- Upper 1/3 → Skeletal muscle “both”
- Middle 1/3 → Mix “Circular smooth & Longitudinal skeletal”
- Lower 1/3 → Smooth muscle “both”

## **What is the difference between adventitia and serosa**

Adventitia → Retroperitonum “not covered by peritonium”

Serosa → Intraperitonum “covered by peritonium”

## **Where is serosa absence in GIT (Presence of adventitia only)?**

Cervical and thoracic parts of esophagus

## **What is the type of mesothelium that covers serosa?**

simple squamous epithelium

## **In the fundus & body of stomach, where is the mucus secreted from?**

From surface of simple columnar epithelium

## **What are the general features of fundus and pylorus under microscope?**

- Fundus → Basophilic “rich in Rough endoplasmic reticulum and ribosomes”
- pylorus → Acidophilic

## **What are the predominant cells in stomach?**

- Fundus → Chief cells “Peptic”
- Pyloric → Mucus neck cells

## **What type of cell is completely absent in the pylorus of stomach?**

Chief cells

# MCQs

**Q1- the tubular portion of digestive system is subdivided into:**

- a) esophagus and stomach
- b) small intestine and large intestine
- c) esophagus, stomach, small intestine and large intestine
- d) esophagus, stomach, duodenum and colon

**Q2- The Alimentary canal consists of ..... layers generally**

- a) two
- b) three
- c) four
- d) five

**Q3- Which layer of the esophagus contains glands?**

- a) Mucosa
- b) Submucosa
- c) Muscularis Externa
- d) Serosa or Adventitia

**Q4- ..... has folds, known as rugae that disappear in the distended Stomach**

- a) Serosa
- b) Adventitia
- c) Mucosa
- d) Submucosa

**Q5- Muscularis Externa of esophagus consists of inner ..... and outer ..... Muscle layers**

- a) Longitudinal, Circular
- b) Oblique, Circular
- c) Longitudinal, Oblique
- d) Circular, Longitudinal

**Q6- Fundic Glands are rich in**

- a) Parietal cells & mucous neck cells
- b) Peptic cells & stem cells
- c) Peptic cells & parietal cells
- d) Enteroendocrine cells & stem cells

**Q7- Which one of the following contains glands in its submucosa:**

- a) Esophagus
- b) Fundus of stomach
- c) Pylorus of stomach
- d) All of them

**Q8- Which of the following pits is deeper:**

- a) Fundic gland pits
- b) Pyloric gland pits

1-c  
5-d

2-c  
6-c

3-b  
7-a

4-c  
8-b

# MCQs

**Q9- Vitamin B12 is absorbed by the help of:**

- a) peptic cells
- b) parietal cells
- c) mucous neck cells
- d) Enteroendocrine cells

**Q10- Which ONE of the following is the type of epithelium that lines the stomach:**

- a) Non-Keratinized stratified squamous epithelium
- b) Stratified columnar epithelium
- c) Simple squamous epithelium
- d) Simple columnar epithelium

**Q11- Which of the following is the secreted substance from Parietal cells.**

- a) HCl
- b) Pepsinogen
- c) Mucus
- d) Hormones

**Q12- Which of the following cells is rich in rER:**

- a) Parietal cells
- b) Peptic cells
- c) Mucous neck cells
- d) Stem cells

**Q13- Which of the following cells is rich in mitochondria:**

- a) Parietal cells
- b) Peptic cells
- c) Mucous neck cells
- d) Stem cells

**Q14- How many smooth muscle layers are found in muscularis externa of Pylorus:**

- a) 1
- b) 2
- c) 3
- d) 4

**Q15- What are the predominant cells of pyloric glands:**

- a) Oxyntic cells
- b) Chief cells
- c) Mucous neck cells
- d) Stem cells

9-b  
13-a

10-d  
14-b

11-a  
15-c

12-b