Human Histology session

1st stage

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LECTURER:Dr.Nabigh A Nagi M.Sc.

Histology of Digestive system

Part 1

Introduction
A. Structure of digestive system

The digestive system is made up of the gastrointestinal tract—also called the GI tract or digestive tract—and the liver, pancreas, and gallbladder. The GI tract is a series of hollow organs joined in a long, twisting tube from the mouth to the anus. The hollow organs that make up the GI tract are the mouth, esophagus, stomach, small intestine, large intestine, and anus. The liver, pancreas, and gallbladder are the solid organs of the digestive system.

Introduction
Functions of digestive system

* Ingestion of food.
* Secretion of fluids and **digestive** enzymes.
* Mixing and movement of food and wastes through the body.
* **Digestion** of food into smaller pieces.
* Absorption of nutrients.
* Excretion of wastes.

Microanatomy of the Tubular portion of the Digestive tract

Digestive tract walls consist of 4 type of layers

1-Mucosa (lining of lumen)

A-Epithelium = varies with location: stratified squamous in mouth, esophagus, and anus; simple columnar in the stomach and intestine.

B-Lamina propria =loose FECT (Fibro elastic connective tssue)

C-Muscularis mucosae- smooth muscle

2-Submucosa

Loose to moderately dense FECT

Microanatomy of the Tubular portion of the Digestive tract

3-Muscularis externa

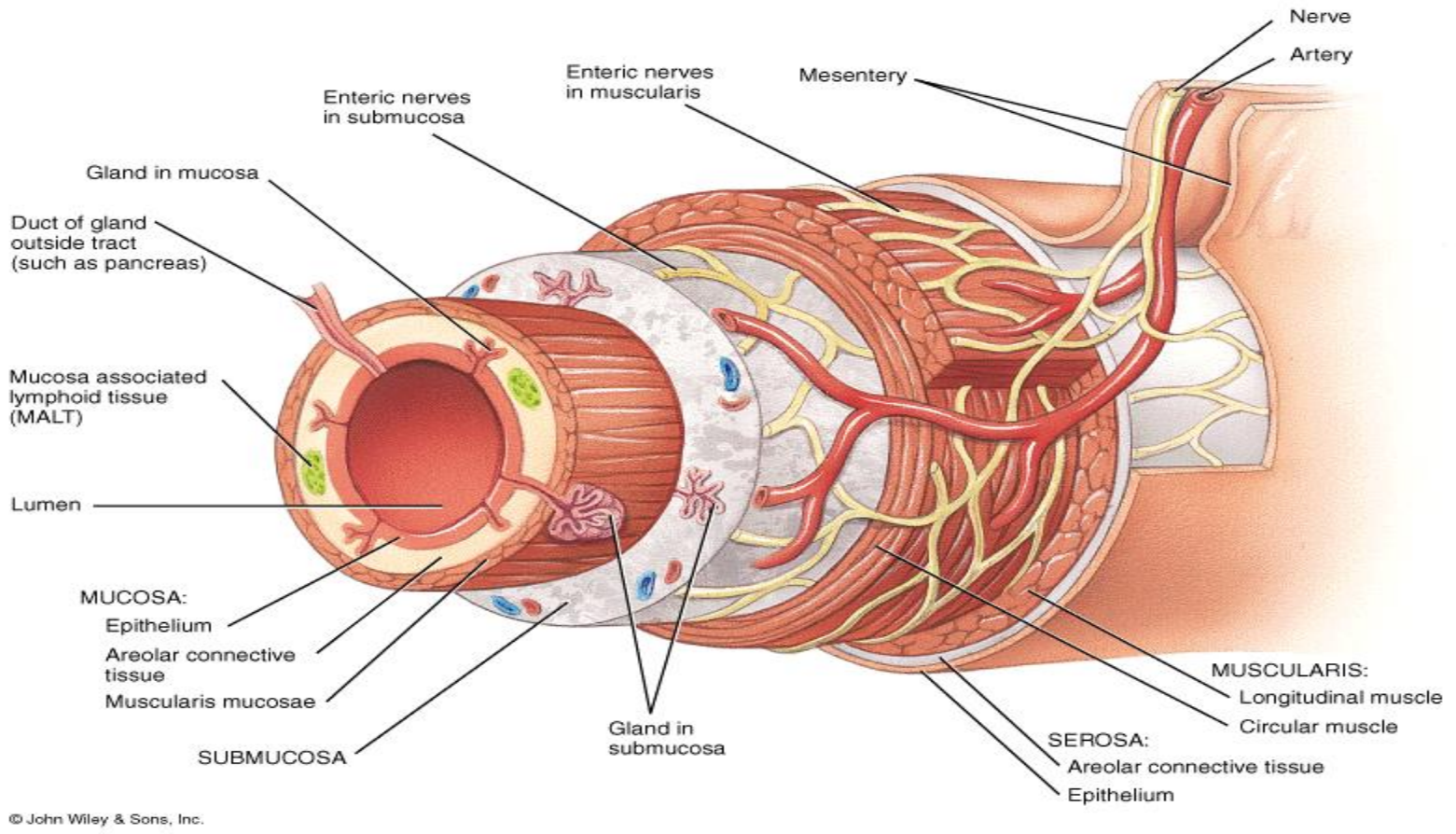
Smooth muscle along most of the gut

Skeletal muscle near both ends of the gut

Usually consists of inner circular and outer longitudinal layers.

4-Adventitia =loose FECT

Microanatomy of the Tubular portion of the Digestive tract



Oral cavity

1-Mucosa

The oral cavity is lined by a mucous membrane (the oral mucosa) consisting of a stratified squamous epithelium, which may or may not be keratinized, and an underlying connective tissue layer, the lamina propria. The surface is kept moist with mucus produced by the major and numerous minor salivary glands. The oral mucosa is well supplied with nerve endings and, on the dorsal surface of the tongue, special sensory endings for taste. The submucosa underlying the lamina propria of the oral cavity is variable. At times the lamina propria and submucosa are substantively so similar. In your slides, the submucosa will be distinguished from the lamina propria only by the presence of minor salivary glands in a loose textured tissue.

Oral cavity

2-Teeth

3-Tongue

A-The tongue is covered by oral mucosa. The epithelium on the upper surface is heavily keratinized in places, particularly on the tips of filiform papillae.

B-The tongue contains a core of skeletal muscle arranged in bundles.

C-The upper surface of the tongue (the epithelium plus the adjacent lamina propria)forms numerous finger-like papillae which are classified into 3 categories:

Oral cavity

1-Filiform papillae

A-pointed tip

B-Heavily keratinized epithelium

C-No taste buds

D-Most numerous type of papillae

2-Fungiform papillae

A-flattened apex

B-Moderately keratinized epithelium

C-Apical taste buds

D-Second Most numerous type of papillae

Oral cavity

3-Circumvallate papillae

A-Flattened apex

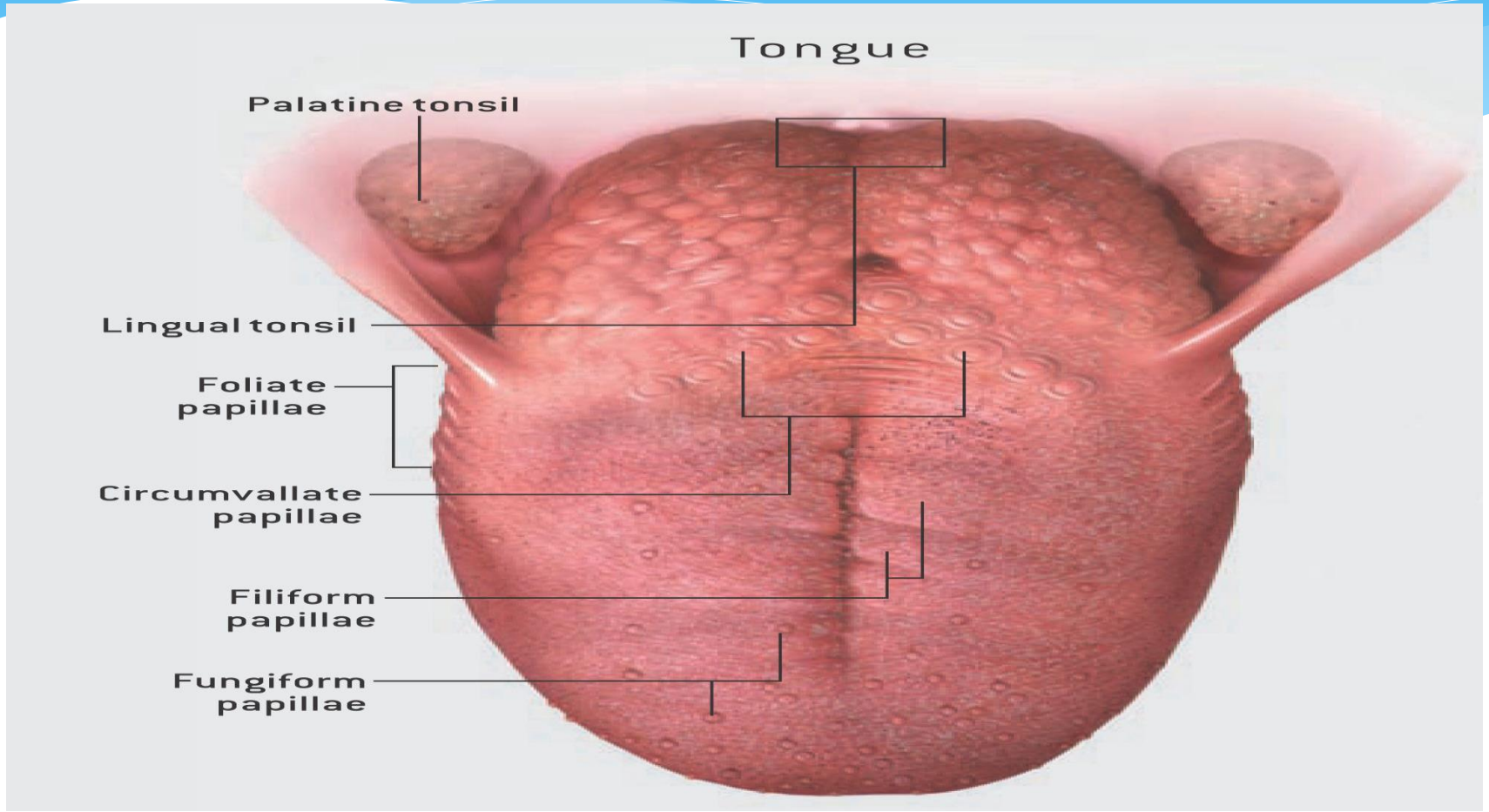
B-Moderately keratinized epithelium

C-Lateral taste buds in the papilla and in the surrounding structures

D-surrounded by a groove with compound serous glands (Von Ebner's glands) secreting into its base

E-Least numerous type of papilla

Oral cavity


Tongue
Palatine tonsil
Lingual tonsil
Foliate papillae
Circumvallate papillae
Filiform papillae
Fungiform papillae

Esophagus

1- mucosa

A-Epithelium- Stratified squamous epithelium

B-Lamina propria-loose FECT.

C-Muscularis mucosae –usually longitudinally arranged smooth muscle.

2-Submucosa

A-Loose to moderately dense FECT.

B-May contain mucous secreting glands.

3-Muscularis externa

A-Tow layers

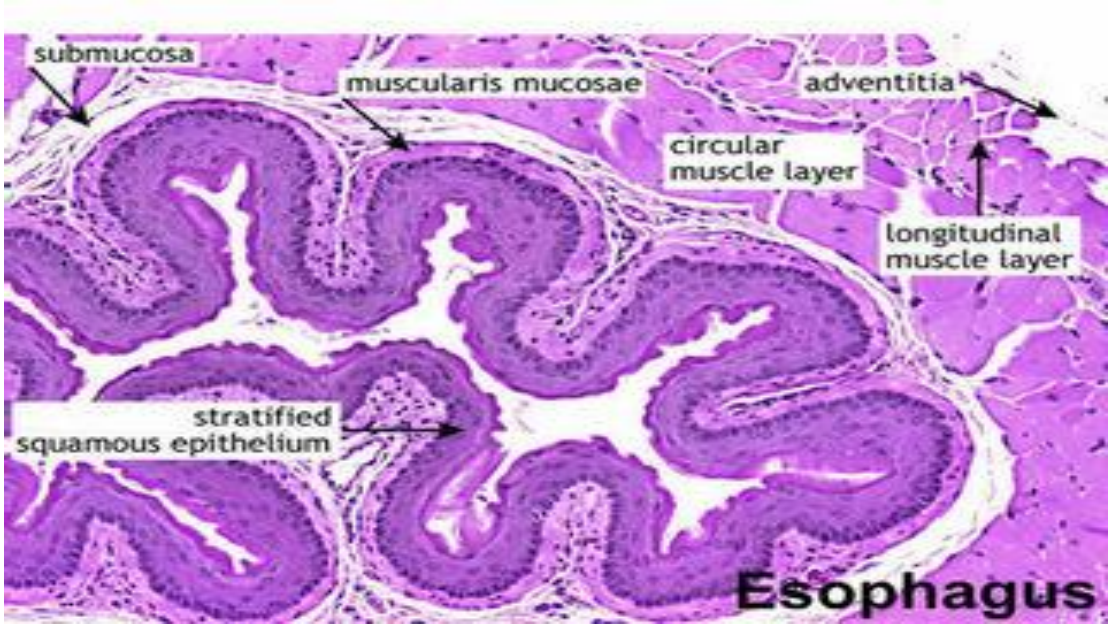
Inner layer=more or less circular

Outer layer=more or less longitudinal

Esophagus

B-Skeletal muscle is gradually replaced by smooth muscle.

* Upper 1/3 of esophagus-mostly skeletal muscle
* Middle 1/3 of esophagus-mixed
* Lower 1/3 of esophagus-mostly smooth muscle.
* 4-Adventitia
* Loose FECT



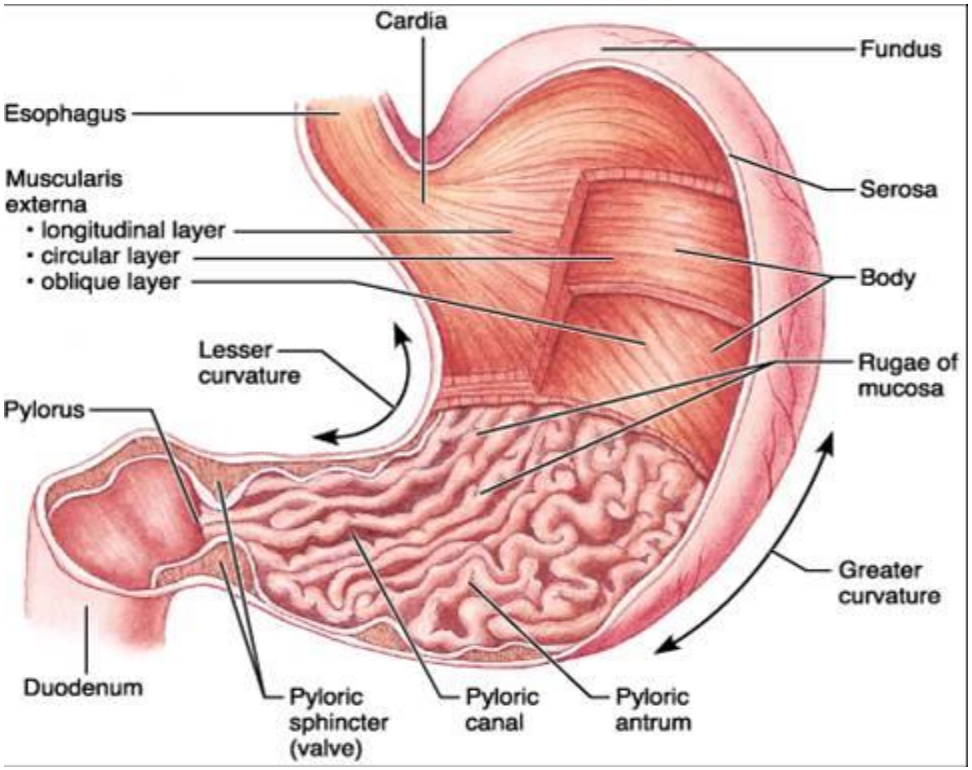
Stomach

The stomach is a key part of the gastrointestinal (GI) tract, sitting between the esophagus and duodenum. Its functions are to mix food with stomach acid and break food down into smaller particles using chemical and mechanical digestion.

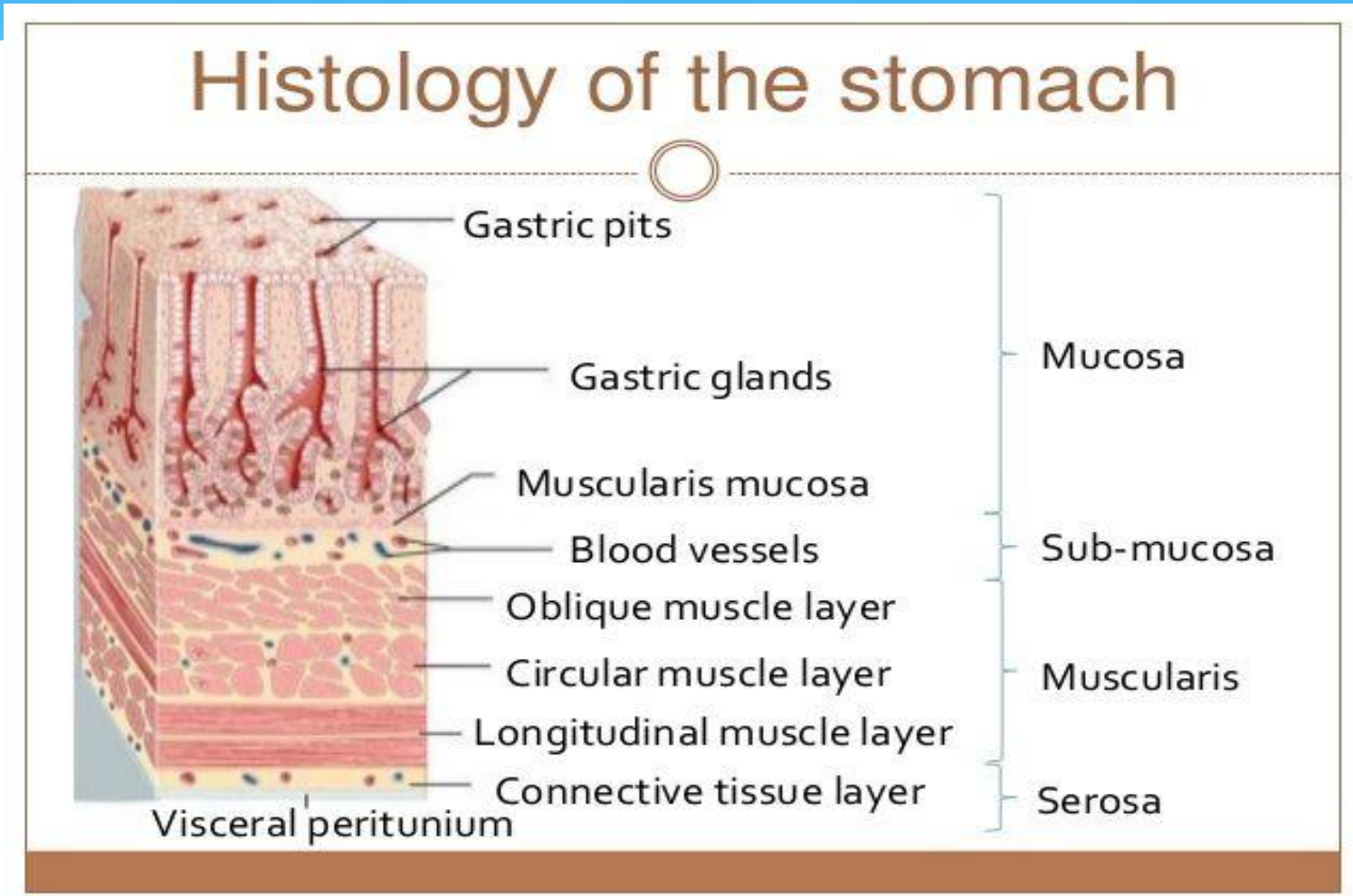
The stomach can perform these roles due to the layers of the stomach wall. These are the gastric mucosa, submucosa, muscularis externa and serosa.

Stomach parts

The stomach is anatomically divided into four regions, histologically we identify only three; cardia, fundus and pylorus. This is because the fundus and body are histologically identical.



Stomach wall



Stomach wall

* The stomach wall consists of 4 layers of tissue. From deep (external) to superficial (internal) these are the serosa, muscularis externa, submucosa and mucosa. The outer layer of the stomach wall is smooth, continuous with the parietal peritoneum. The inner wall (mucosa and submucosa layers) is thrown into folds known as rugae, or gastric folds, which allow the stomach to distend upon the entry of the food. A bolus of food enters the stomach from the esophagus. The various tissue layers of the stomach wall then combine their functions to digest the bolus into a viscous, pulpy fluid called chyme. Chyme is directed into the duodenum of the small intestine for further digestion and absorption.

Gastric mucosa

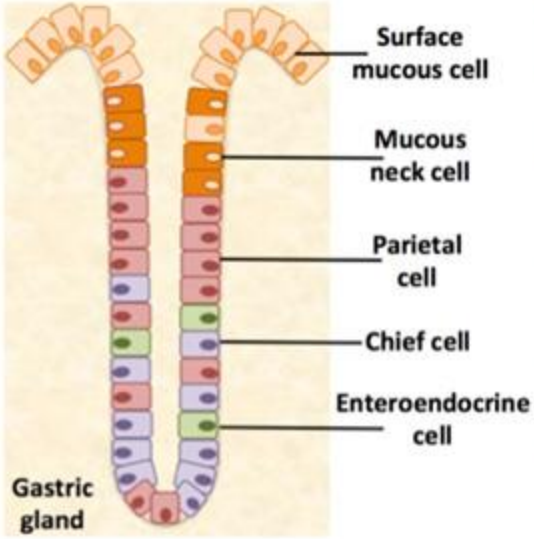
* The innermost layer of the stomach wall is the gastric mucosa. It is formed by a layer of surface epithelium and an underlying lamina propria and muscularis mucosae. The surface epithelium is a simple columnar epithelium. It lines the inside of the stomach as surface mucous cells and forms numerous tiny invaginations, or gastric pits, which appear as millions of holes all throughout the stomach lining. These gastric pits are important as they are connected to the various glands of the stomach.

Surface mucous cells

* The surface mucous cells, are the simple columnar epithelium lining the lumen of the stomach. They secrete alkaline, highly viscous mucus, which closely adheres to the cellular surface.
* The mucus protects the stomach lining by minimising the abrasion from food particles and forming a physical barrier from the hydrochloric acid.

Gastric pits

Gastric pits are formed by invaginations of the surface epithelium. Gastric pits connect to gastric glands and thus allow the glandular products to be delivered into the stomach lumen. The pits are lined with the same mucus secreting surface epithelium that faces the stomach lumen.

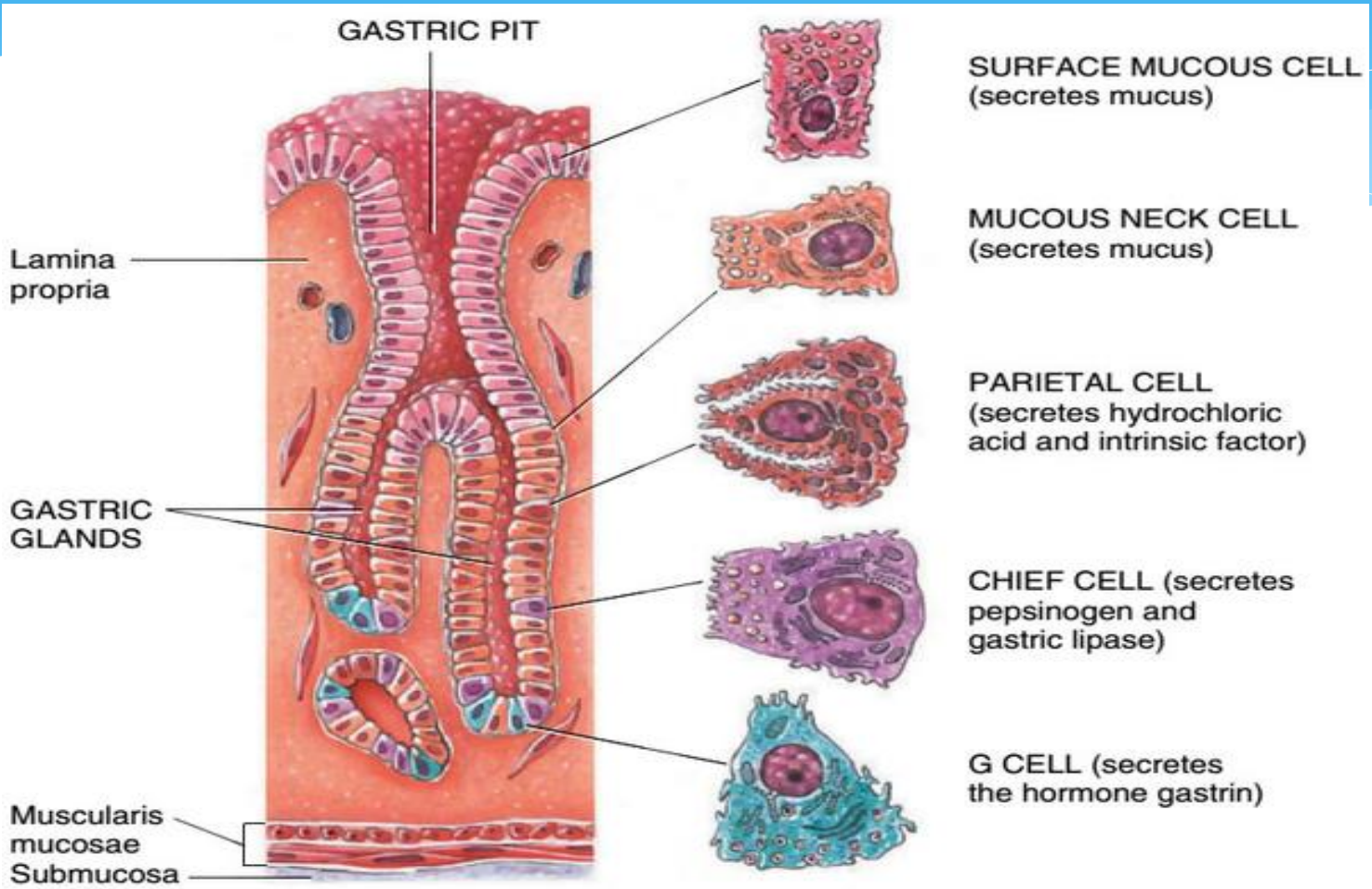


Cells of the gastric glands	Secretory products
Surface mucous cells	Mucin in an alkaline fluid
Mucous neck cells	Mucin in an acidic fluid
Parietal cells	HCl & intrinsic factor
Chief cells	Pepsinogen & lipase
G cells/enteroendocrine cells	Gastrin

Gastric glands

* Gastric glands open into the base of gastric pits. They are found throughout the entire inner surface of the stomach and are divided into 3 types depending on the region in which they are found. Gastric glands proper (principal glands) are found in the fundus/body of the stomach. The cells of these glands produce around two litres of gastric juice a day. The mucus secreting pyloric glands are only associated with the pyloric antrum and cardiac glands are located only within the cardia of the stomach.
* Gastric pits and gastric glands are made up of the same 5 cell types: mucous neck cells, stem cells, parietal cells, chief cells and enteroendocrine cells.

Gastic glands



Lamina propria and muscularis mucosae

The lamina propria is the layer of connective tissue located just deep to the surface epithelium. It contains blood and lymphatic vessels, lymphoid tissue and surrounds the gastric glands.

The muscularis mucosae layer consists of two thin layers of smooth muscle. It separates the lamina propria from the underlying submucosa. The inner layer of muscularis mucosae consists of circular fibres while the outer layer fibres are arranged longitudinally. Its function is to help expel the secretions of the gastric glands into the stomach lumen.

Gastric submucosa

* Deep to the mucosa is a thick layer of connective tissue known as the gastric submucosa. Its arrangement means that it is durable, flexible and mobile. Aside from rich vasculature and lymphatics, this layer also holds the submucosal (Meissner's) plexus. The nerve fibres of this plexus carry parasympathetic innervation to the blood vessels and smooth muscle of the stomach wall. Parasympathetic stimulation is associated with 'rest and digest' functions and therefore, stimulates digestion.

Gastric Muscularis externa

The gastric muscularis externa, also known as tunica muscularis, is the smooth muscle located deep to the submucosa. It is made up of 3 layers: inner oblique, middle circular and outer longitudinal. The muscularis externa layer produces churning movements required for mechanical digestion.

Gastric Muscularis externa

* The arrangement of the muscularis externa varies between different stomach regions. In the cardia the layers are well-developed, creating a sphincter to prevent acid reflux from the stomach into the esophagus. In the fundus, the muscle is poorly developed as a lot less churning takes place in this region. The body is composed of all three muscle layers, except in the anterior and posterior parts of the stomach where the longitudinal muscle layer is largely absent. In the pyloric region the muscularis externa is well developed in order to propel chyme into the duodenum.

Gastric serosa

* Gastric serosa is the outermost layer of the stomach wall. It consists of a layer of simple squamous epithelium, known as mesothelium, and a thin layer of underlying connective tissue. The mesothelium produces serous fluid, which lubricates the outer wall of the stomach and ensures its smooth movement in the abdominal cavity.

End of part 1

* Thanks a lot for attention

* Prepared by:
* Dr.Nabigh Al-Sharifi
* B.sc-M.Sc.
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