

ANAT 2160/BIOL 3430 Gastrointestinal system Laboratory Module

Objectives:

- 1) Understand the general structure of the three layers in the gut wall (mucosa, submucosa and muscularis externa) as a basis for studying how the features of the wall vary in different regions of the gut.
- 2) Within each region of the gut (esophagus, stomach, small intestine, large intestine), determine the local structure of the three wall layers, and the functions that are supported by these structures.

Overview:

The histology of the gastrointestinal system varies by region, and the structure of the wall in each region reflects the functions of these regions. The same basic layers are present in the wall throughout the length of the gut, but the histology of each layer varies.

General instructions: Before beginning to look at the slides in this laboratory, you should review the lecture material covering the structure of the wall layers for each section of the gut. Then, as you examine each slide, identify all layers, analyze the structure of each layer (for instance, cell types and their functions, basic tissue types present, characteristics of these tissue types, extracellular features, vascularization), and determine how the structure of a particular layer here compares with that of the same layer in other regions.

The instructions for each slide below are meant to aid in identifying the features of each region, but you should apply the general instructions above to all of the slides listed. Note that in some slides the deeper layers of the wall may be split from the mucosa; this is an artifact of tissue preparation.

Esophagus. There is no absorption from the lumen in this part of the gastrointestinal tract.

4, esophagus. In this slide all layers are clearly visible and easily identified. In particular you can easily pick out the two layers of the muscularis externa. Given that the inner layer of this muscle is arranged circumferentially around the organ, and the outer layer is oriented longitudinally, can you tell the original orientation of the tissue section on your slide when it was taken from the esophagus? Your slide may contain the secretory portions of a few glands (round or oval profiles), located in the submucosa, that secrete primarily mucus. If present, these glands will have ducts carrying the mucus to the lumen.

Stomach.

126, gastroesophageal junction. This slide is excellent not only for examining the transition from esophagus to stomach, but also for the visibility of the different epithelial cell types present in the glands of the stomach wall. There is an abrupt transition from the stratified squamous epithelium lining the esophagus to the simple columnar epithelium lining the glands of the stomach. Stomach glands are branched tubes lined with simple columnar epithelium. The stain used on this slide had multiple components to distinguish different cell types by the color of structures in their cytoplasm. Within the glands, mucus-secreting goblet cells close to the luminal surface of the stomach contain deep purple granules while those lining deeper parts of the glands have more pale-staining cytoplasm. In the mid-region of the glandular epithelium, cells with round or oval, blue-staining cytoplasm and a prominent central pale-staining nucleus are parietal cells. The overall shape of these cells resembles fried eggs. The deepest cells in the glands are chief cells, containing many dark-blue granules. Look for blood vessels (containing erythrocytes) and traces of connective tissue in the lamina propria between the walls of the glands. .

12, stomach wall, body region. Several mucosal folds, or rugae, are visible on this slide. The epithelial cells are not well stained so the different cell types in the glands cannot be distinguished. This slide clearly shows the muscle layers in the thick muscularis externa. How many different orientations of muscle fibres can you identify here?

Small intestine. All regions of the small intestine absorb nutrients from the lumen, in addition to displaying regional specializations. Identify all wall layers, as well as specializations for absorption, such as plicae and villi, in the sections below. Make sure you understand the organization of the villi and glands in the mucosa.

63, duodenum. The core of the plica shown on this slide is filled with the mucus-secreting component of a large submucosal gland called Brunner's gland. The presence of these glands is a diagnostic feature of the duodenum. Why would the large amounts of mucus secreted by these glands be beneficial in this region of the small intestine?

114, jejunum. This slide is not available at every station in the laboratory, but there should be at least one or two slide boxes per bench containing this slide, so you may have to borrow one from your neighbor. Plicae are prominent on this slide.

8, ileum. Villi and glands are clearly identifiable, and you can distinguish blood vessels, connective tissue fibres and some strands of smooth muscle in the lamina propria forming the core of the villi. One of the specializations of the ileum is immune-related defence. Look for the large number of lymphocytes in the lamina propria; are there any lymph nodules in your section? These are Peyer's patches.

Large intestine.

9, colon. The mucosa of the colon has simple tubular glands but no villi. Large amounts of mucus are secreted by goblet cells in these glands to aid the movement of indigestible fecal material toward the anus; these cells can be identified by their relatively pale-staining cytoplasm. The darker-staining columnar epithelial cells primarily absorb water from the fecal mass. How many layers of muscle can you identify in the muscularis externa? If you can see two distinct layers, what can you conclude about the original location of this section within the wall of the colon, given what you know about the anatomy of this tissue?