



**Faculty of Biological Science and Technology**  
**Zoology and Botanical Department**  
**Practical Histology**

# **Digestive System Histology**

## **Part 2**

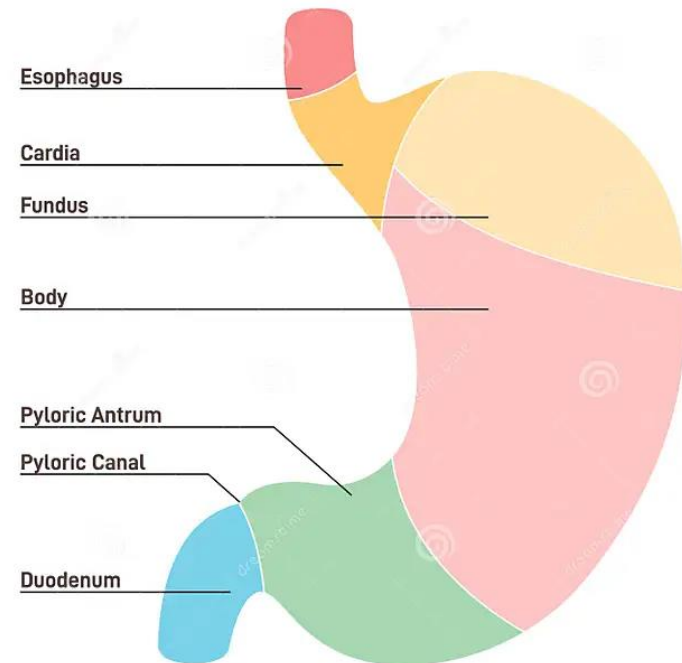
**By: Shirin Kashfi**  
**Ph.D in Animal Development**  
**[Sh.kashfi@staf.ui.ac.ir](mailto:Sh.kashfi@staf.ui.ac.ir)**



# Stomach

- ▶ Stomach is a dilated portion of digestive tract. It is a large, hollow and muscular organ
- ▶ It is composed of four main regions, cardia, fundus, body, and pylorus
- ▶ Cardia and pylorus regions of stomach have similar histological structure. They contain branched coiled tubular glands that secrete mucus
- ▶ Fundus and body regions of stomach have the much larger glands of stomach. These glands produce most of the gastric secretions such as hydrochloric acid and gastric enzymes

## Stomach Sections

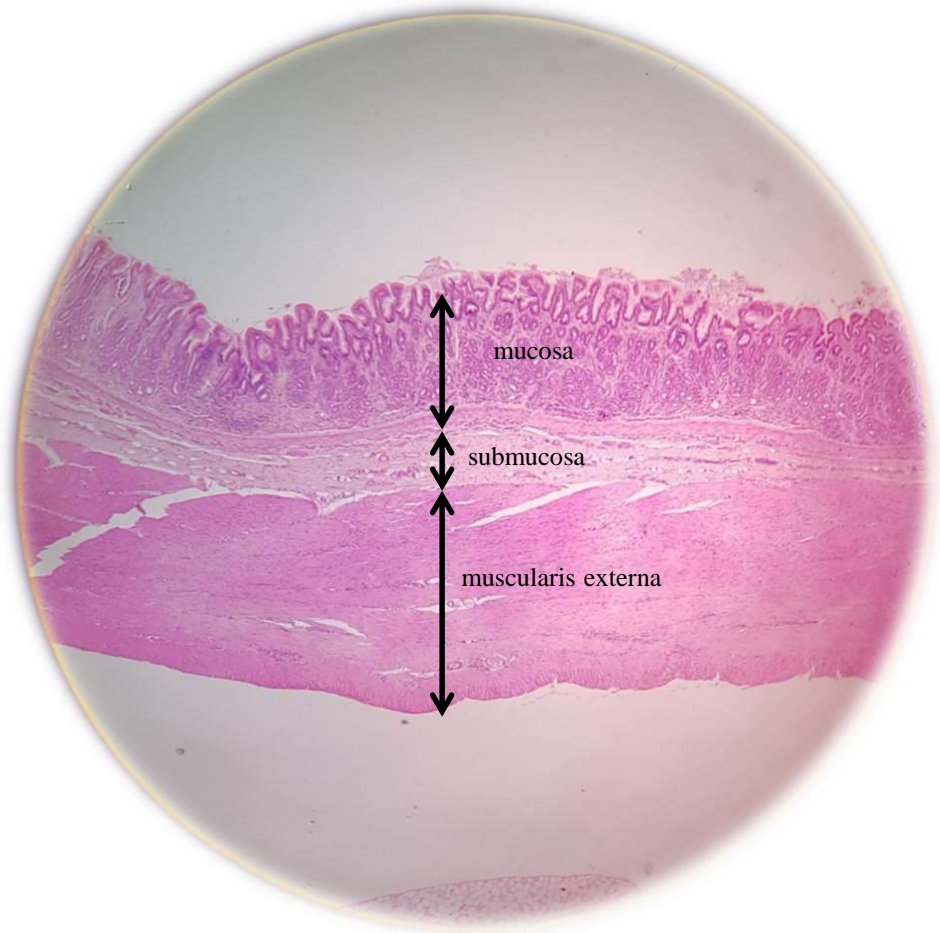


From: <https://www.dreamstime.com/>



## Stomach

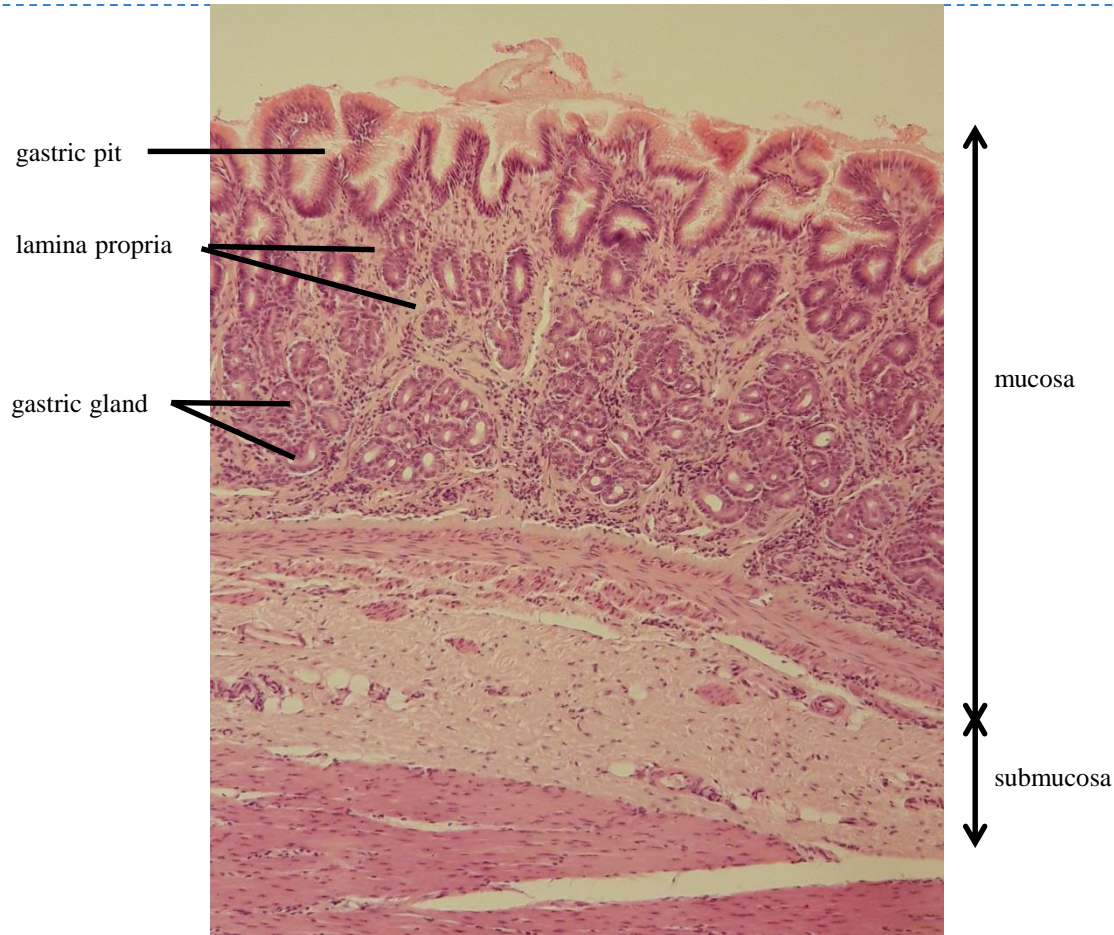
- ▶ Histologically, the wall of stomach consists of four layers. From superficial (internal) to deep (external) these are mucosa, submucosa, muscularis externa, and serosa
- ▶ The mucosa is covered by simple columnar epithelium. Surface epithelium invaginates to the lamina propria and form gastric pits. Gastric pits connect to gastric glands. The pits are lined with the same mucus secreting epithelium that covered stomach lumen
- ▶ The lamina propria contains gastric glands, which are branched tubular glands and open into the bases of gastric pits
- ▶ There are also a thin layer of smooth muscle called muscularis mucosa between mucosa and submucosa
- ▶ Submucosa composed of connective tissue with larger vessels
- ▶ The muscularis externa is smooth muscle that arranged as inner oblique, middle circular and outer longitudinal layers
- ▶ Serosa is the outermost layer of stomach wall



Gastric wall composed of four layers, but three layers are shown in this picture; H&E, 4X. This picture is taken from histological slide in histology laboratory of Isfahan University



## Stomach



Mucosa and submucosa of stomach ; H&E, 14X. This picture is taken from histological slide in histology laboratory of Isfahan University





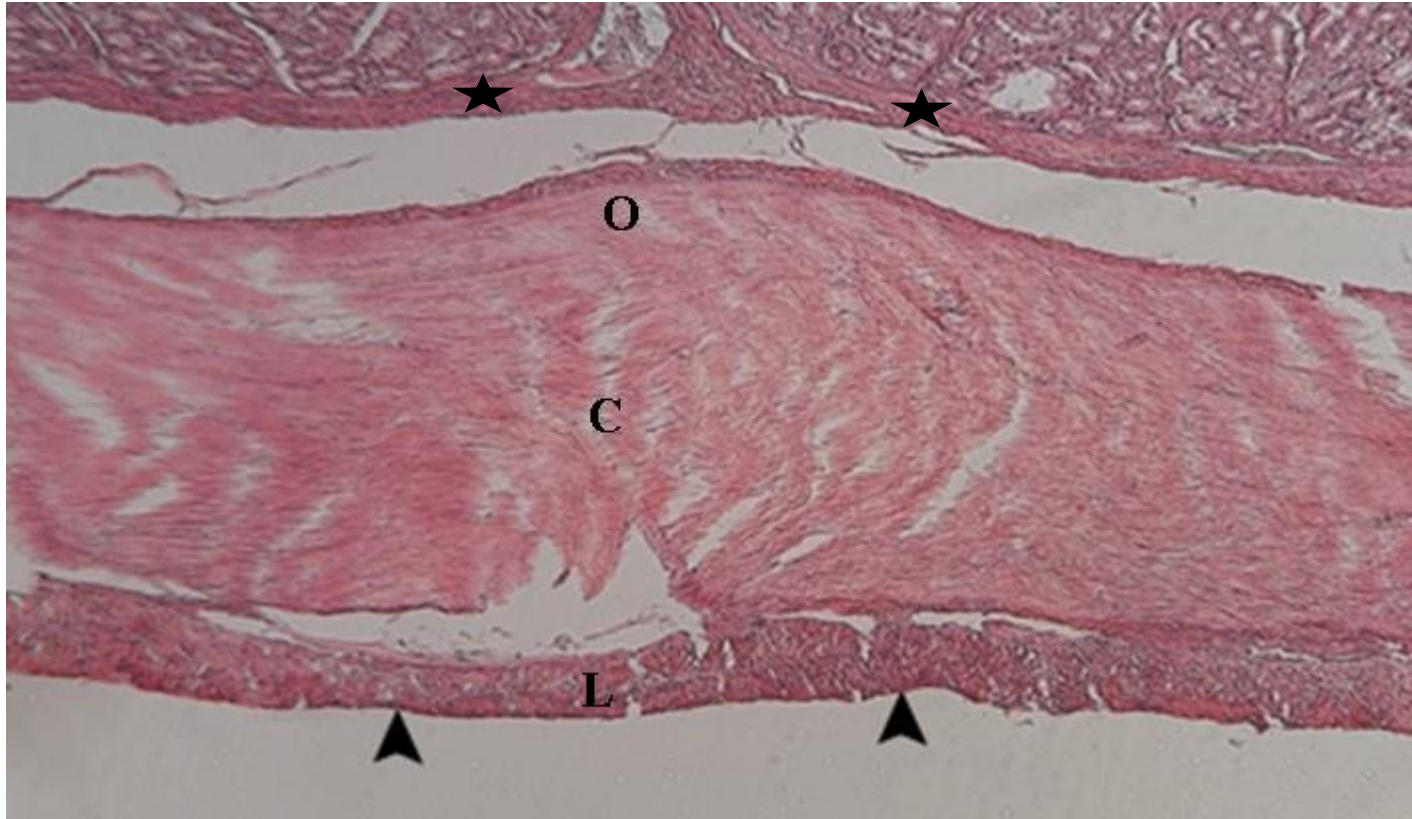
## Stomach: mucosa



Mucosa of stomach; H&E, 40X. This picture is taken from histological slide in histology laboratory of Isfahan University



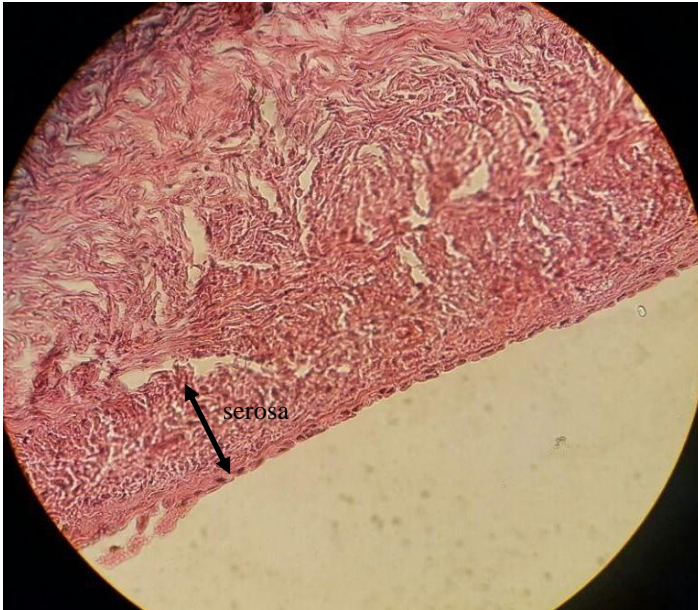
## Stomach: muscular layers



There are three layer of smooth muscle fibers in the gastric wall. O: inner oblique layer, C: middle circular layer, and L: outer longitudinal layer. Serosa also depicts by black arrow head. Muscularis mucosa is shown by stars. H&E, 10 X. This picture is taken from histological slide in histology laboratory of Isfahan University



## Stomach: serosa



Left: serosa in the outer part of stomach wall is shown by two head black arrow. Right: serosa is shown in cropped picture. It is composed of mesothelium and a connective tissue underneath. H&E, 40 X. These pictures are taken from histological slide in histology laboratory of Isfahan University





## Stomach

- ▶ Rugae or gastric rugae are structures produced by folding mucosa and submucosa layers in stomach
- ▶ They are seen in the internal surface of empty stomach and used for expansion of the stomach



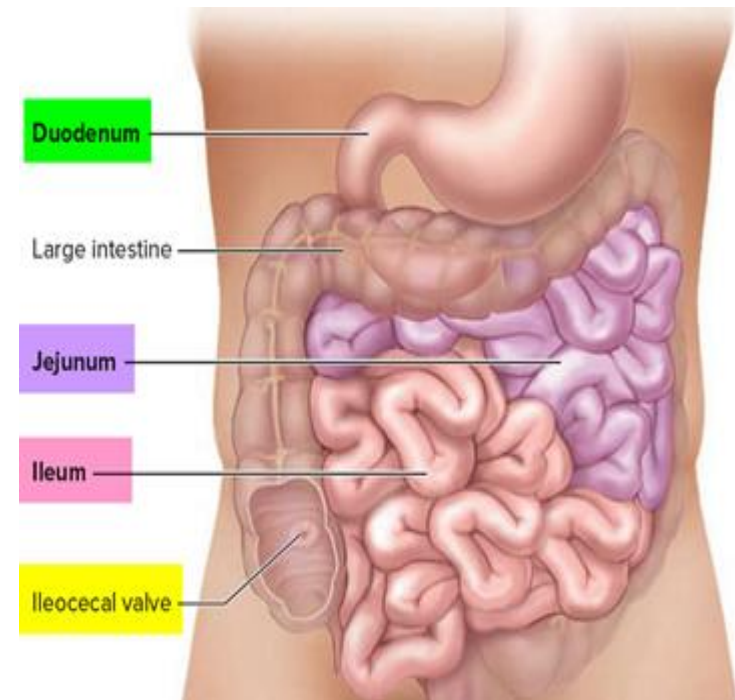
Black lines depict rugae in stomach.  
H&E, 4X. This picture is taken from  
histological slide in histology laboratory  
of Isfahan University





## Small intestine

- ▶ The small intestine divided into three parts: duodenum, jejunum and ileum
- ▶ The duodenum is the first parts of small intestine. Jejunum is the remaining of small intestine which has many coils inside the lower abdominal cavity. Ileum is the last and longest part of small intestine
- ▶ The wall of small intestine follows the general structure of the digestive tract in which the wall has a mucosa, submucosa, external muscular layer and serosa
- ▶ The mucosa composed of simple columnar epithelium and lamina propria underneath and muscularis mucosae
- ▶ External muscular layer is made up of smooth muscle with inner circular and outer longitudinal layer

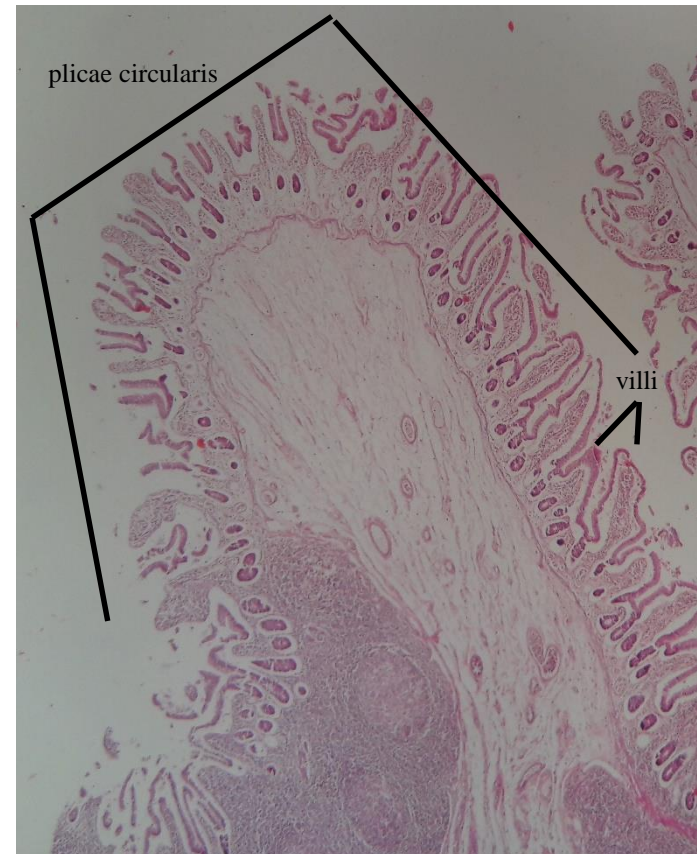


From: <https://healthjade.com/small-intestine/>



## Small intestine

- ▶ The mucosa of small intestine is highly folded including:
- ▶ 1) large circular folds of mucosa and submucosa known as plicae circularis. They are numerous in upper part of the small intestine specially in jejunum
- ▶ 2) smaller folds called villi, which are finger like projection of mucosa. They have 1 mm long
- ▶ There is also very fine projections on the apical surface of epithelial cells which is known as microvilli
- ▶ Plicae circularis, villi and microvilli together increase the surface area of nutrients absorption

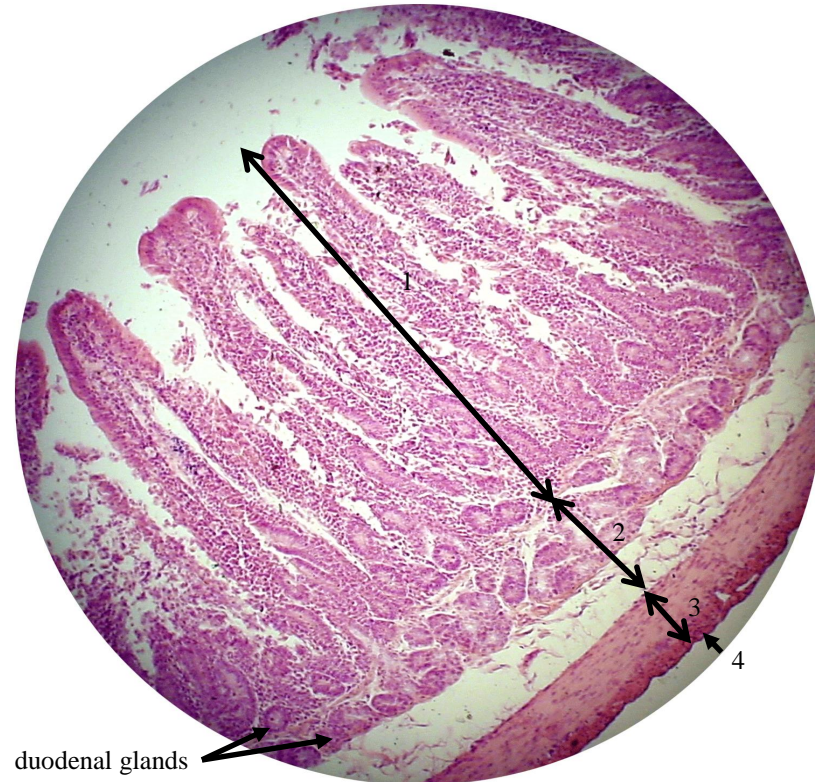


Plicae circularis and villi in jejunum (small intestine). H&E, 4X. This picture is taken from histological slide in histology laboratory of Isfahan University



## Duodenum

- ▶ Duodenum has numerous duodenal (Brunner) glands in mucosa and submucosa layers



Duodenum. 1) mucosa, 2) submucosa, 3) muscularis externa, 4) serosa. H&E; 4X. This picture is taken from histological slide in histology laboratory of Isfahan University





## Jejunum

- ▶ There is very large and obvious plicae circularis in jejunum



jejunum. H&E; 4X. This picture is taken from histological slide in histology laboratory of Isfahan University





## Ileum

- ▶ There are numerous MALTs in mucosal and submucosal layer of ileum. Besides, ileum has thin wall in comparison to other parts of small intestine



Ileum. H&E; 4X. This picture is taken from histological slide in histology laboratory of Isfahan University



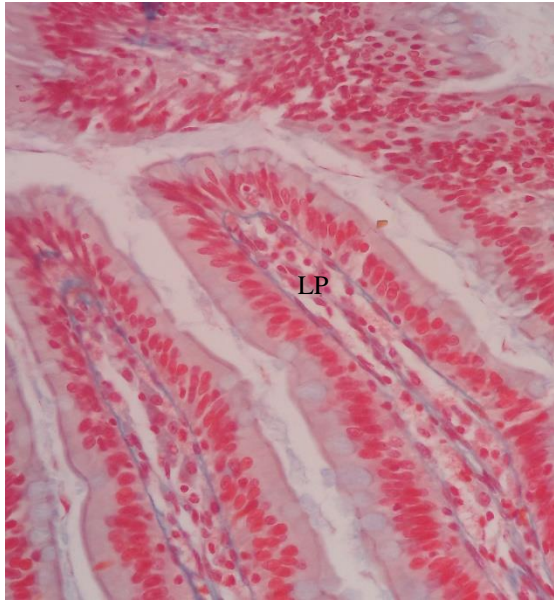
## Duodenum



Duodenal glands in duodenum. H&E; 40X. This picture is taken from histological slide in histology laboratory of Isfahan University



## Mucosa in small intestine



Simple columnar epithelium lining the villi in duodenum. LP, lamina propria. Blue line depicts basal membrane. H&E; 100X. This picture is taken from histological slide in histology laboratory of Isfahan University

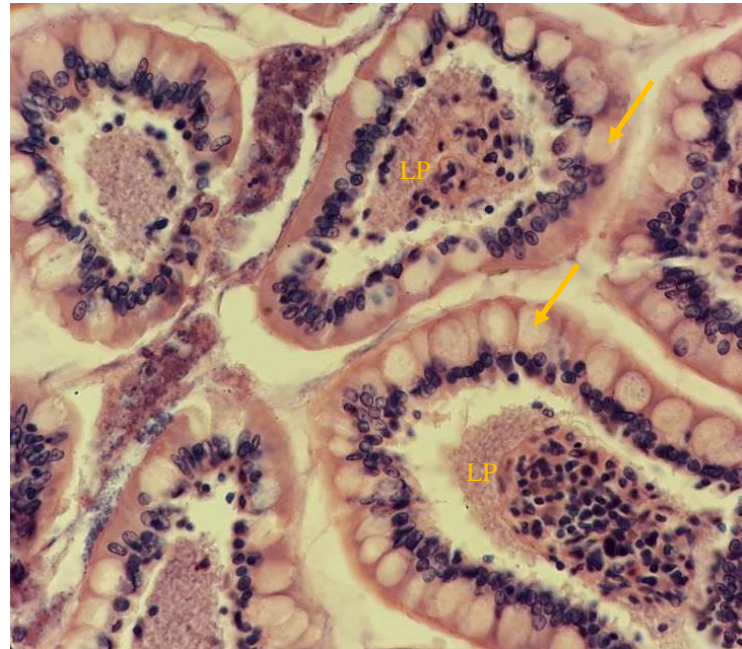


Cross section of tip of a villus in small intestine. Black arrow depict enterocytes. Lacteal duct (LD) can be seen in the center of villus. LP, lamina propria. H&E; 100X. This picture is taken from histological slide in histology laboratory of Isfahan University





## Goblet cells

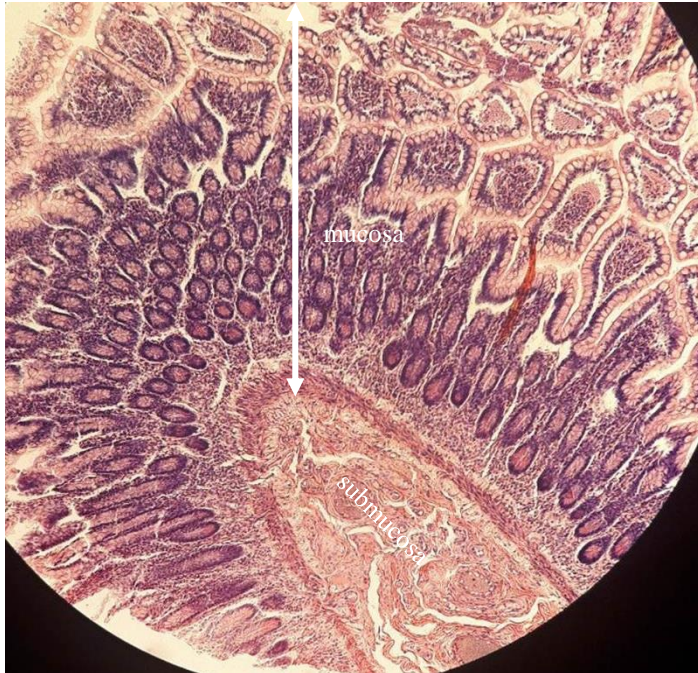


Cross section of tip of villi in small intestine. Goblet cells depict by yellow arrow. LP, lamina propria. H&E; 100X. This picture is taken from histological slide in histology laboratory of Isfahan University

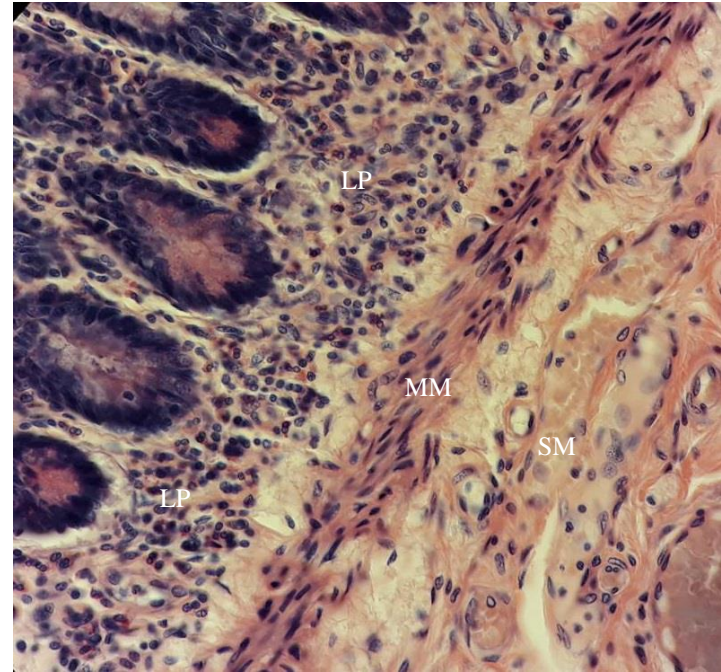




## Mucosa and submucosa in small intestine



Cross section of mucosa and submucosa in jejunum. H&E; 4X. This picture is taken from histological slide in histology laboratory of Isfahan University

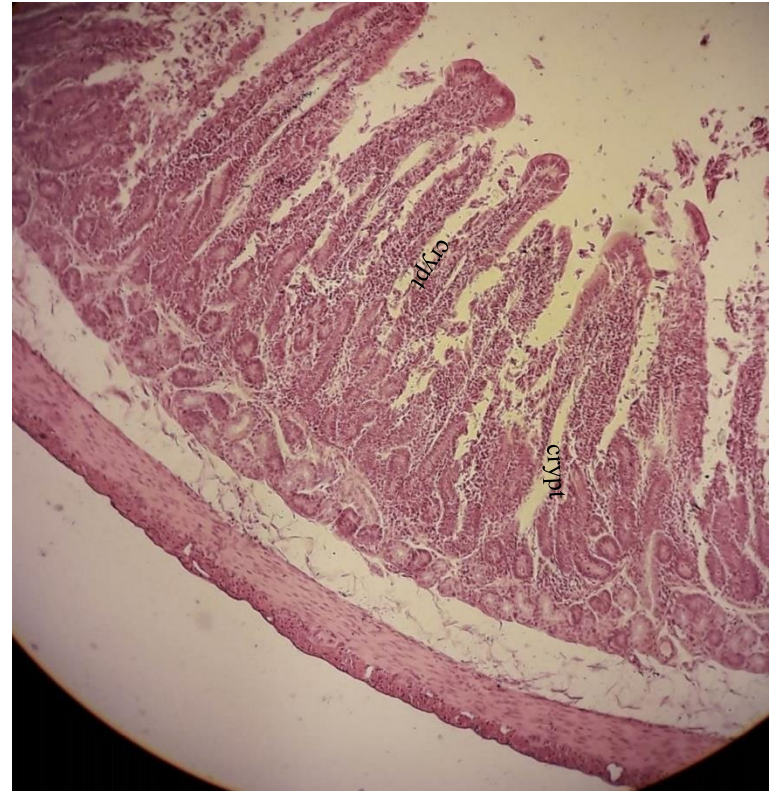


Cross section of mucosa and submucosa in jejunum. LP, lamina propria; MM, Muscularis mucosa, SM, submucosa. H&E; 100X. This picture is taken from histological slide in histology laboratory of Isfahan University



## Intestinal crypt

- ▶ Intestinal crypt or crypt of leiberkunhn is a gland found in lining epithelium of small intestine



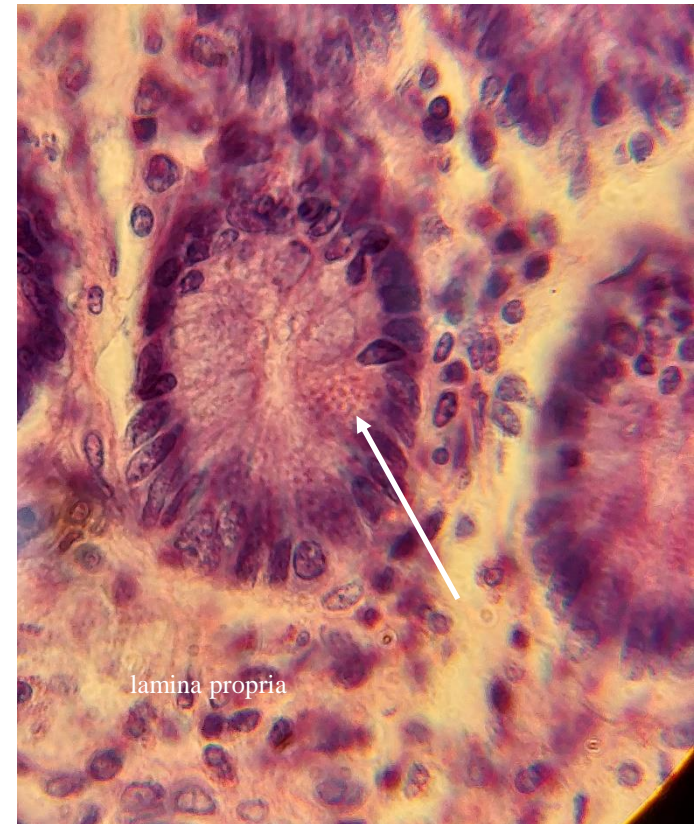
Cross section of duodenum. H&E, 4X. This picture is taken from histological slide in histology laboratory of Isfahan University





## Paneth cells

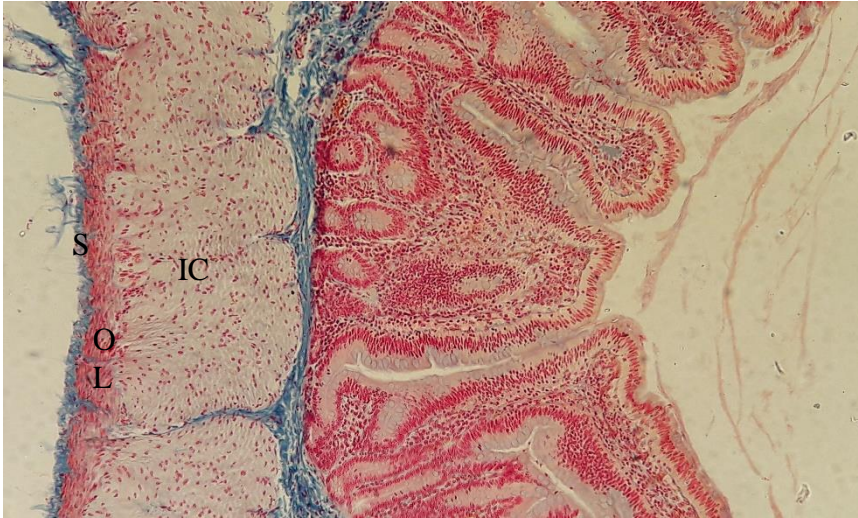
- ▶ Paneth cells are located at the base of intestinal crypts
- ▶ They are exocrine cells with large eosinophilic granules in their apical cytoplasm
- ▶ These cells play important roles in innate immunity



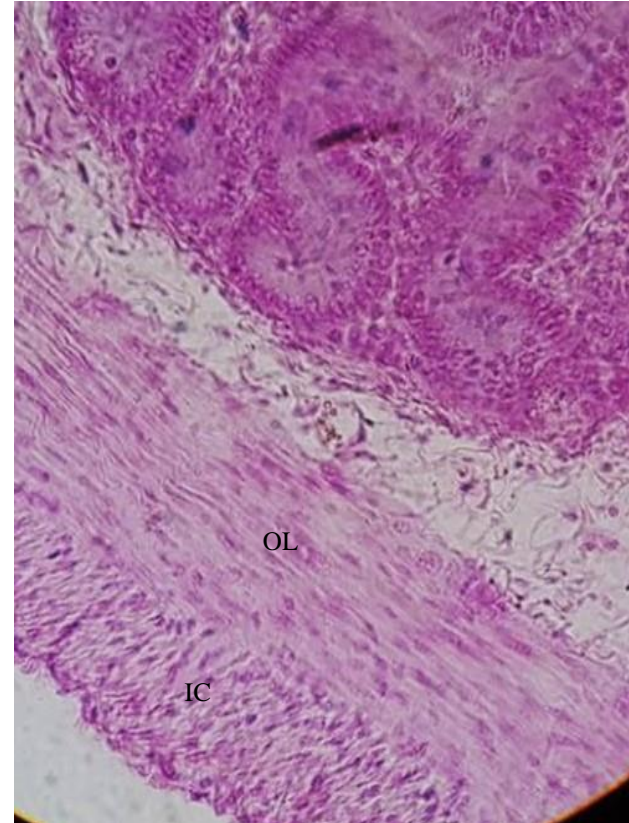
Cross section of the base of intestinal crypts, surrounded by lamina propria. Arrow depicts Paneth cell. H&E, 100X. This picture is taken from histological slide in histology laboratory of Isfahan University



## Muscularis externa



Longitudinal sections of jejunum. IC, inner circular muscular layer; OL, outer longitudinal muscular layer; S, serosa. 4X. This picture is taken from histological slide in histology laboratory of Isfahan University

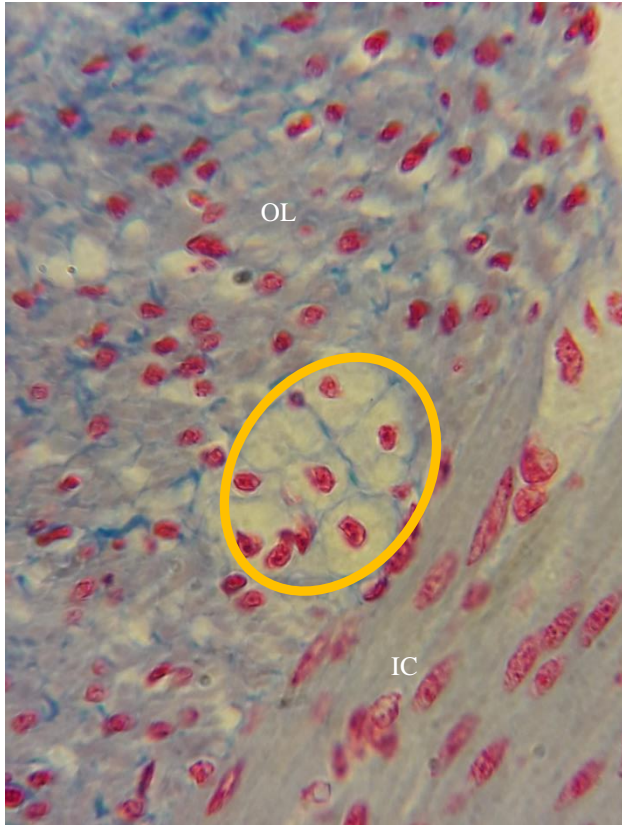


Cross sections of external muscular layer in ileum. IC, inner circular muscular layer; OL, outer longitudinal muscular layer; H&E, 40X. This picture is taken from histological slide in histology laboratory of Isfahan University





## Muscularis externa and myenteric plexus in small intestine



Cross sections of external muscular layer of small intestine. IC, inner circular muscular layer; OL, outer longitudinal muscular layer; yellow circle depicts parasympathetic ganglion of myenteric plexus. H&E, 100X. This picture is taken from histological slide in histology laboratory of Isfahan University

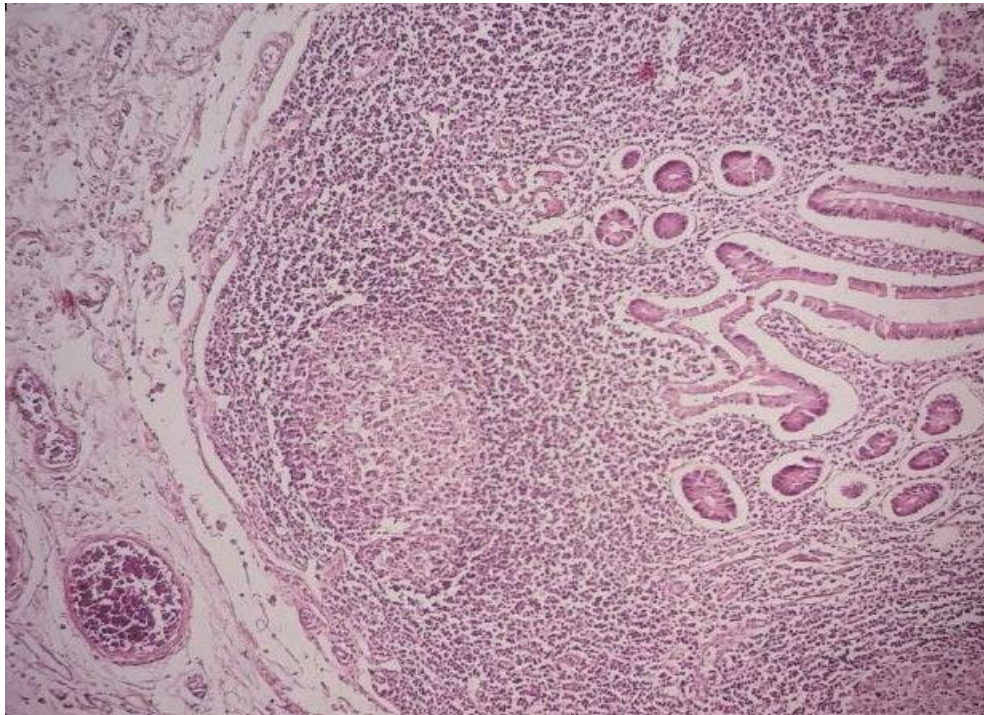


Cross sections of external muscular layer of small intestine. IC, inner circular muscular layer; OL, outer longitudinal muscular layer; yellow circle depicts parasympathetic ganglion of myenteric plexus. H&E, 100X. This picture is taken from histological slide in histology laboratory of Isfahan University



## Peyer patches

- ▶ Peyer patches are round or oval clusters of sub-epithelial lymphoid nodules found in the mucosa layer of small intestine. They are more prominent in ileum



Peyer patch in the mucosa layer of jejunum. H&E, 10X. This picture is taken from histological slide in histology laboratory of Isfahan University