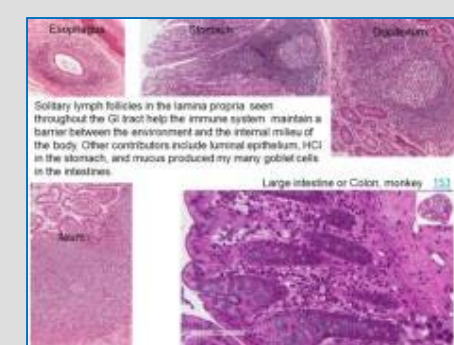
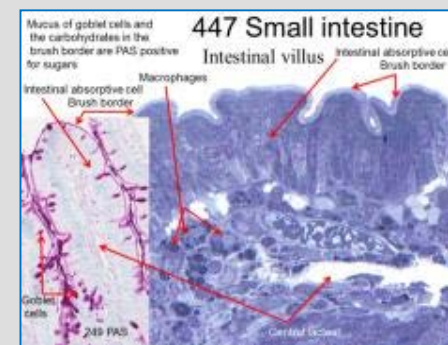
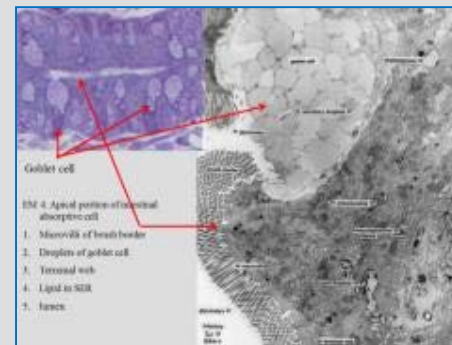
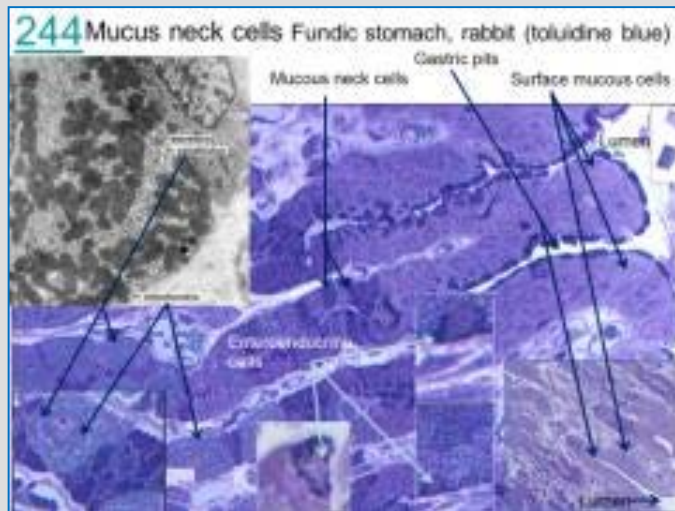
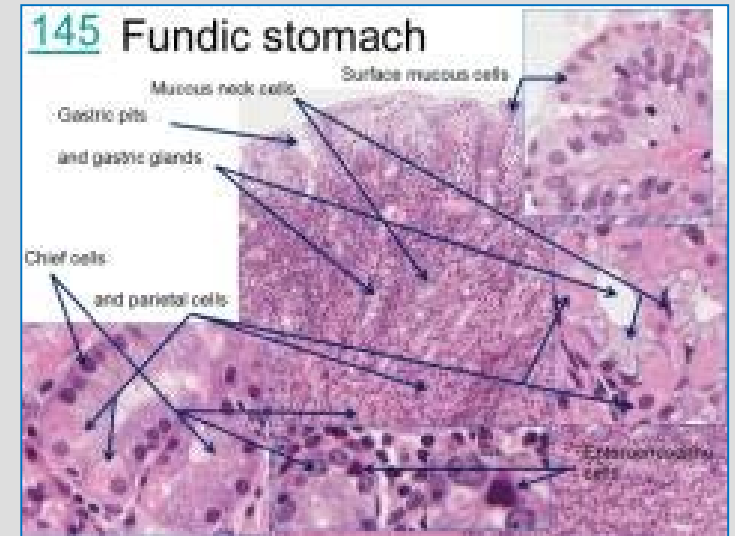
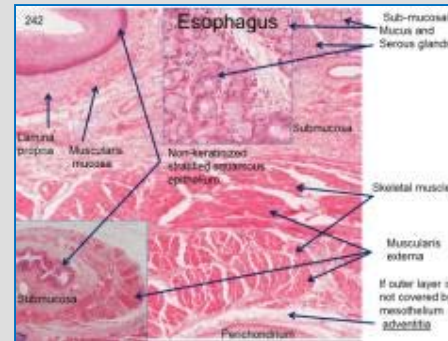
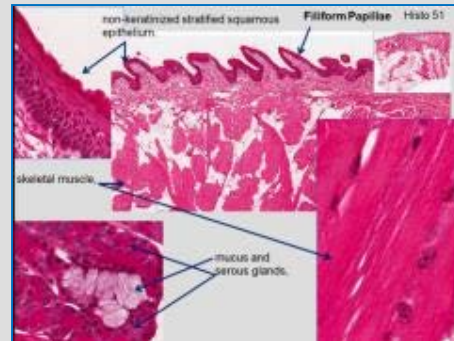
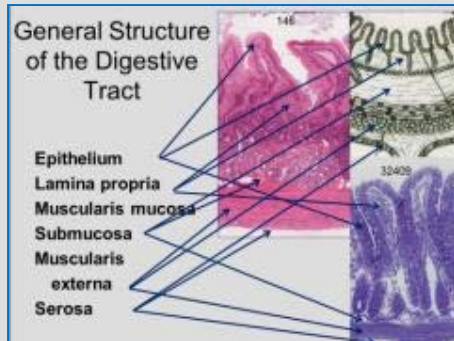


Medical School Histology Basics

Digestive System

VIBS 243 lab



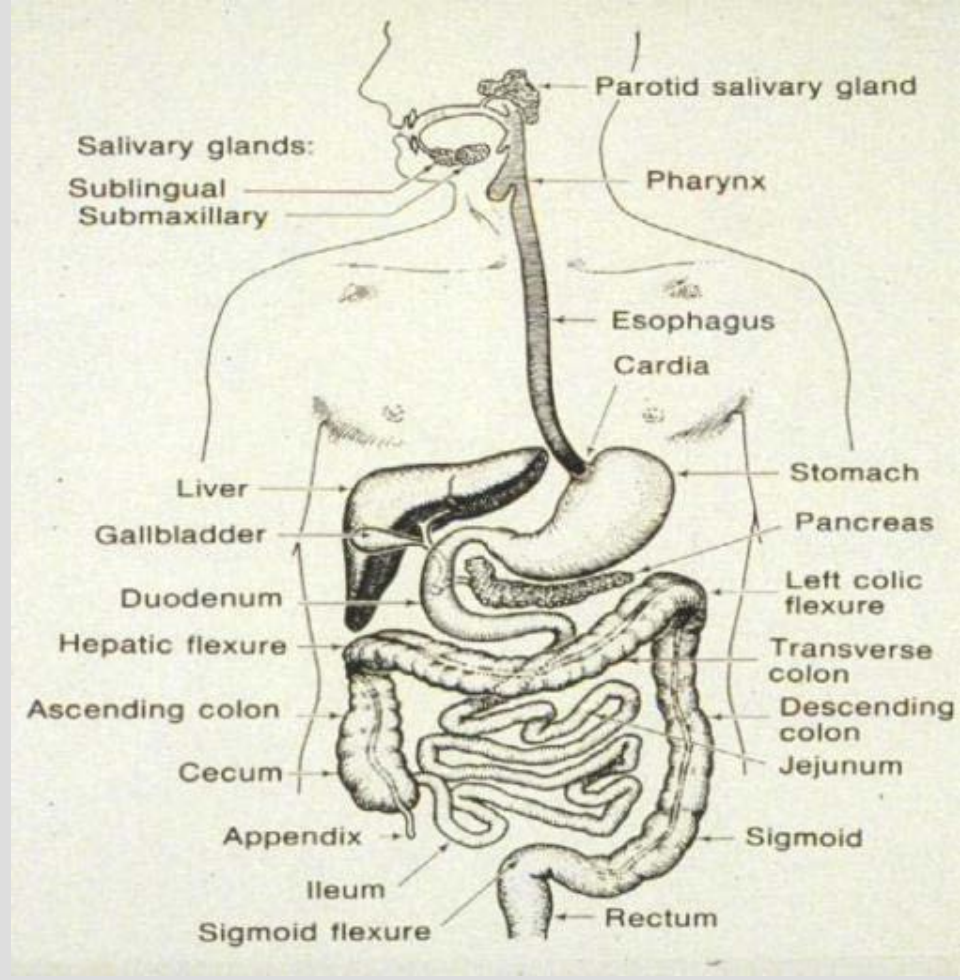
Larry Johnson

Texas A&M University

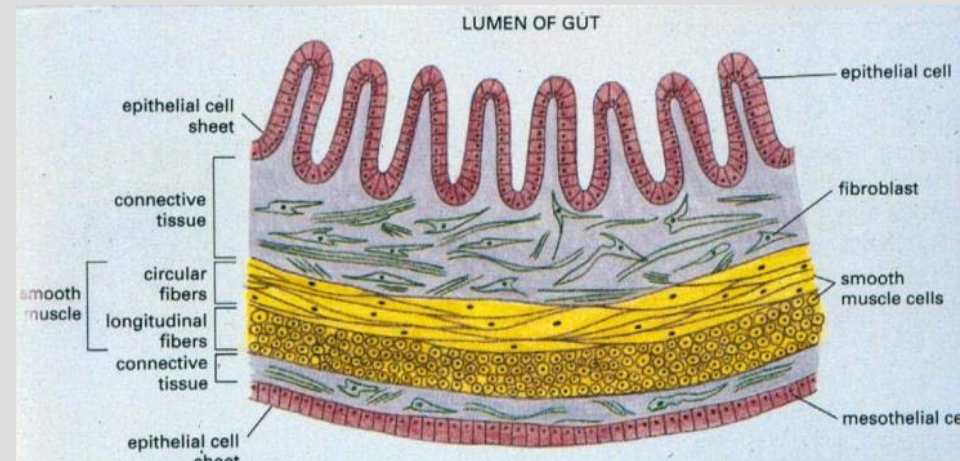
Objectives

To understand the general organization of organs of the digestive system and how they function to obtain metabolites necessary for growth and energy for the body, yet maintain a barrier between the environment and the internal milieu of the body

To identify and describe functions of cellular structures, cells, and groups of cells in the digestive system.



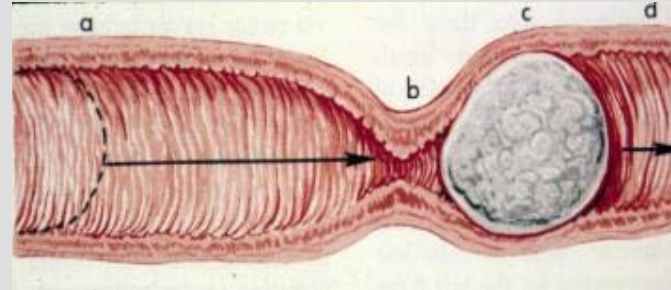
Ref code
2, 16



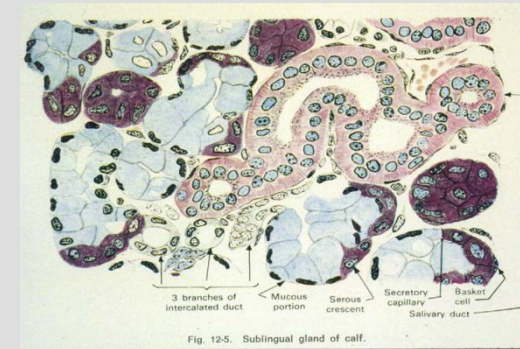
Function of the Digestive System

Ref code
4, 16

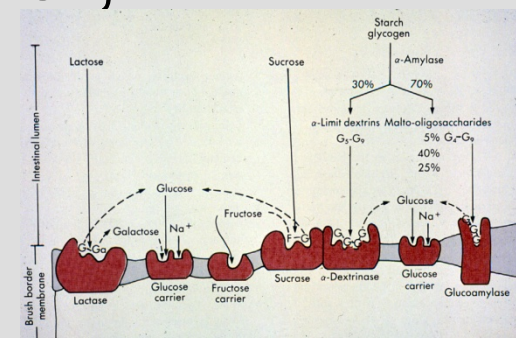
Movement of food



Secretion of digestive juices



Absorption of digested foods, water,
and electrolytes



Adaptation of G.I. Tract for Specific Function

Function

Simple passage
from one part
to another

Storage of food or feces

Digestion

Absorption of end products

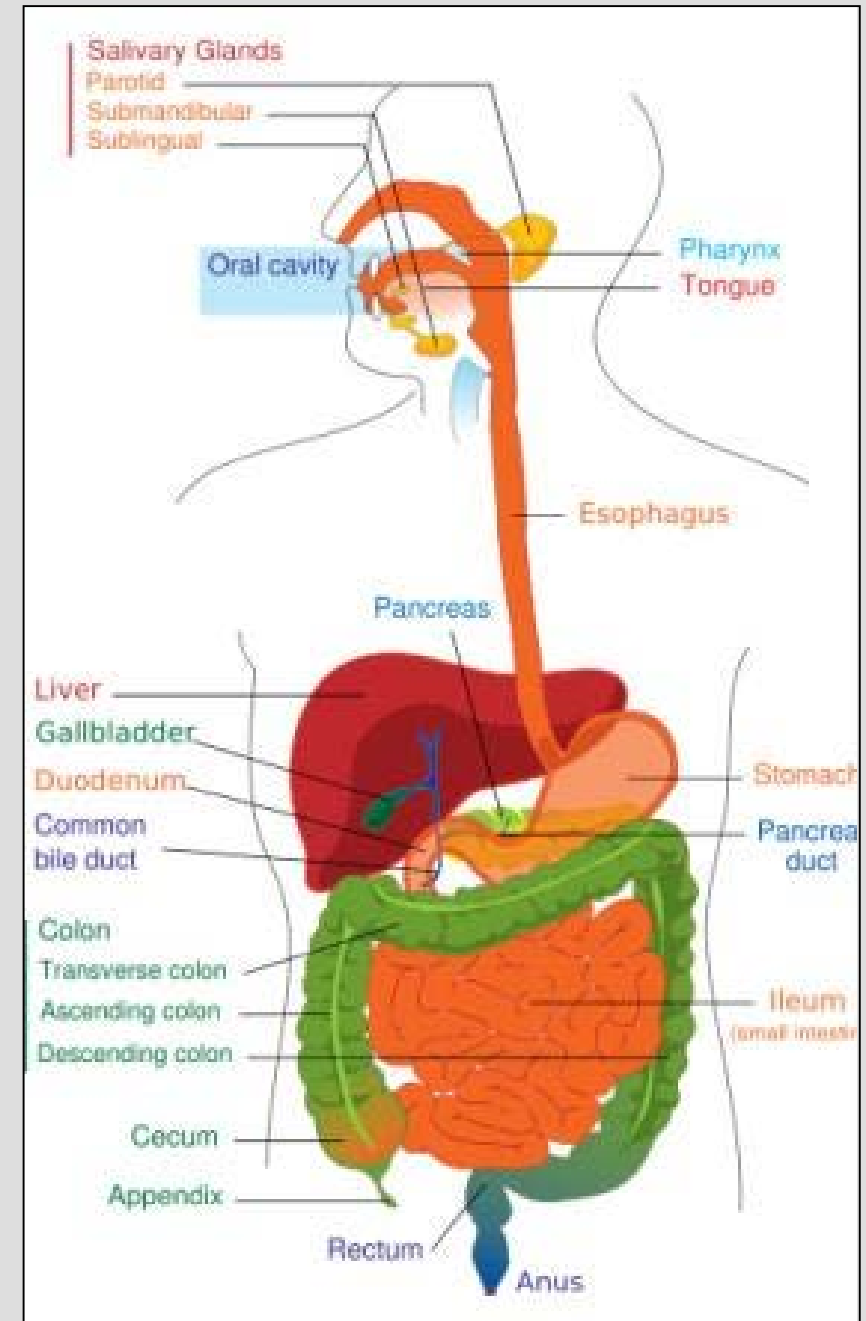
Organ

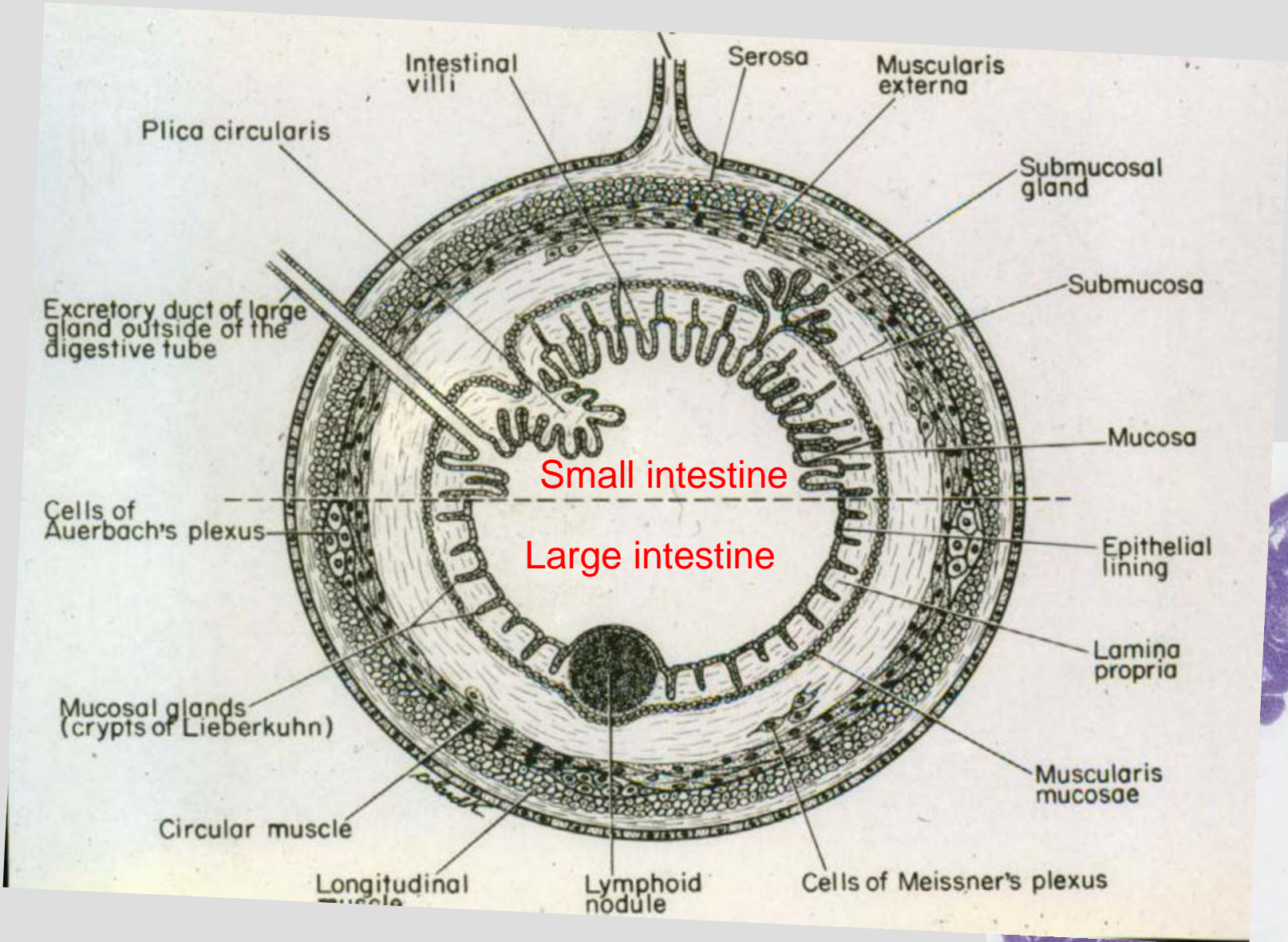
Esophagus

Stomach
or distal colon

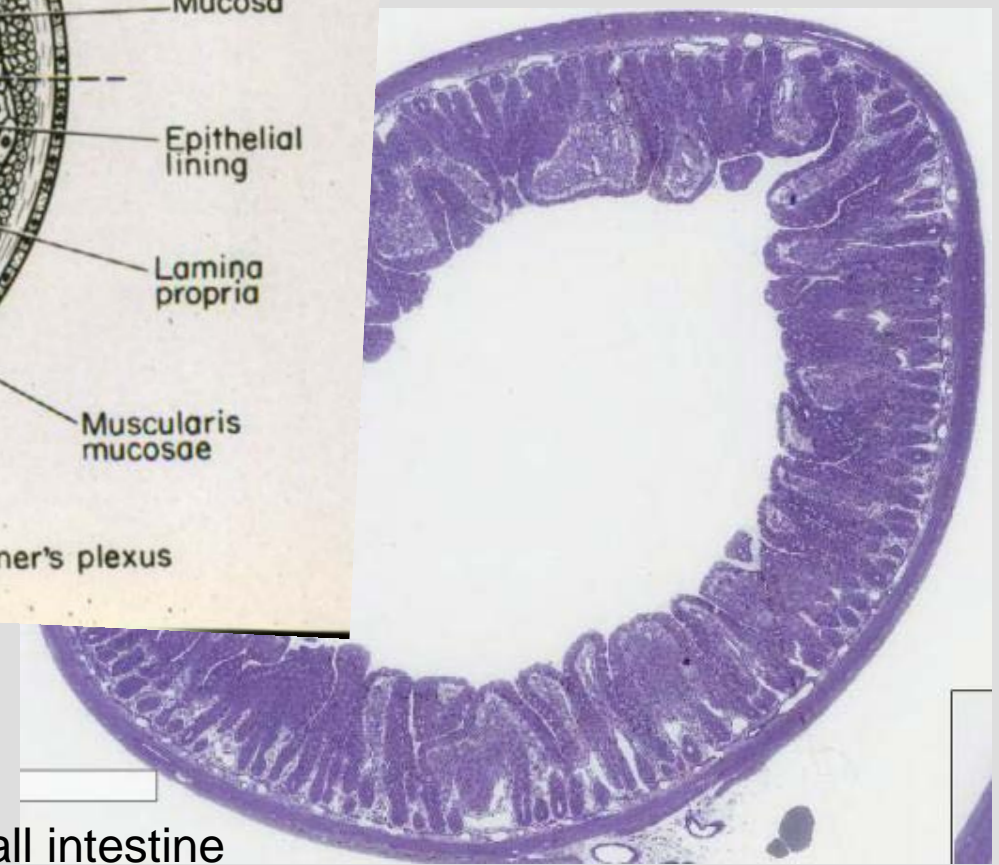
Stomach, small
intestine

Small intestine,
proximal colon





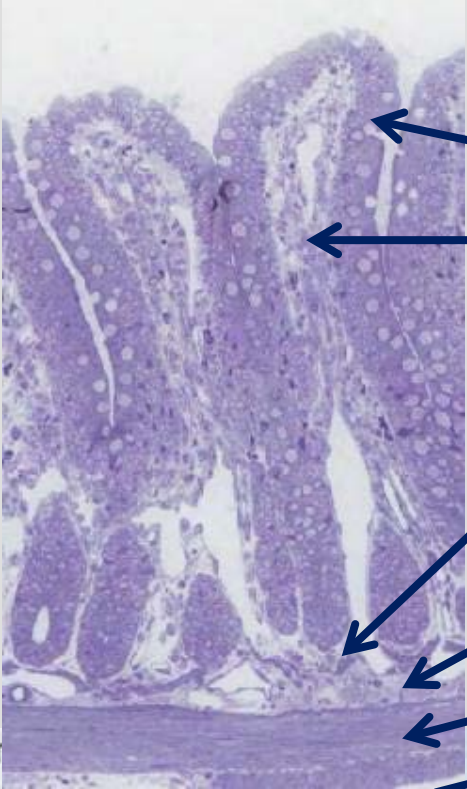
32409



General Structure of the Digestive Tract

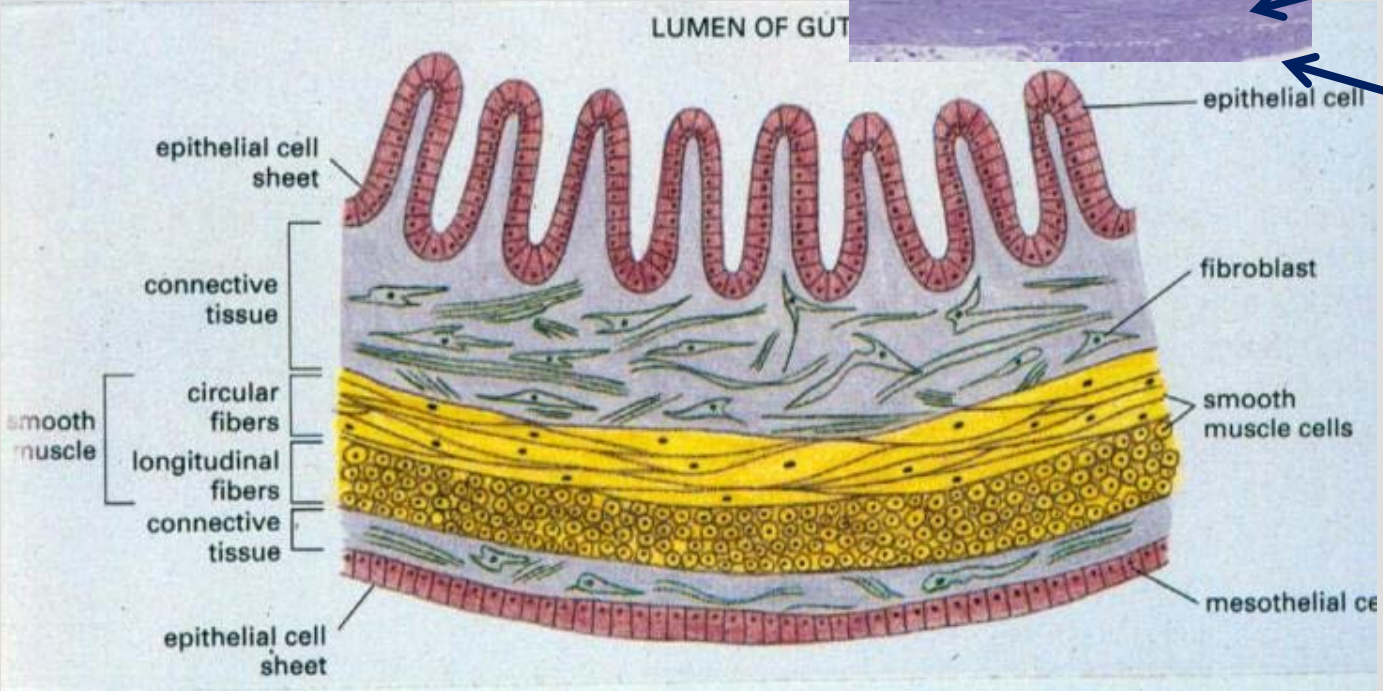
32409

Ref code # 2



Epithelium
Lamina propria

Muscularis mucosa
Submucosa
Muscularis externa
Serosa



General Structure of the Digestive Tract

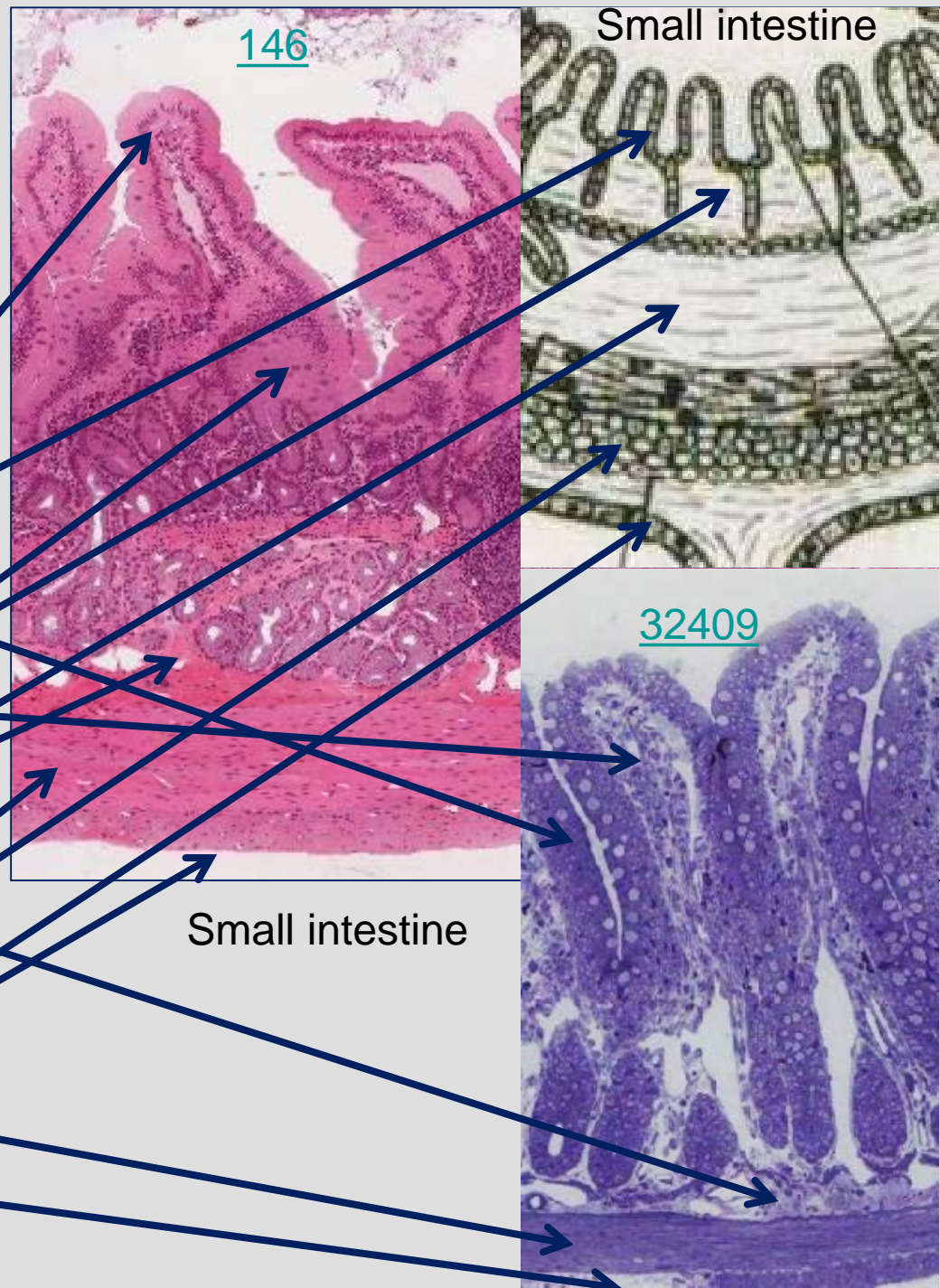
Epithelium

Lamina propria

Submucosa

Muscularis externa

Serosa



Ref code
6

General Structure of the Digestive Tract

153

Large intestine

Ref code # 6

Epithelium

Lamina propria

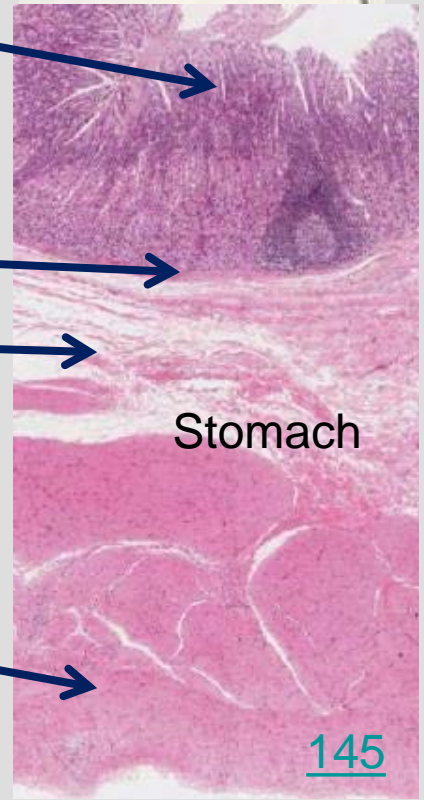
Muscularis mucosa

Submucosa

Muscularis externa



Large intestine



Stomach

145

Large intestine

Muscularis externa

Mesothelium

153

153

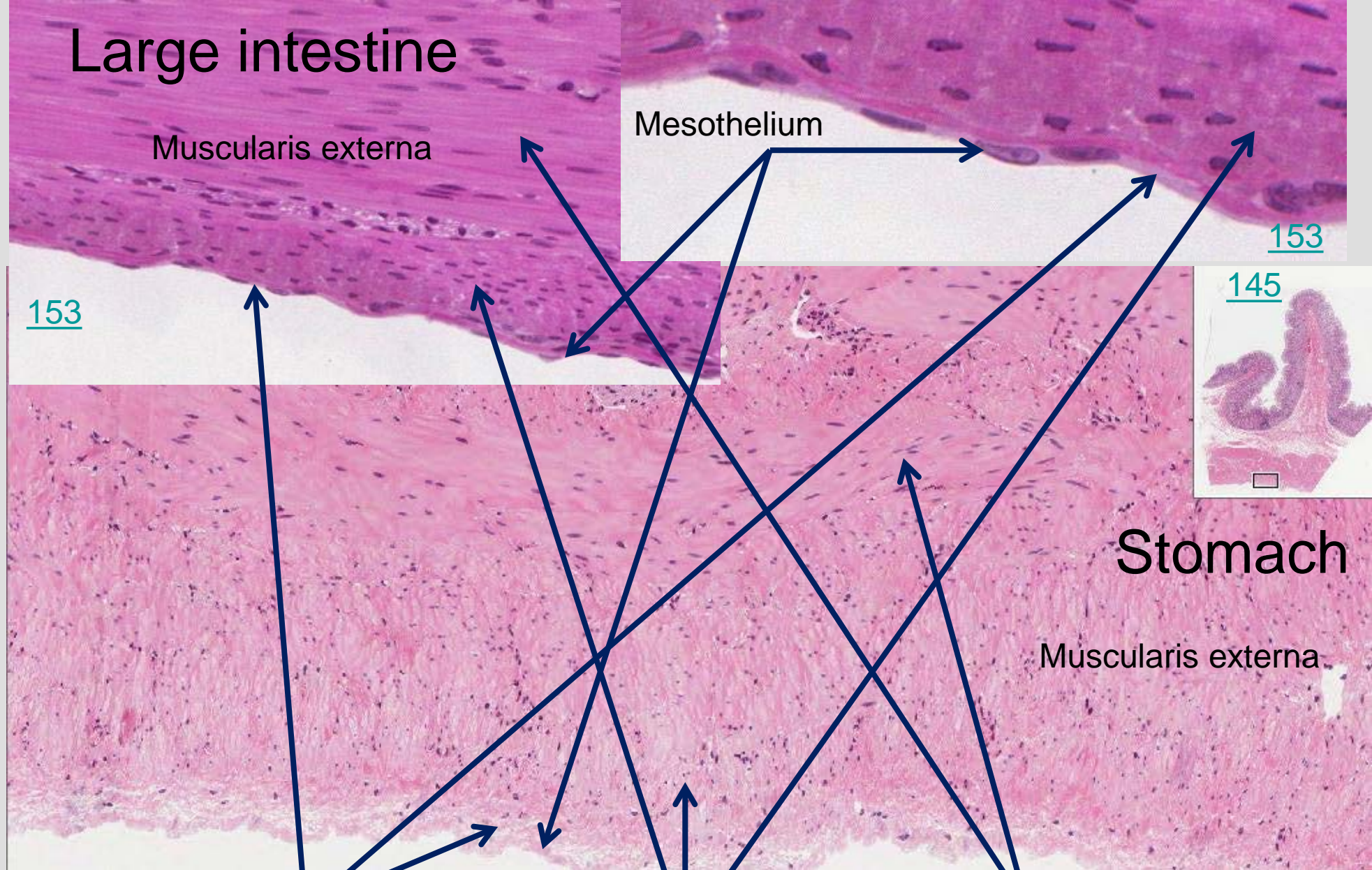
145

Stomach

Muscularis externa

Serosa

Inner, thicker circular layer
Outer longitudinal layer of the muscularis externa



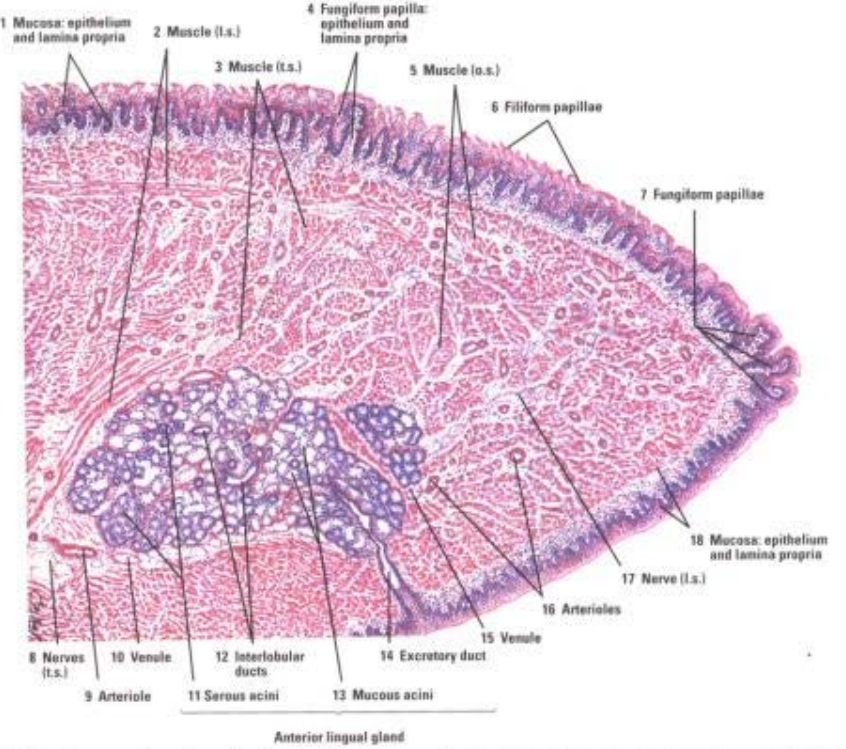
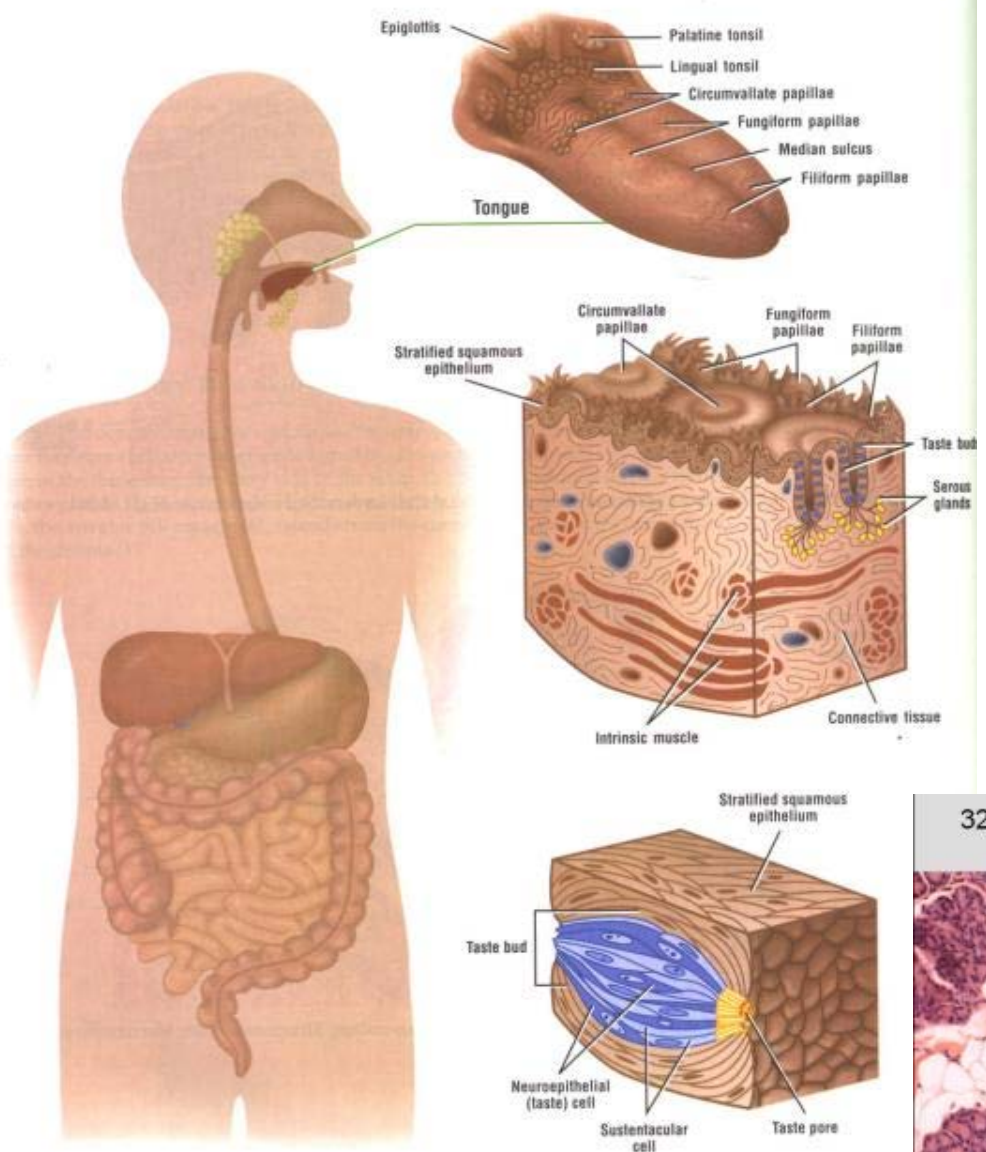
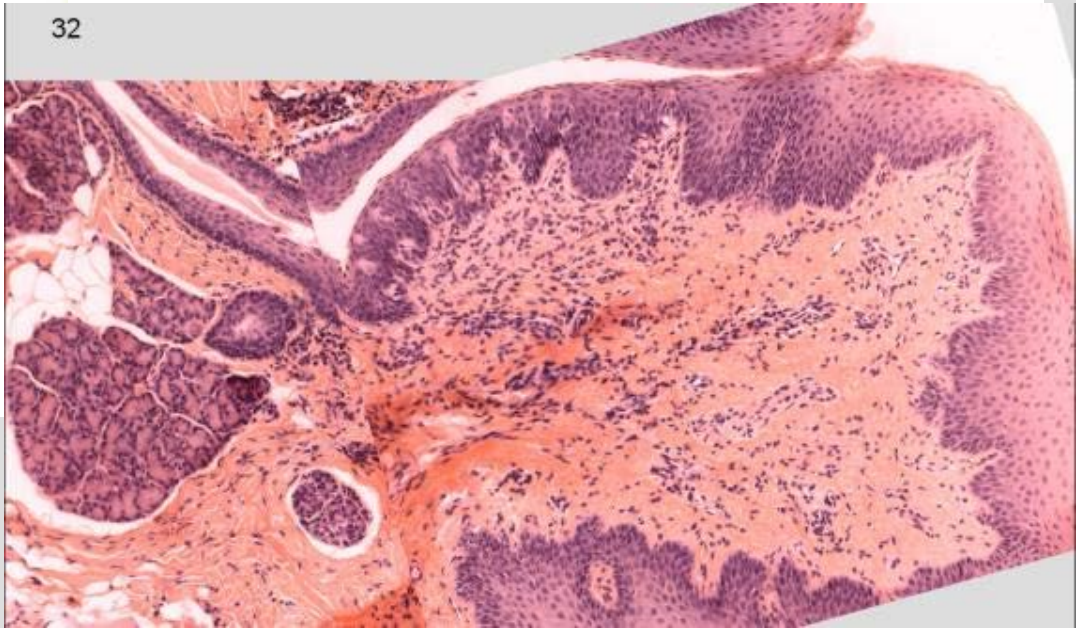
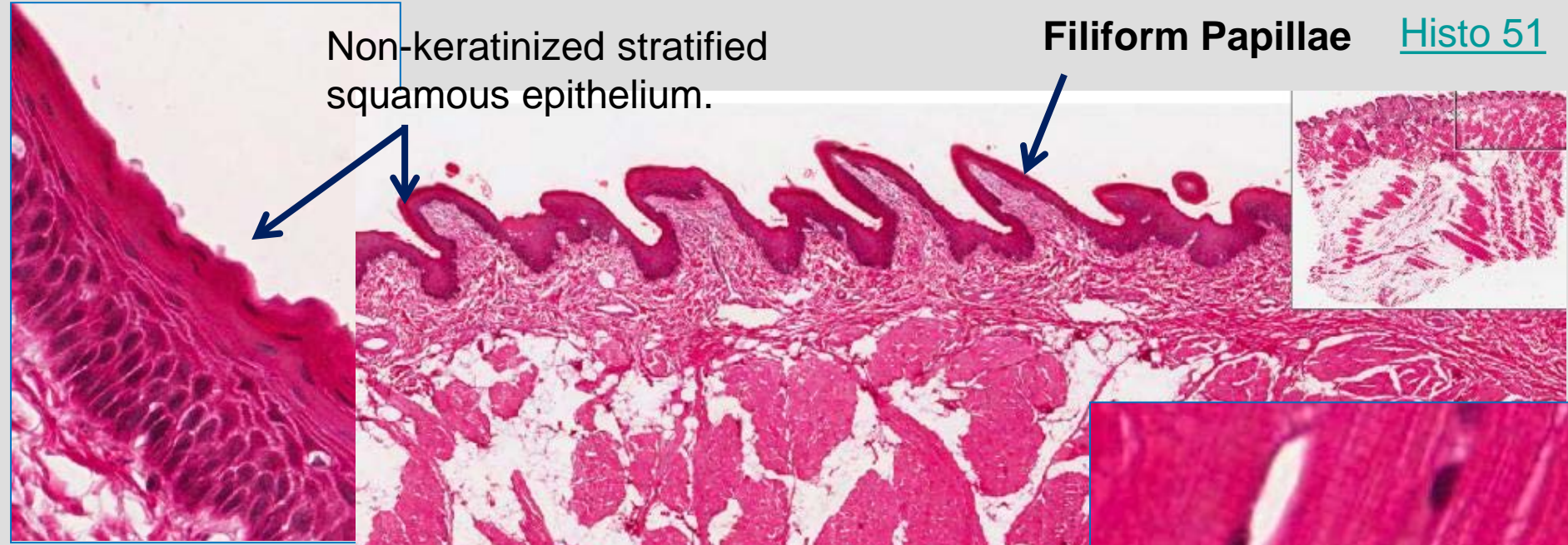


Fig. 10-2 Tongue: Apex (longitudinal section, panoramic view). Stain: hematoxyline-eosin. Low magnification.



Non-keratinized stratified squamous epithelium.

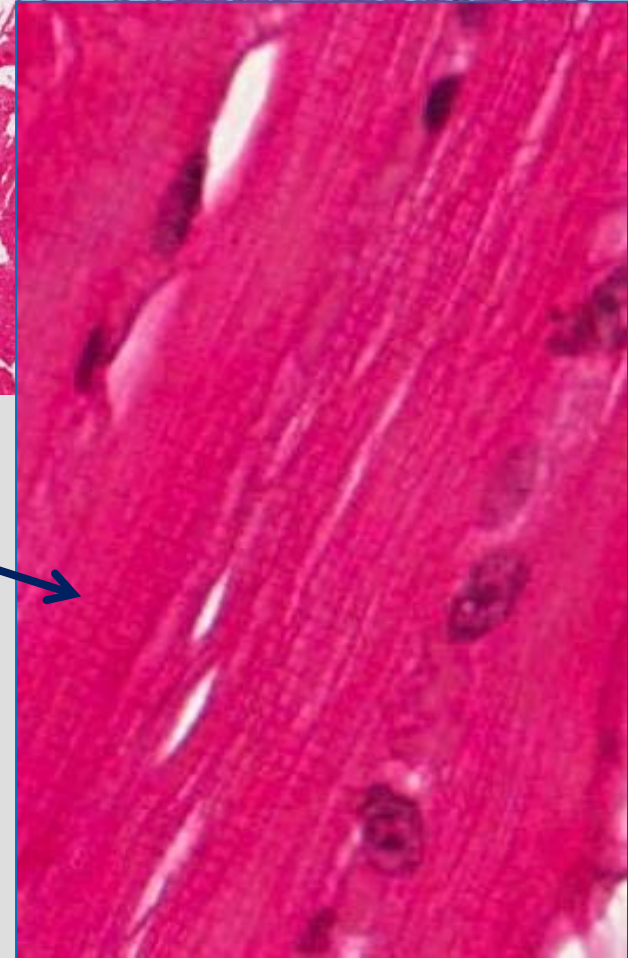
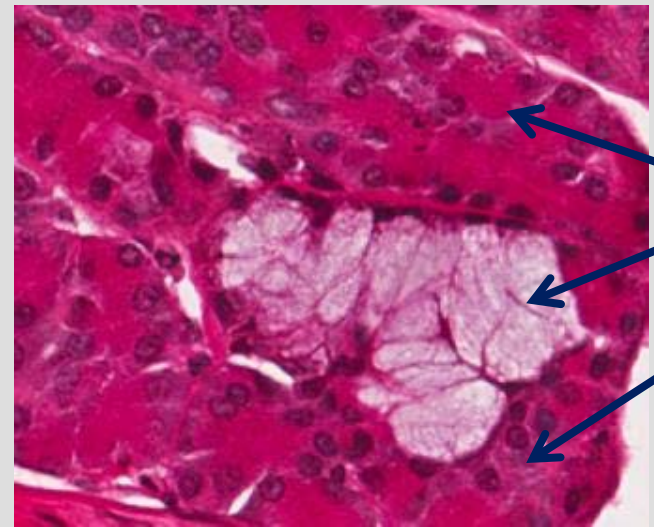
Filiform Papillae



Skeletal muscle,



Mucus and Serous glands,



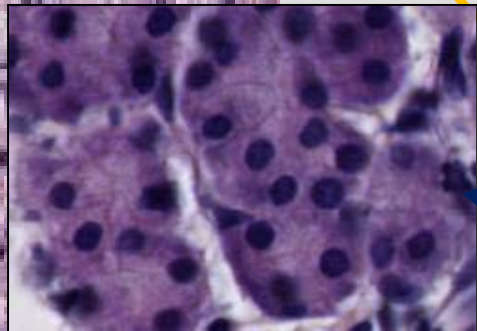
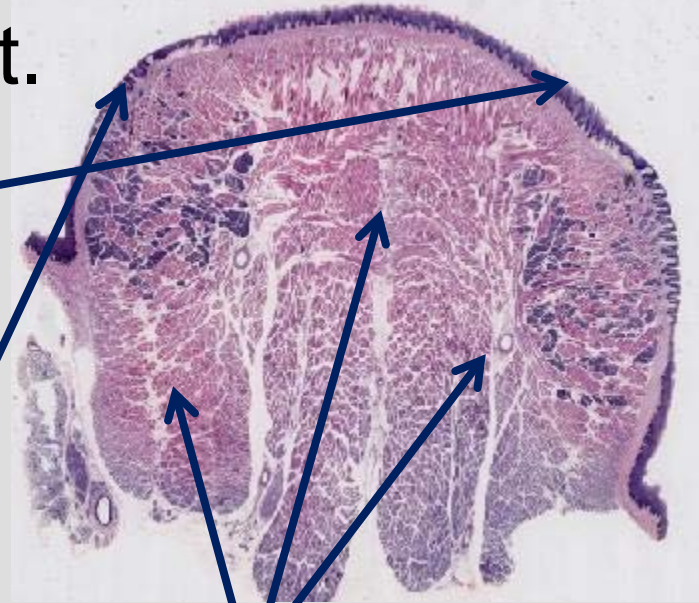
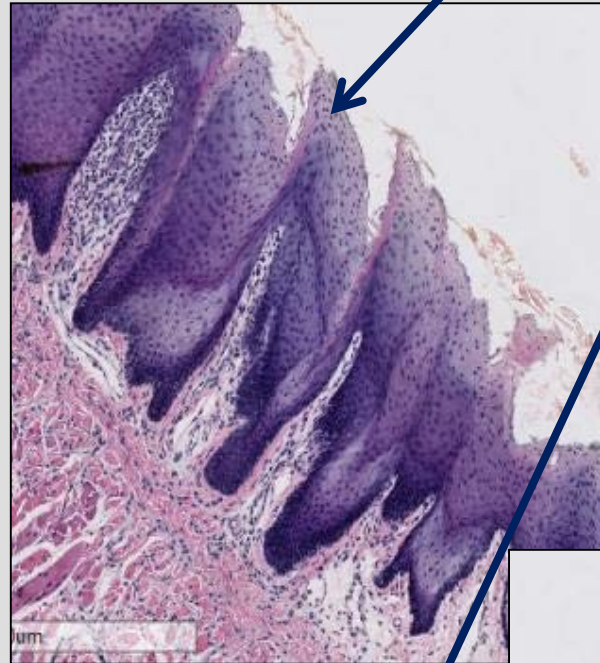
FILIFORM PAPILLAE

Ref code
6

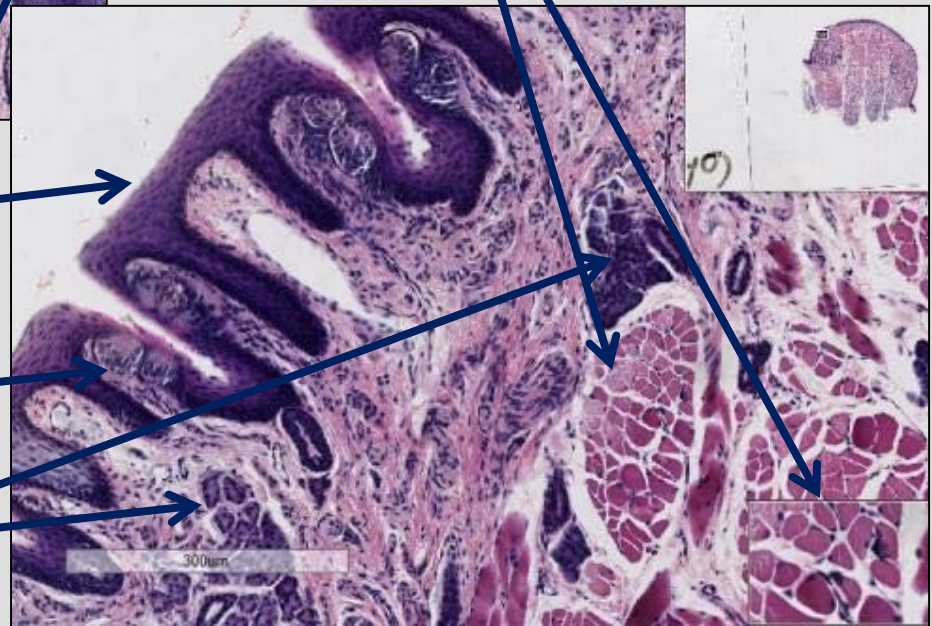


Figure 23–6. Scanning electron micrograph of the filiform papillae of rabbit tongue. (Micrograph courtesy of F. Fujita.)

Slide #12 (1101). Tongue, rabbit.



Foliate papillae that possess Taste buds



Serous glands

Ref code # 5

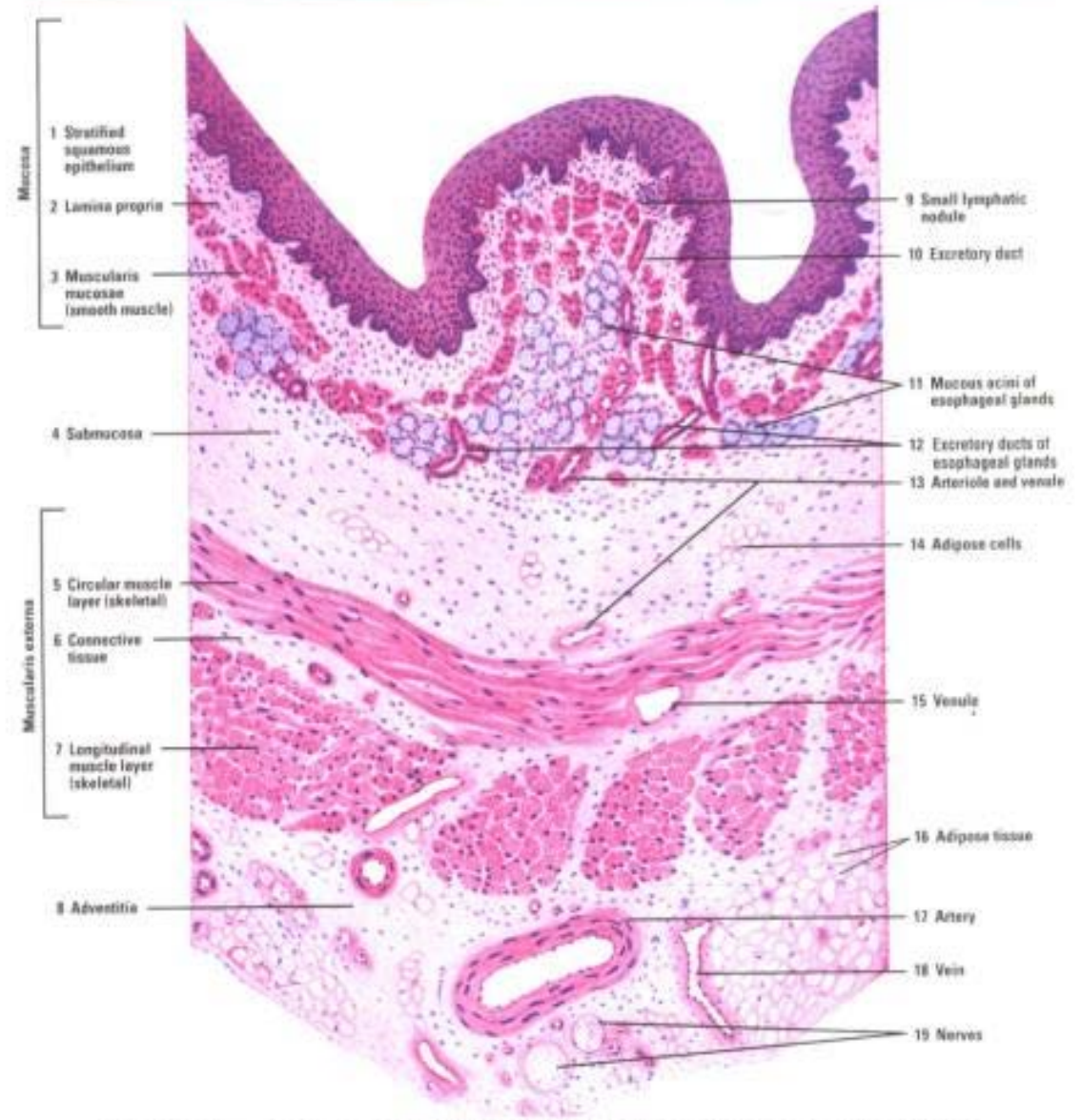
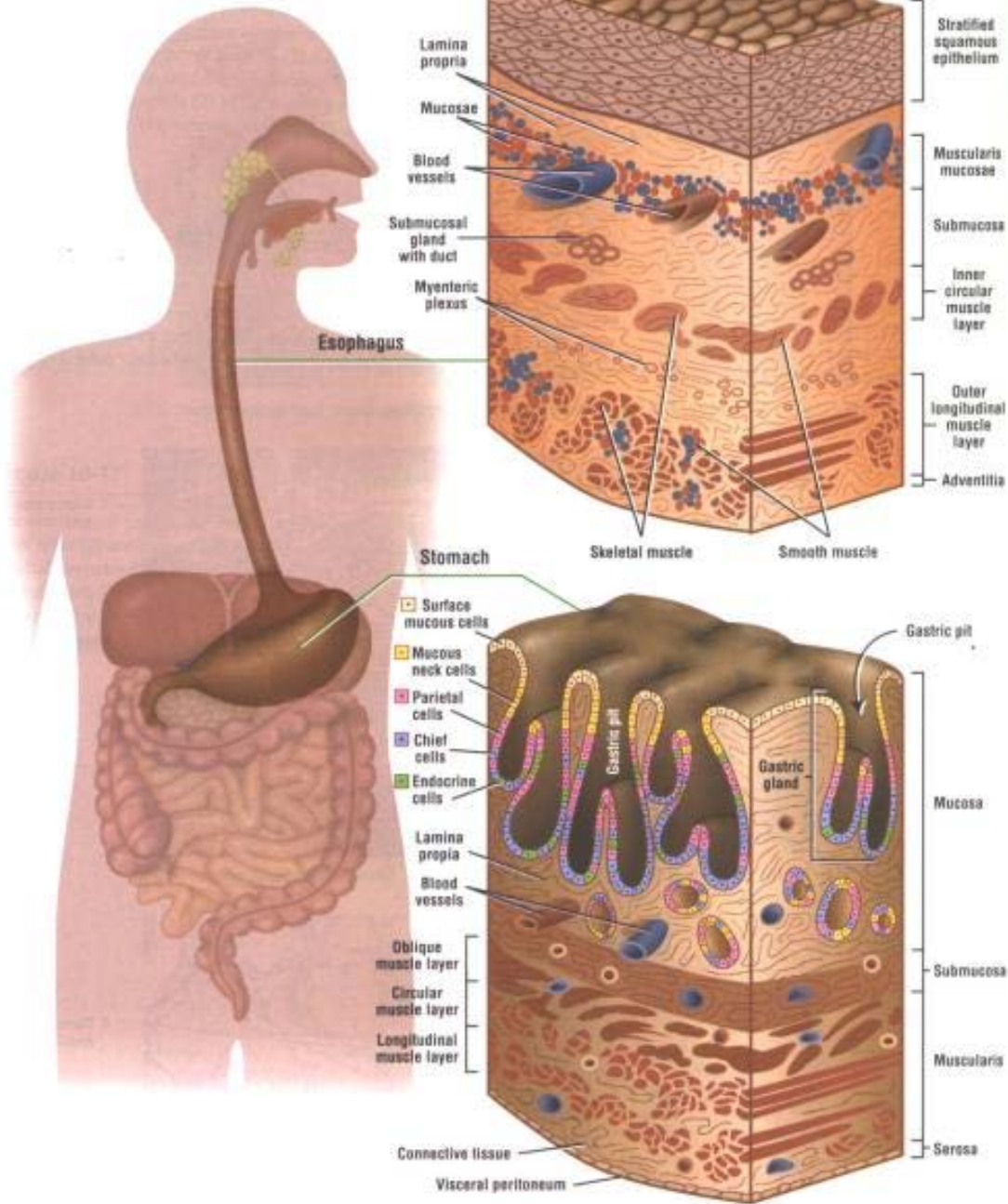
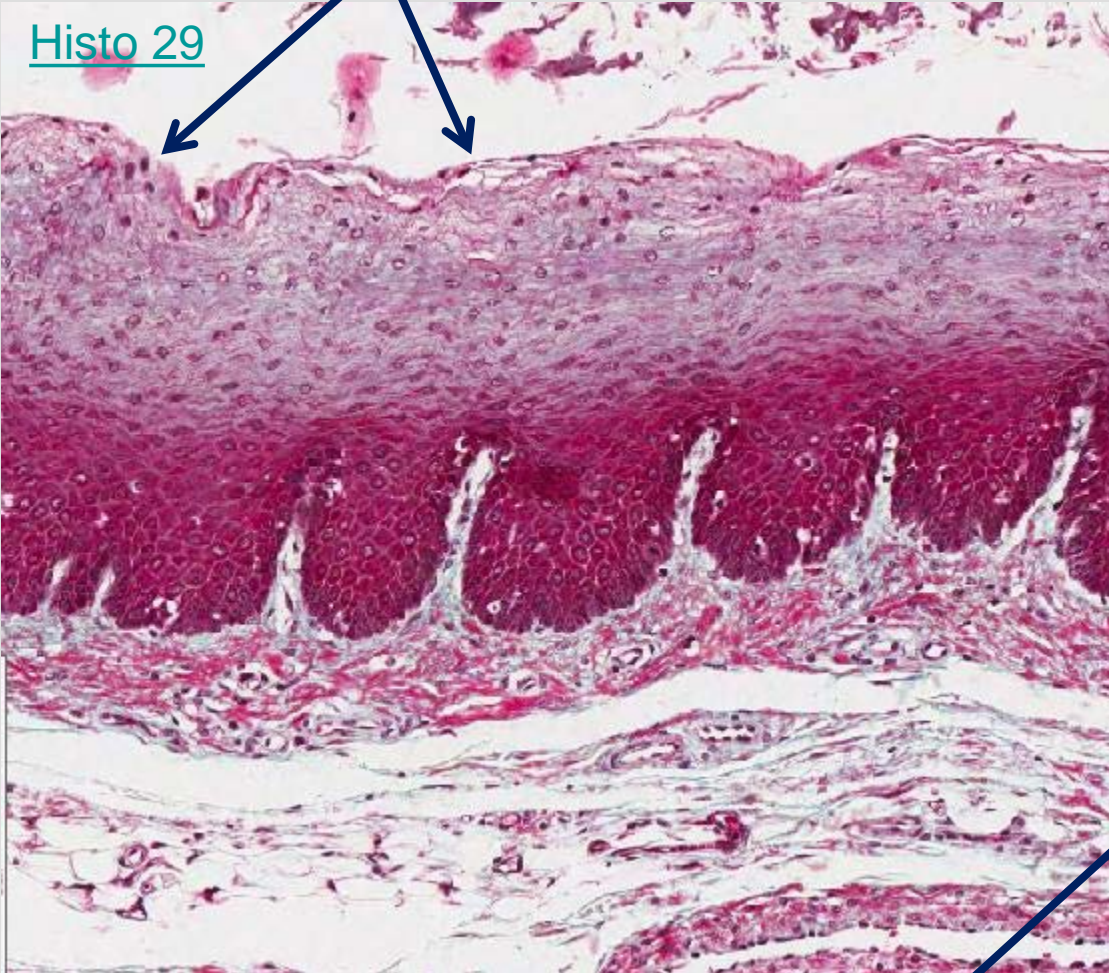


Fig. 11-1 Upper Esophagus: Wall (transverse section). Stain: hematoxylin-eosin. Low magnification.

Esophagus

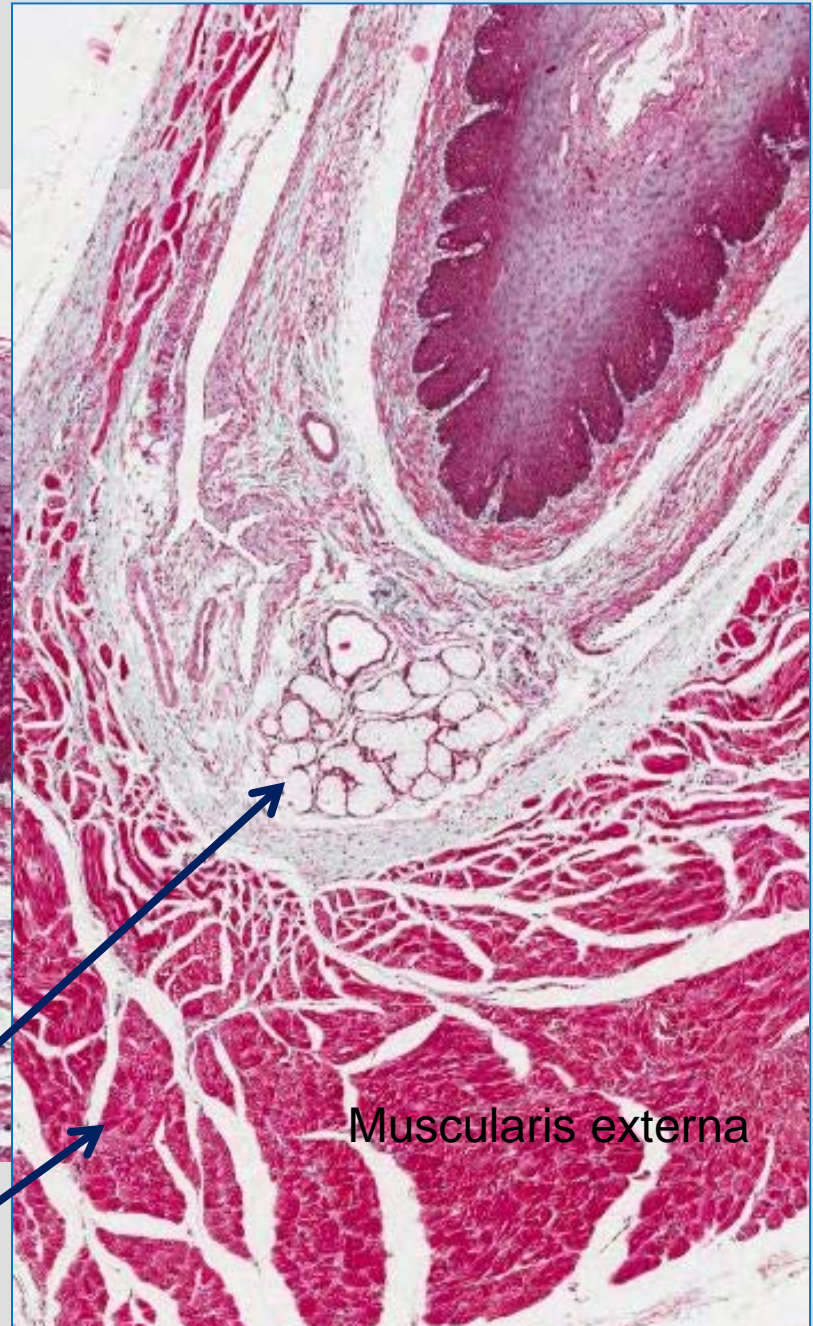
Non-keratinized stratified squamous epithelium.

Histo 29



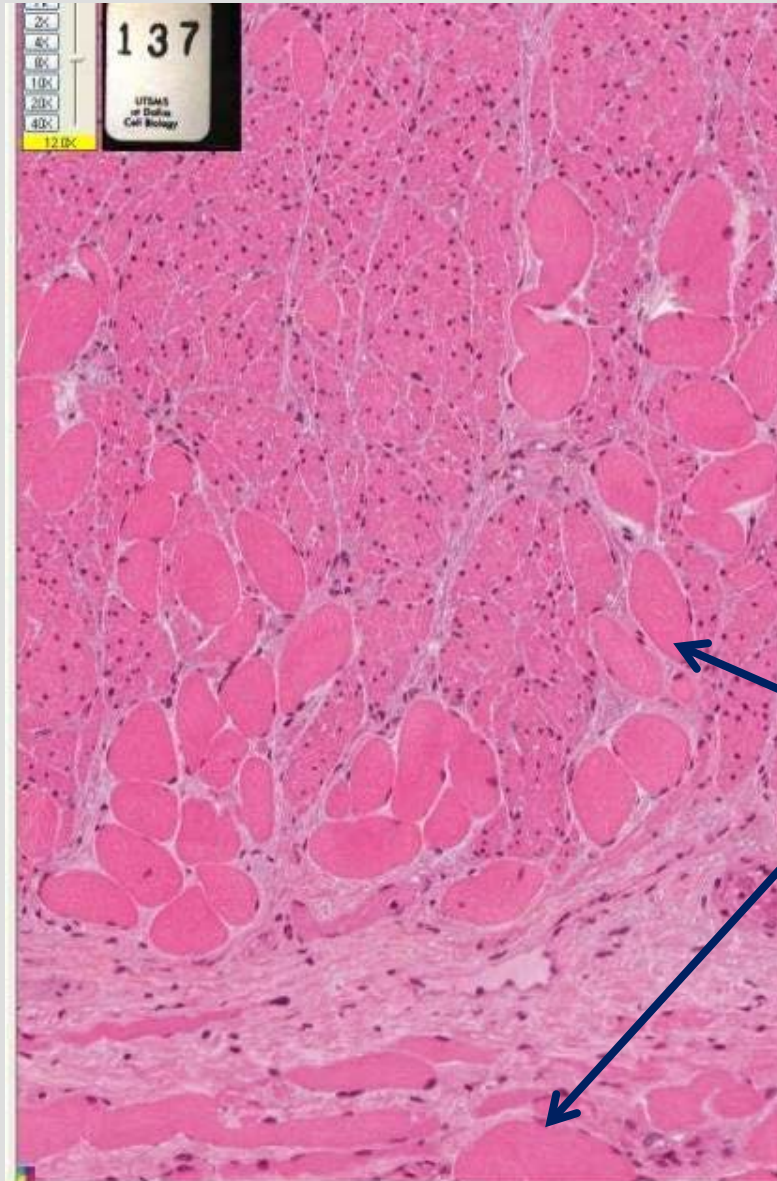
Sub-mucosal glands

Skeletal muscle



Muscularis externa

137 Esophagus – skeletal and smooth muscle

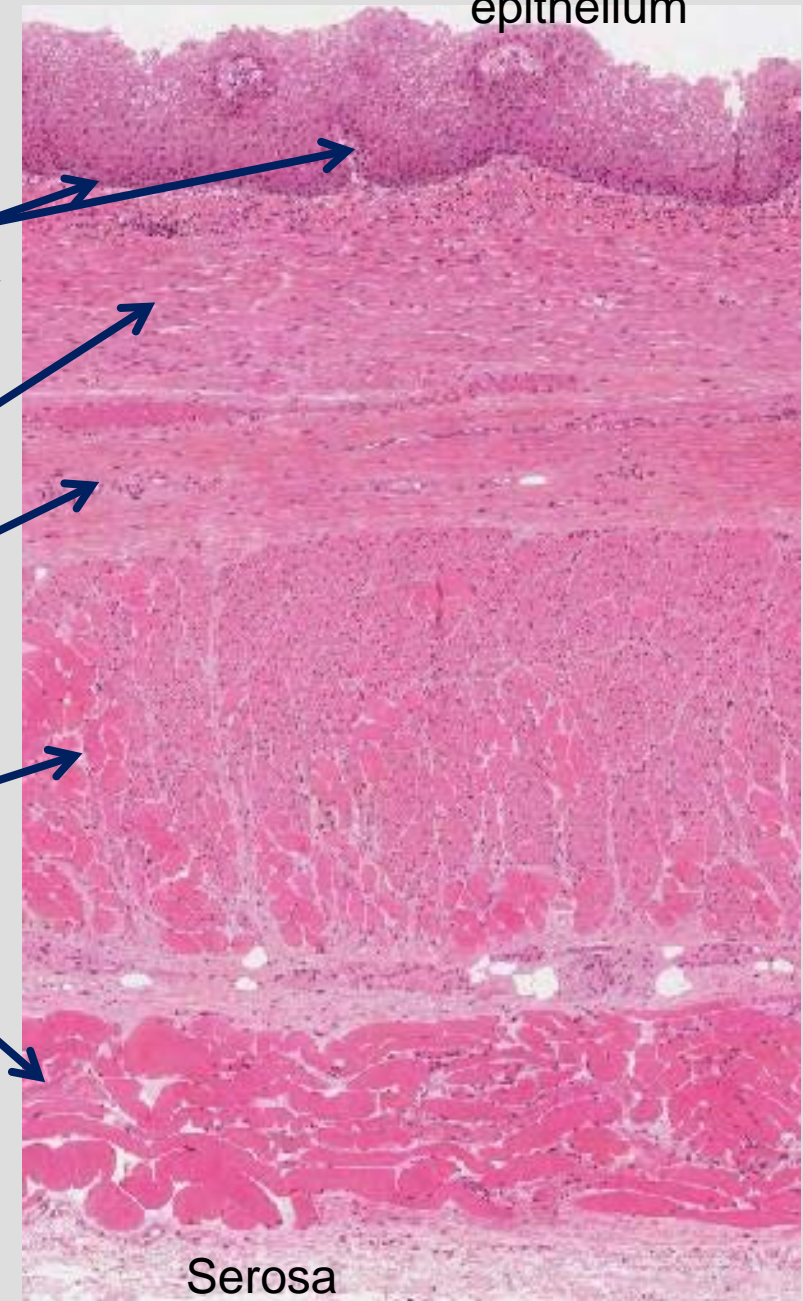


Lamina propria

Muscularis mucosa

Submucosa

Muscularis externa



epithelium

Serosa

242

Esophagus

Sub-mucosal
Mucus and
Serous glands

Submucosa

Lamina
propria

Muscularis
mucosa

Non-keratinized
stratified squamous
epithelium

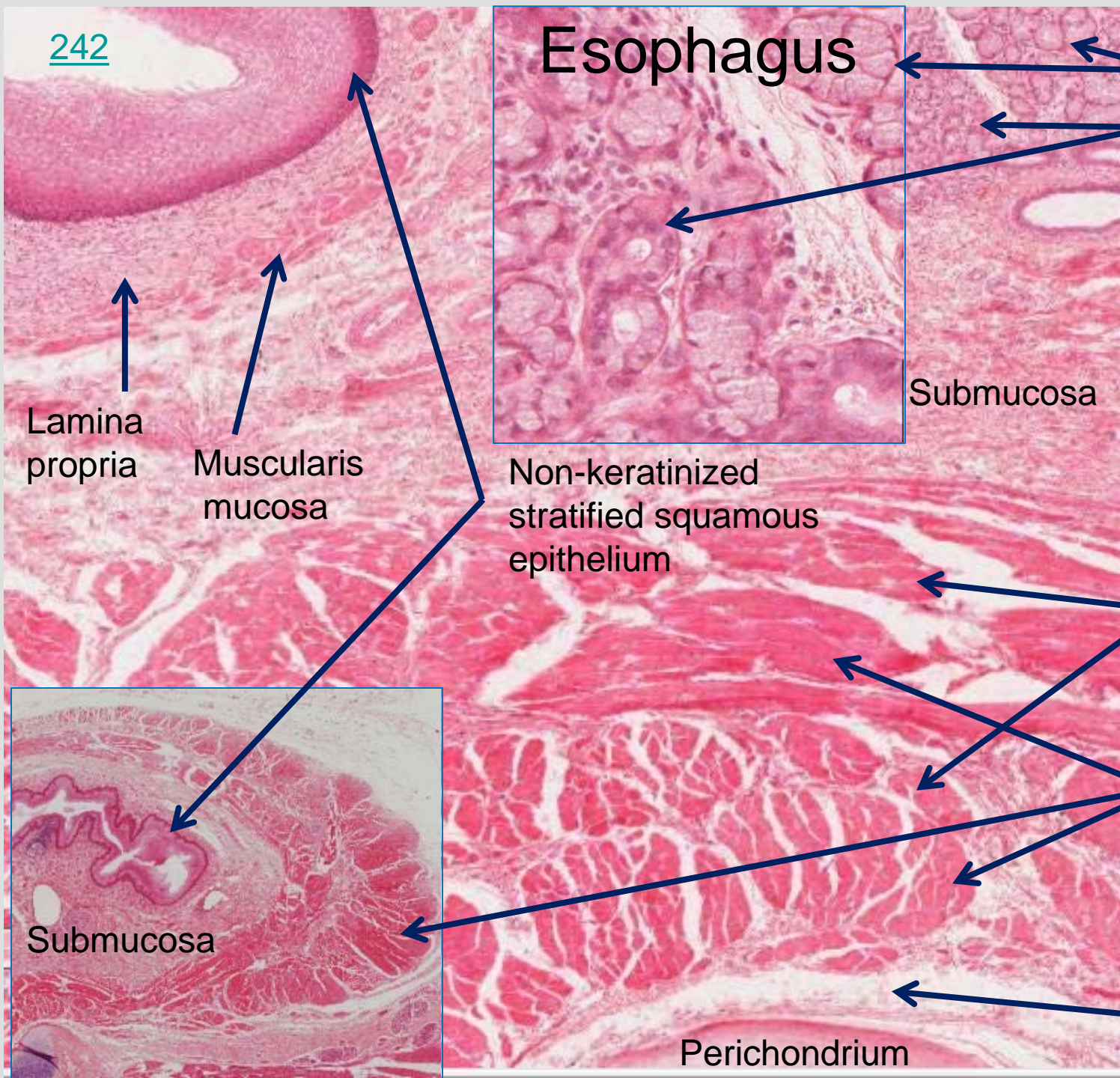
Skeletal muscle,

Muscularis
externa

If outer layer is
not covered by
mesothelium =
adventitia

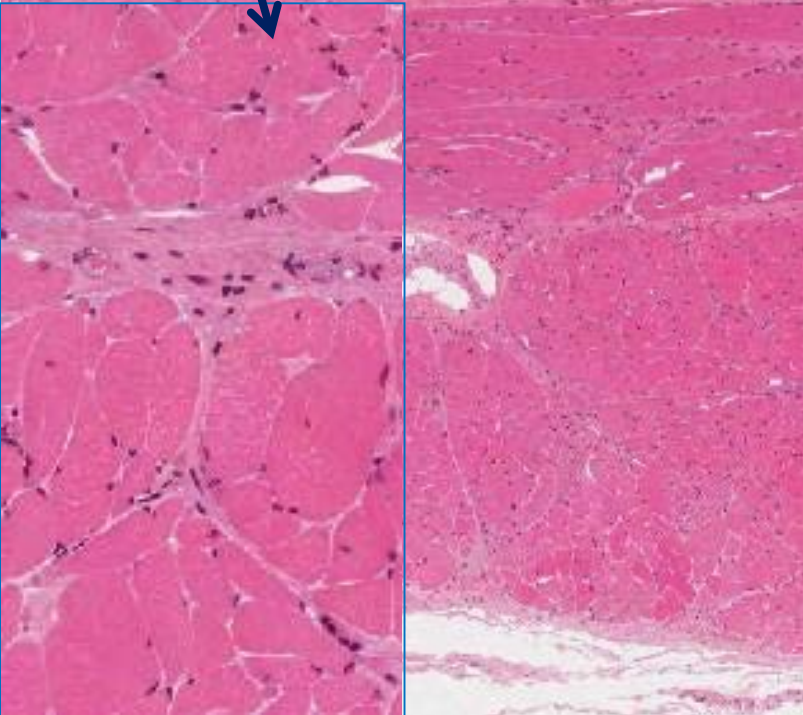
Submucosa

Perichondrium

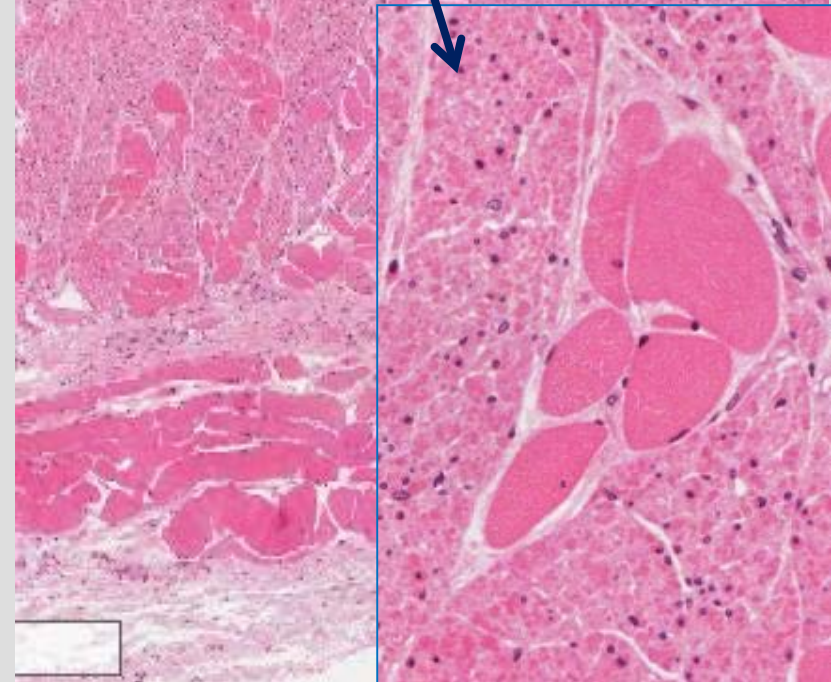


Esophagus

Muscularis externa of the upper esophagus is composed mostly of skeletal muscle



The muscularis externa in middle to lower esophagus is composed mostly of smooth muscle.



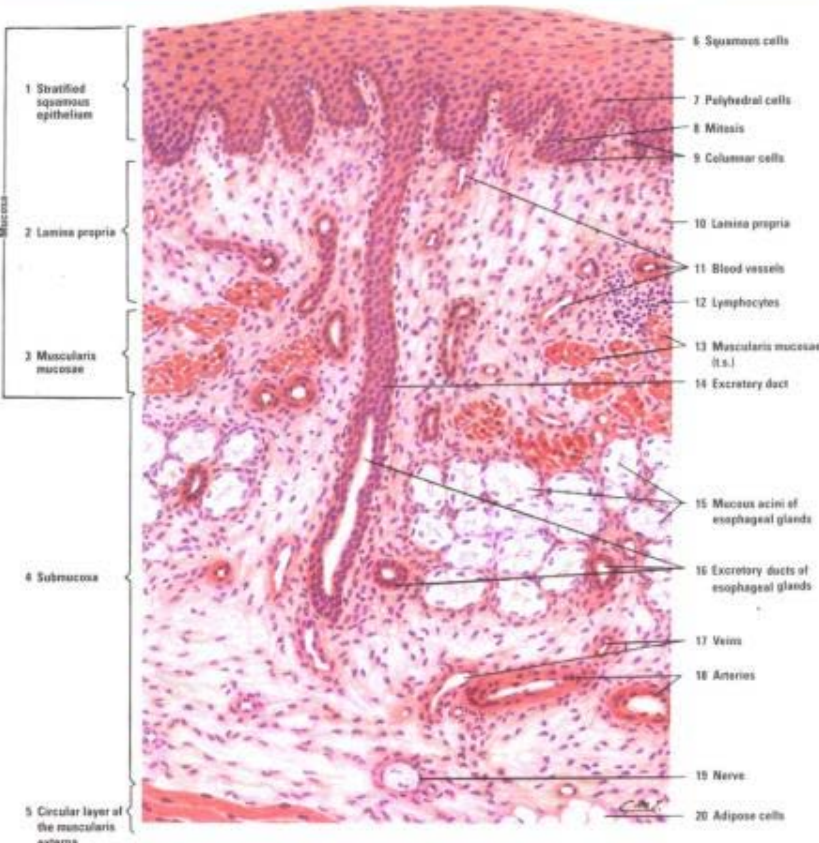


Fig. 11-2 Upper Esophagus: Mucosa and Submucosa (transverse section). Stain: hematoxylin-eosin. Medium magnification.

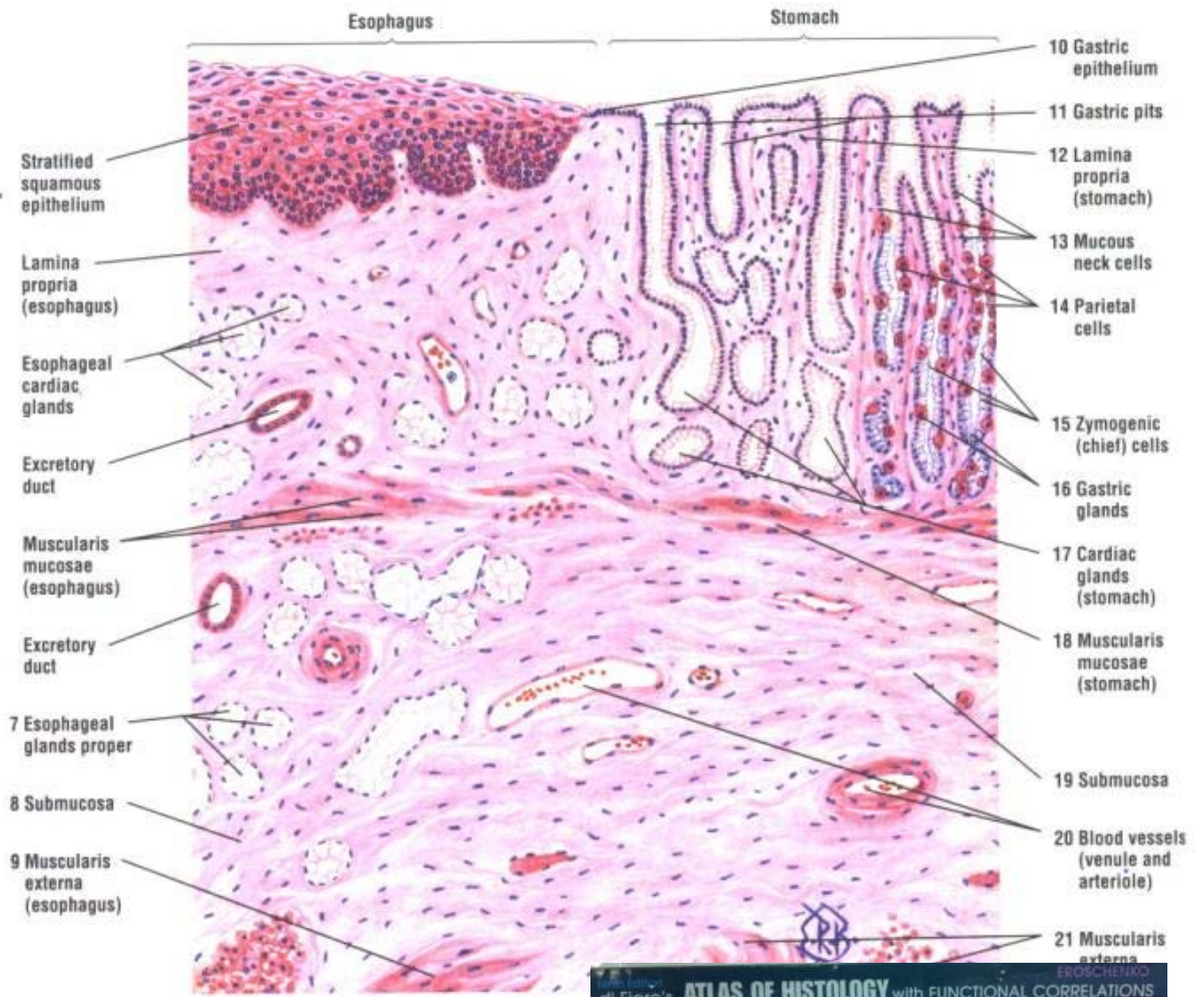
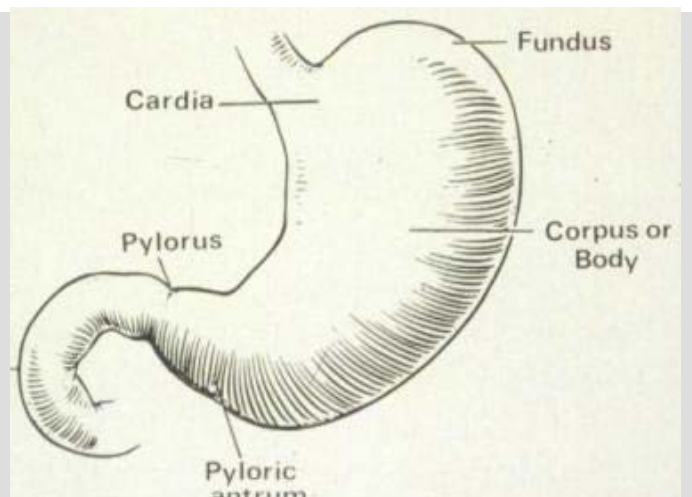
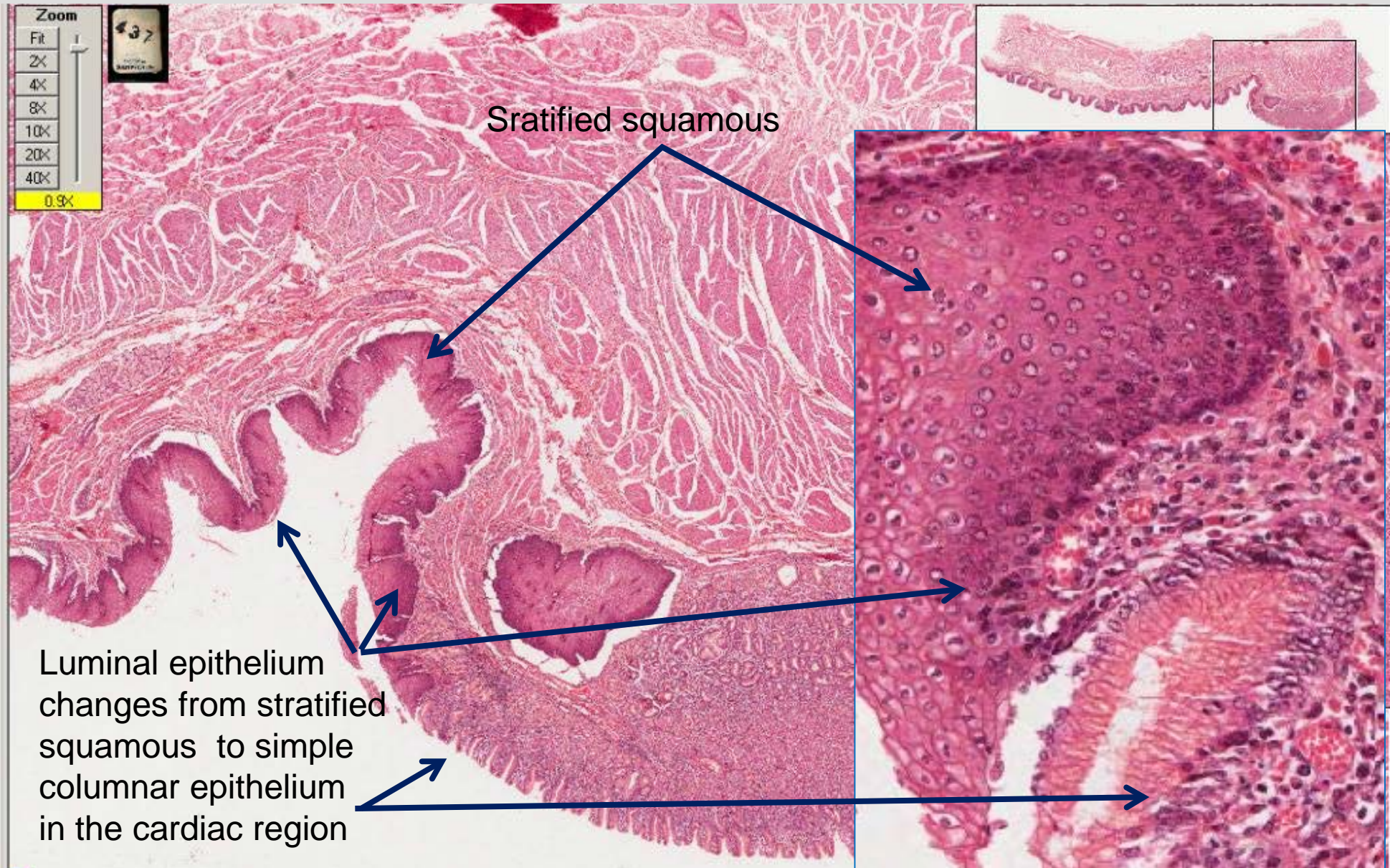


Fig. 11-5 Esophageal–Stomach Junction. Stain: hematoxylin-eosin. Low magnification.

437 Cardio-esophageal junction



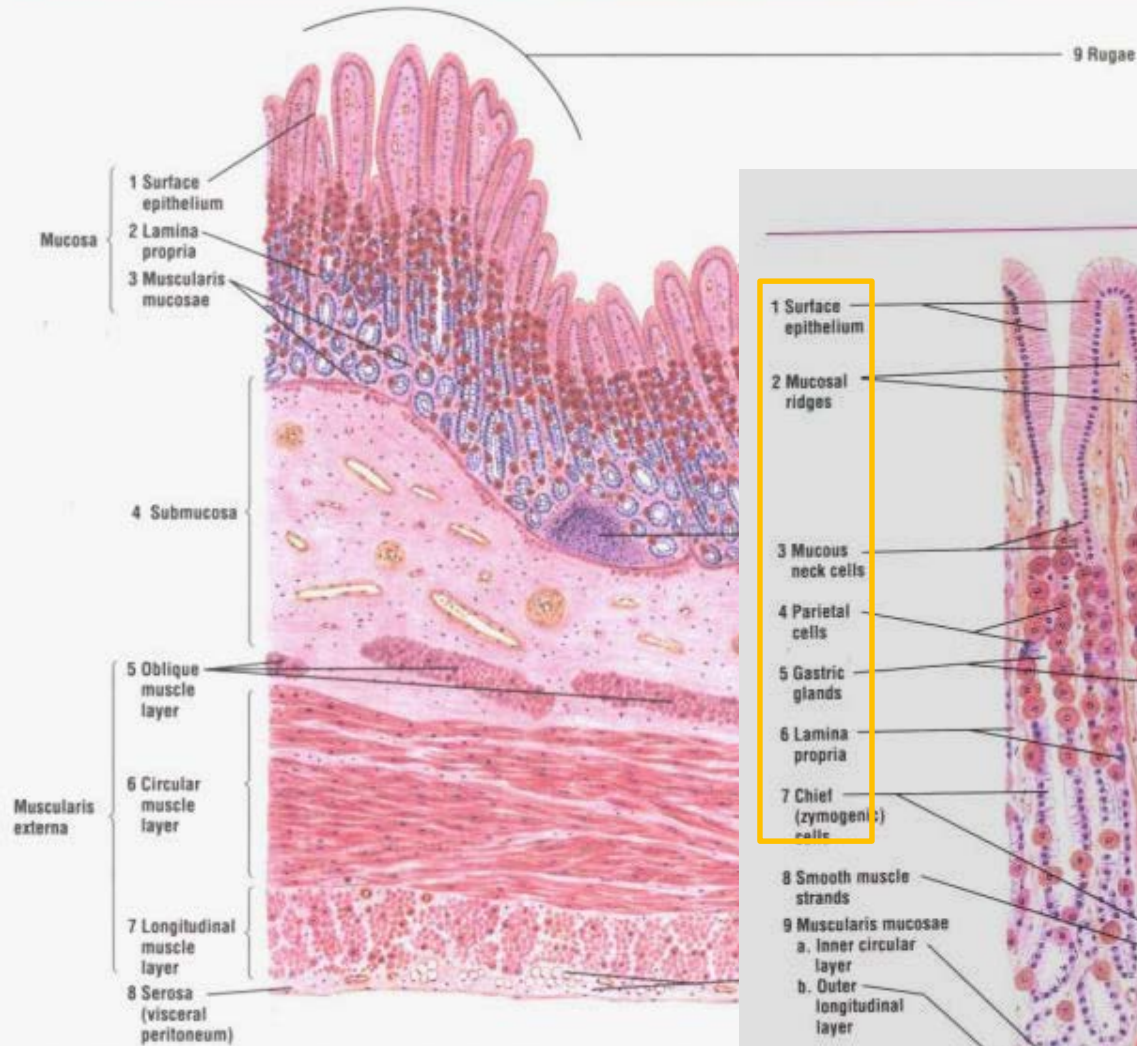


Fig. 11-6 Stomach: Fundus and Body Regions (transverse section)

The stomach have no goblet cells, no brush border on surface cells, and no villi.

Ref code # 5

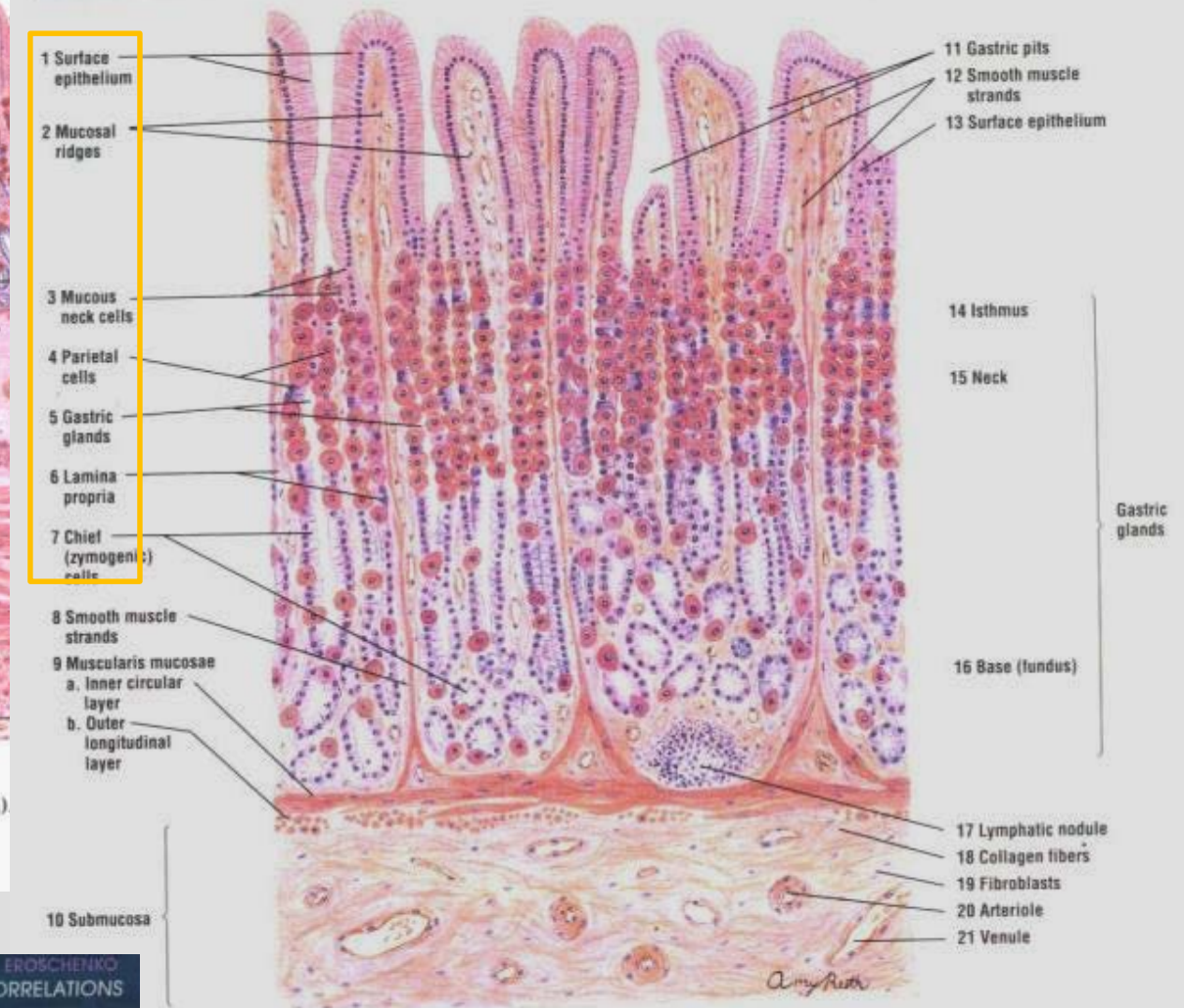
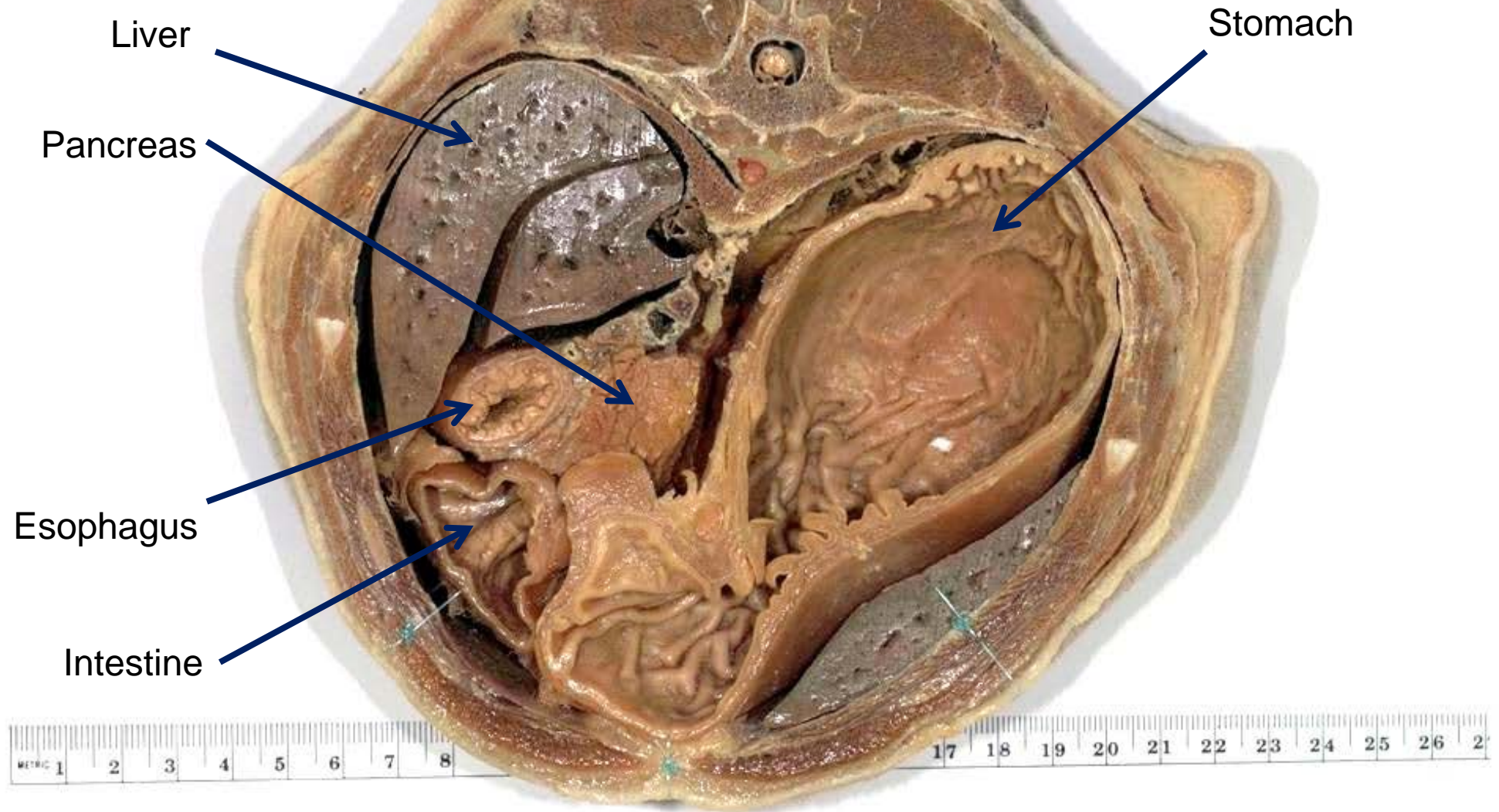
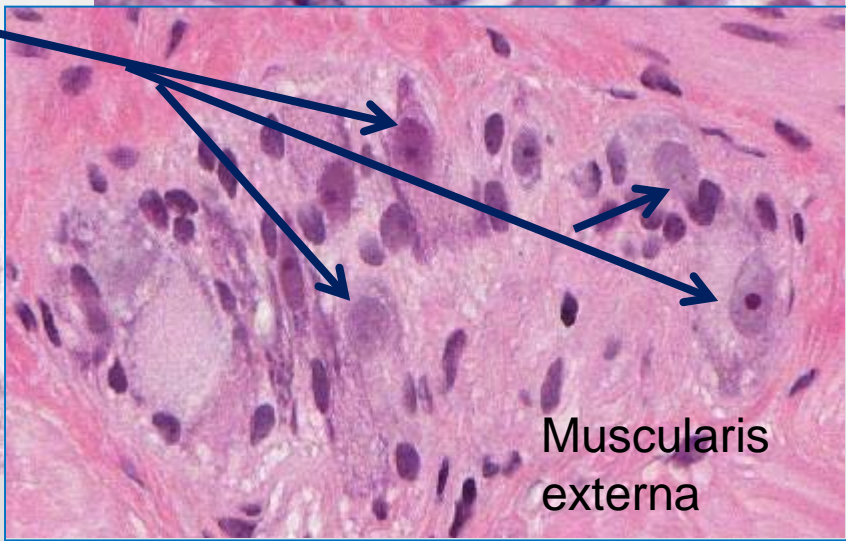
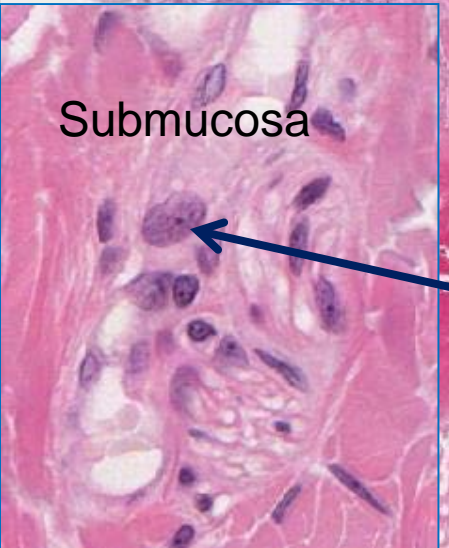
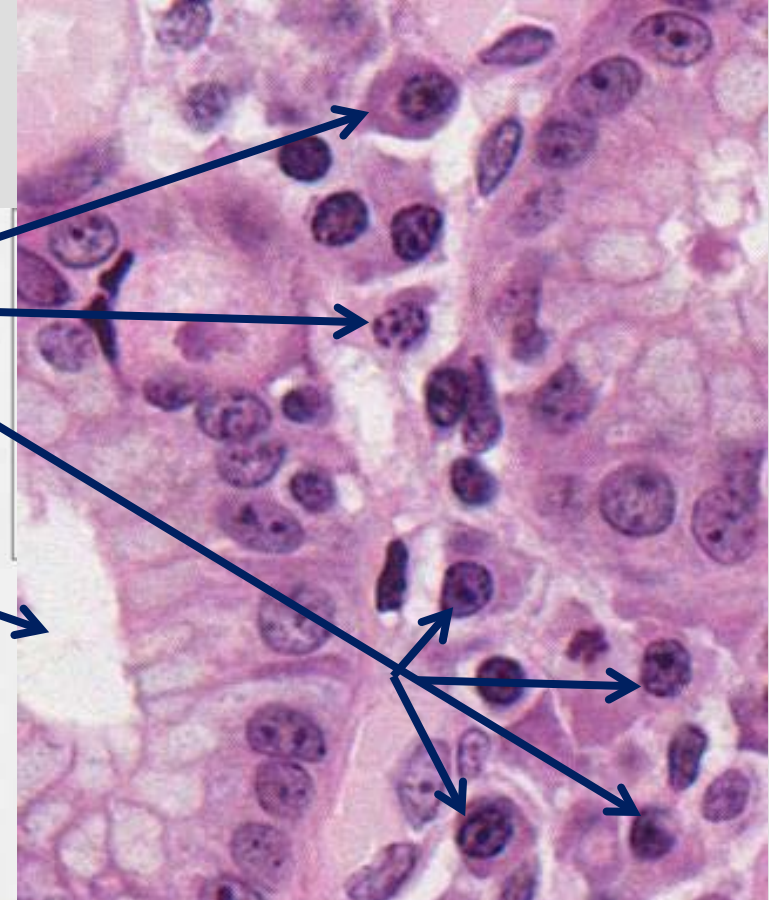
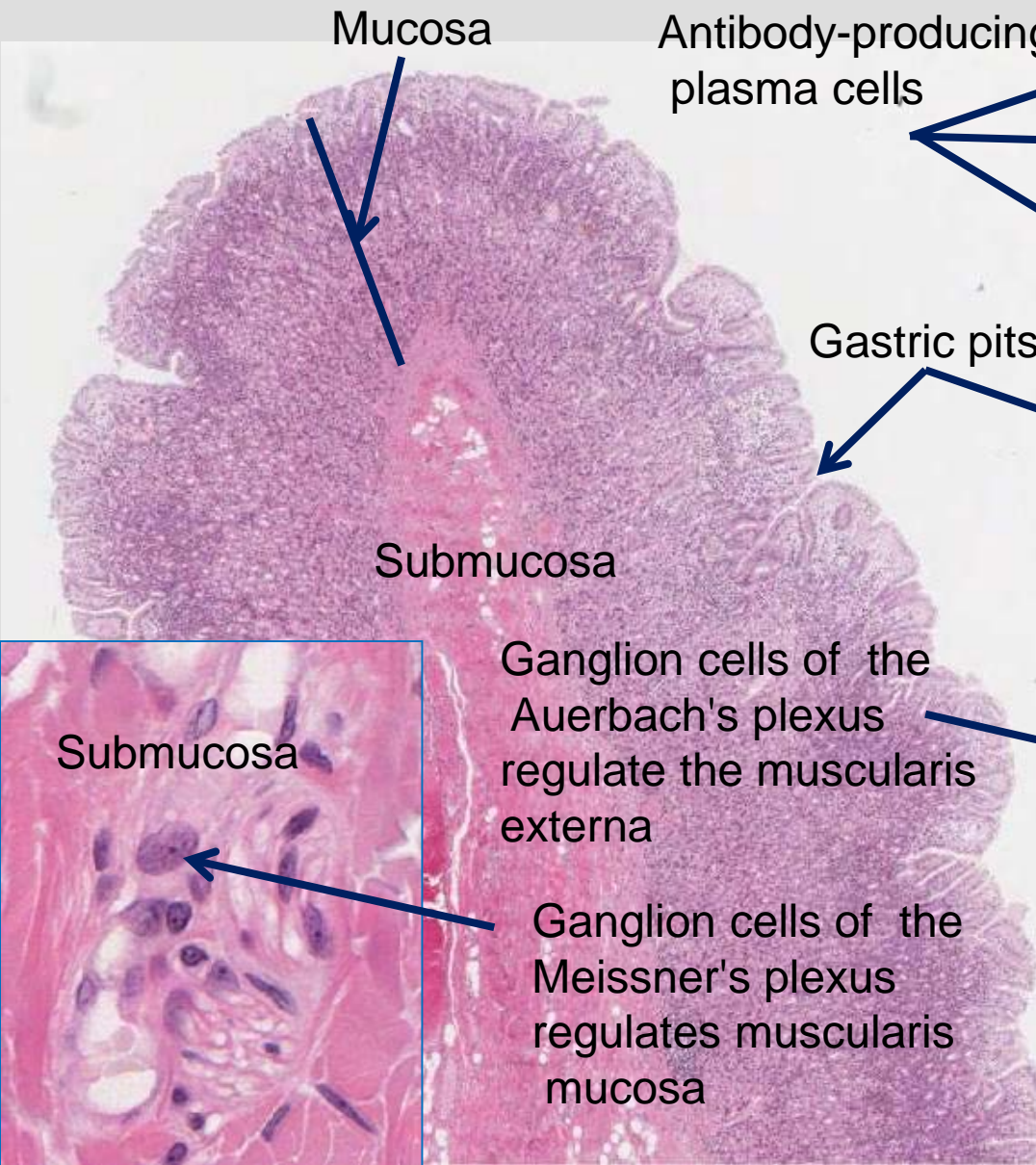


Fig. 11-7 Stomach: Mucosa of the Fundus and Body (transverse section). Stain: hematoxylin-eosin. Medium magnification.

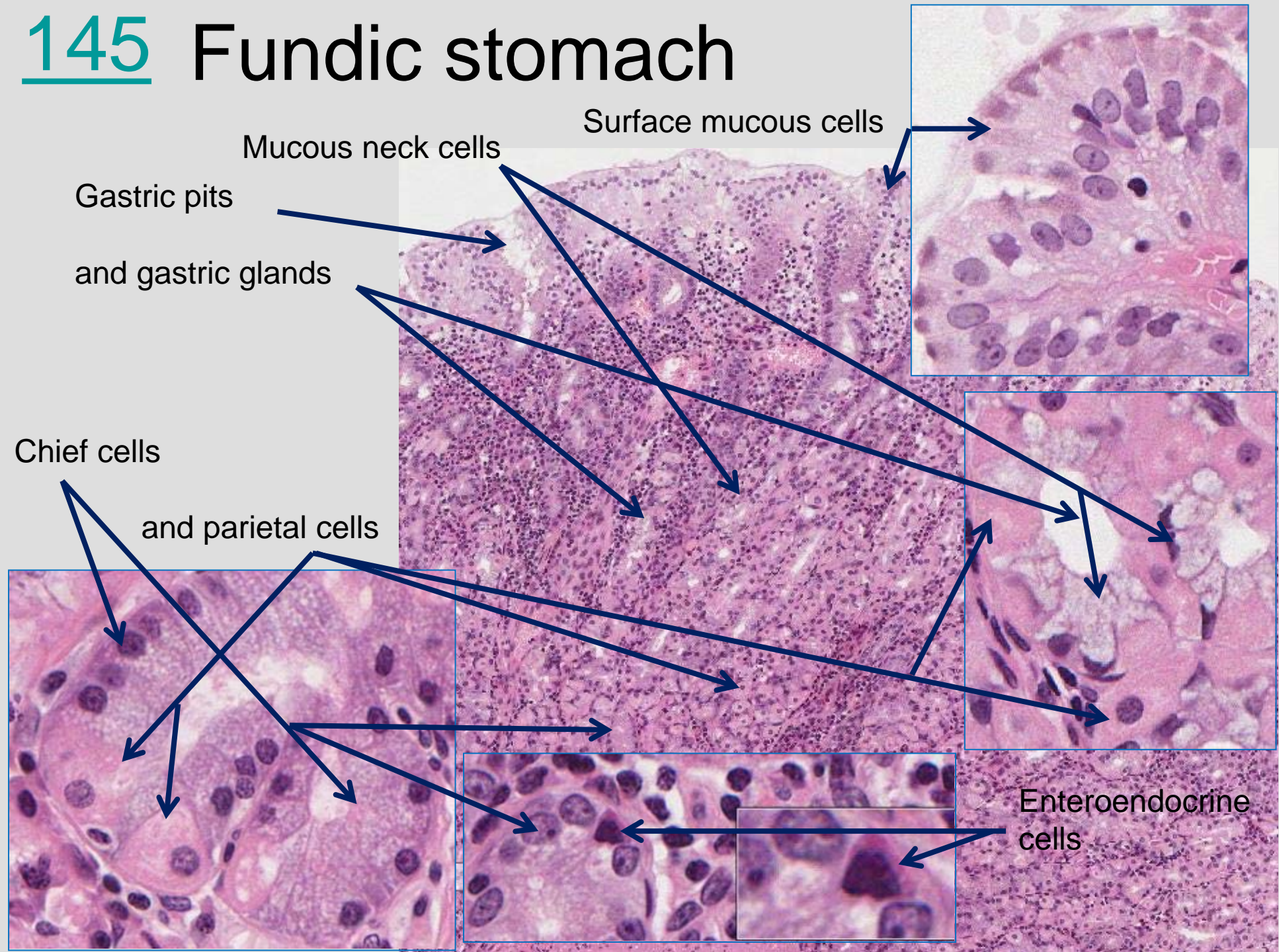
Dog cross section of body



145 Fundic stomach

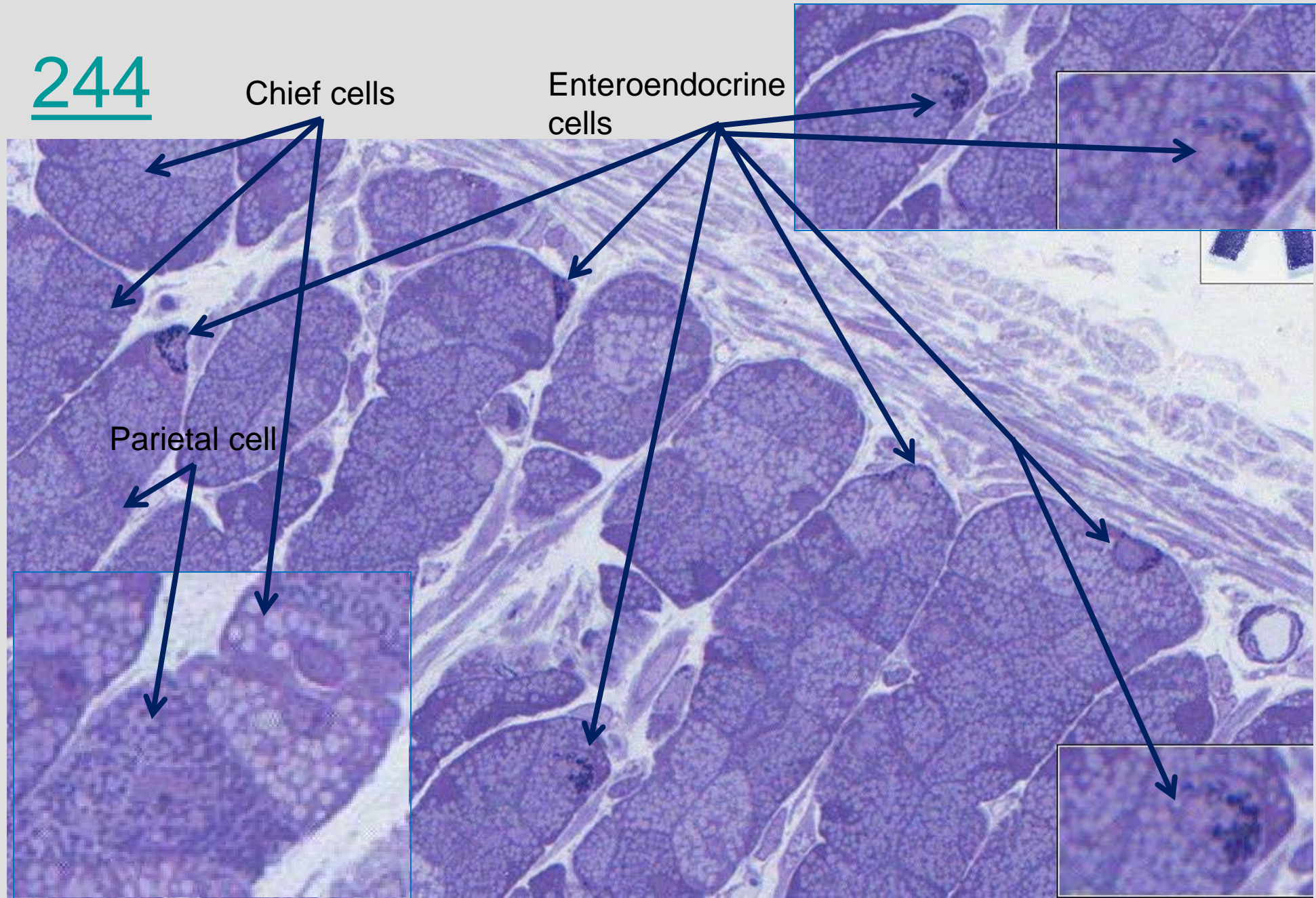


145 Fundic stomach



Mucus neck cells Fundic stomach, rabbit (toluidine blue)

244

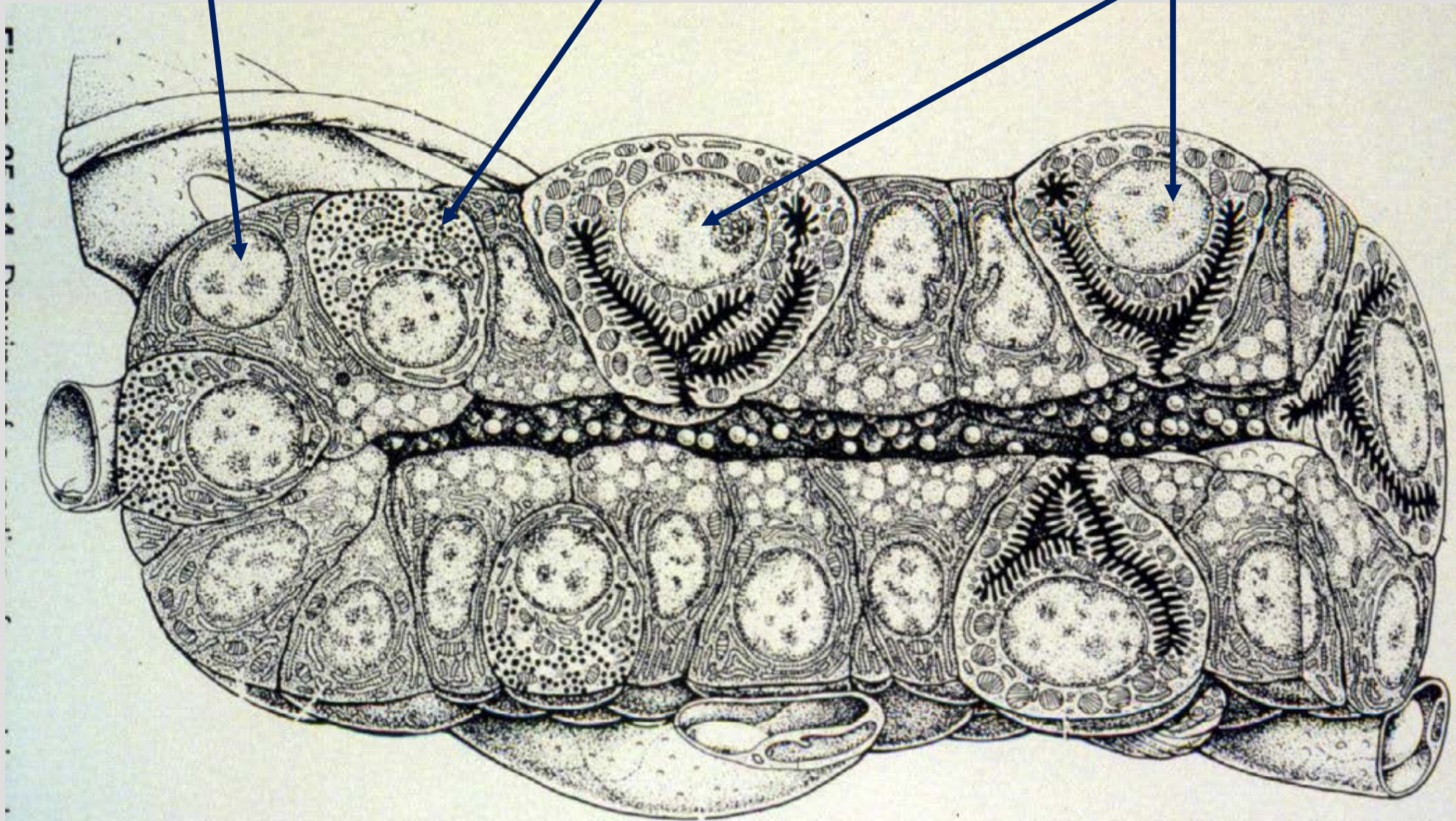


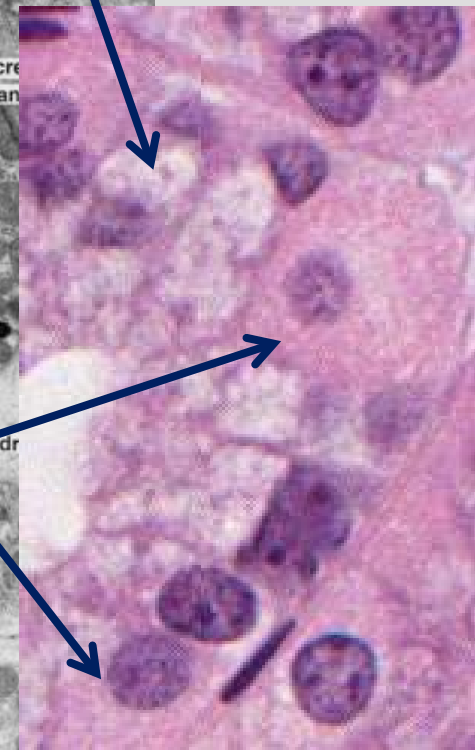
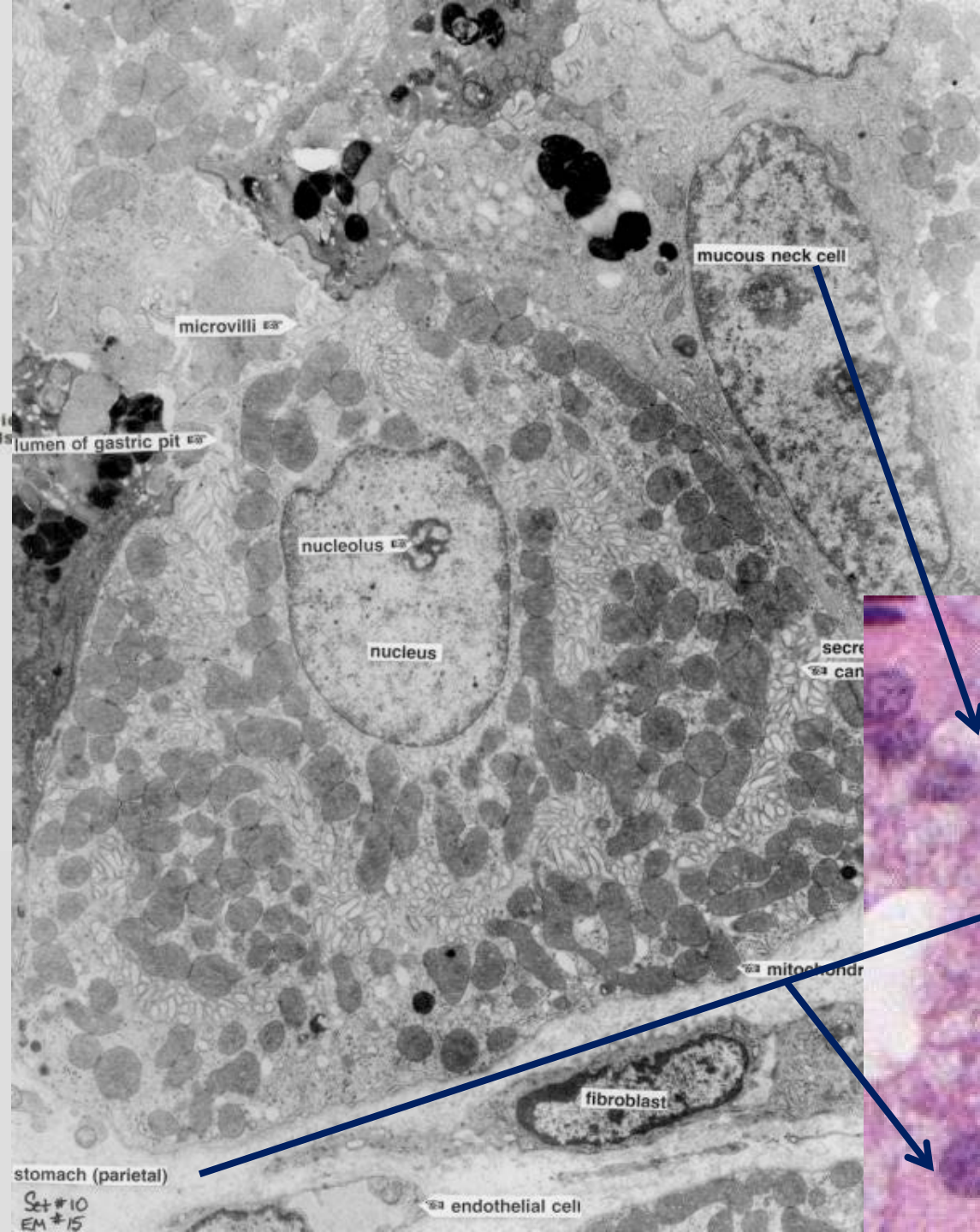
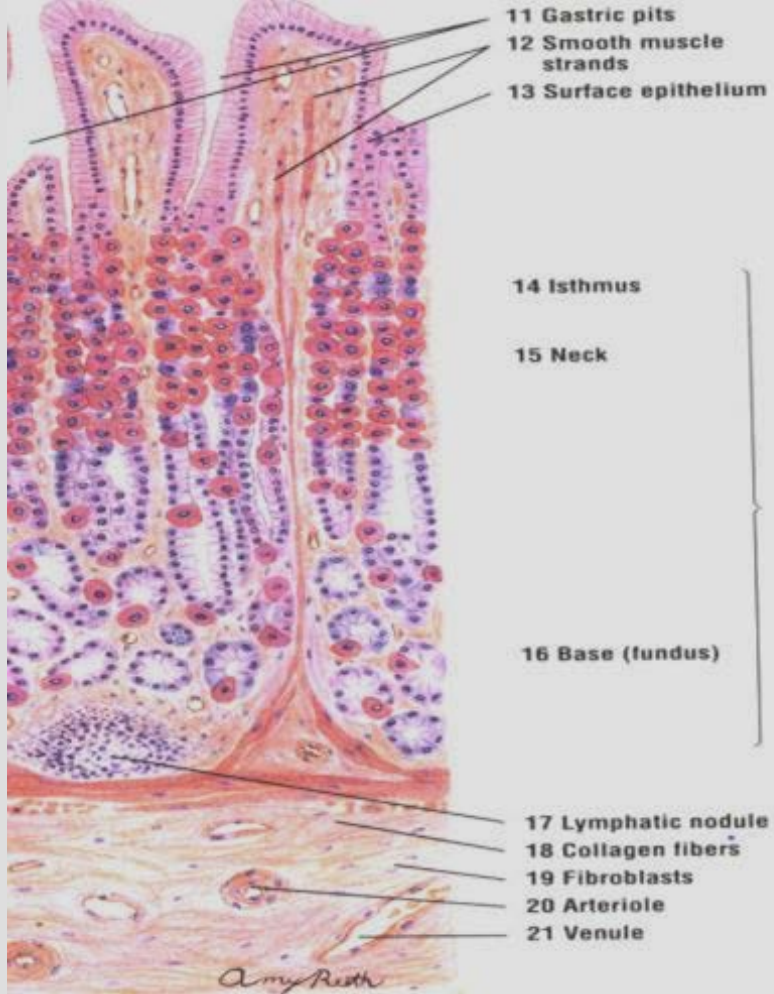
Chief cell

Enteroendocrine cell

Parietal cells

Ref code
6

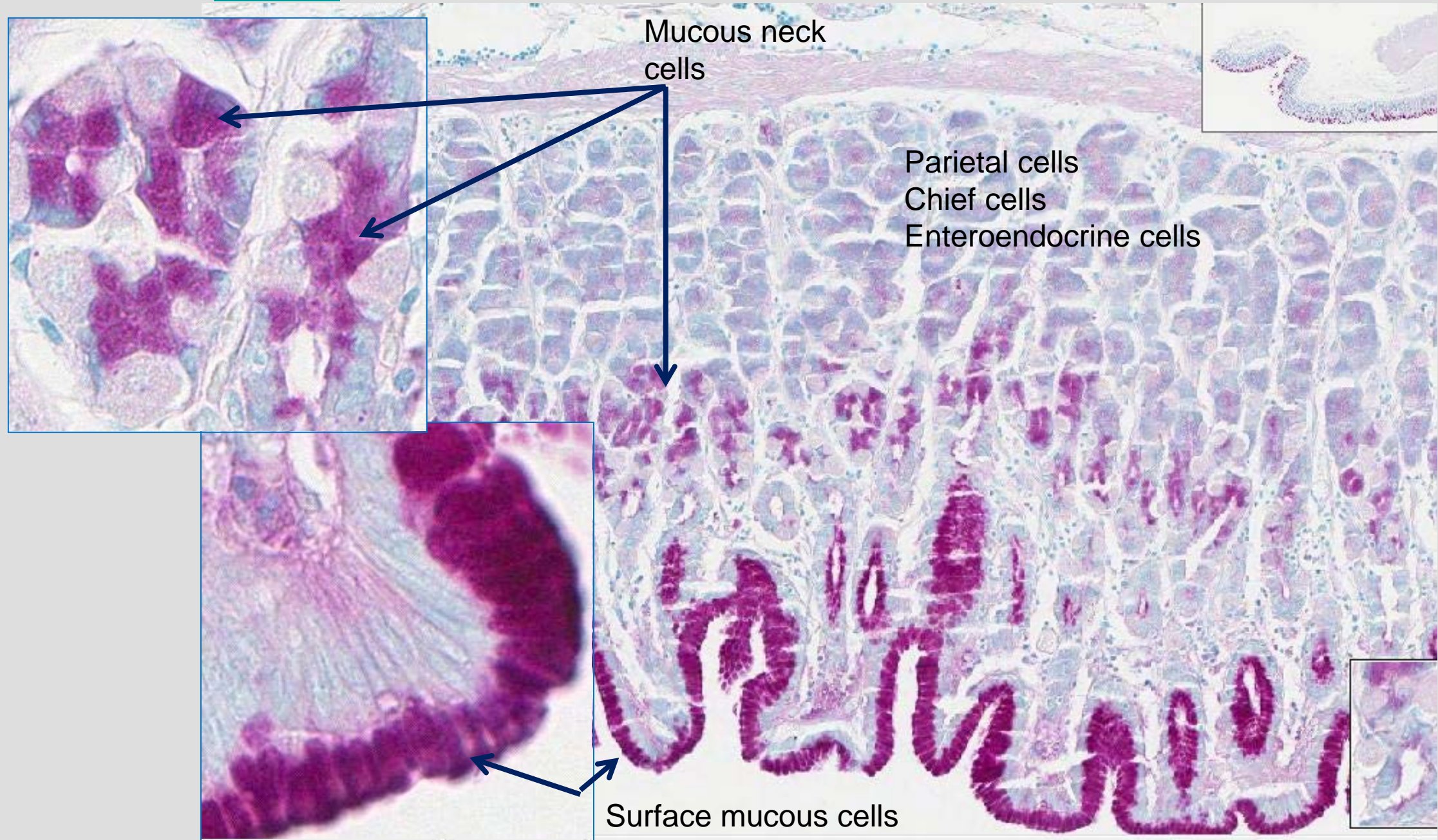




- EM 15 Parietal cell produces
1. HCl
 2. Bicarbonate
 3. **Intrinsic factor** for vitamin B12 absorption by gut: needed in red blood cell formation

243

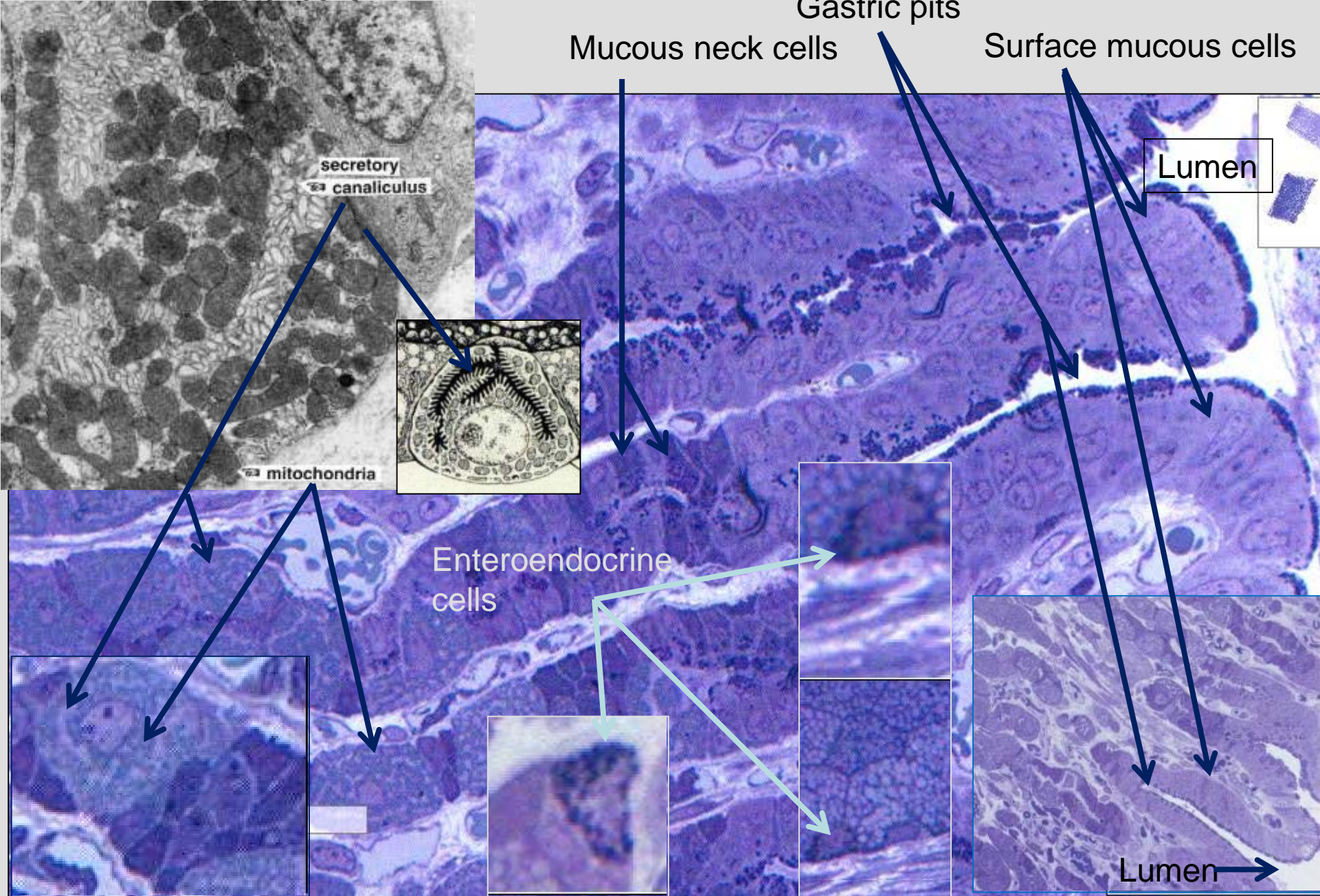
Fundic stomach, monkey (PAS)

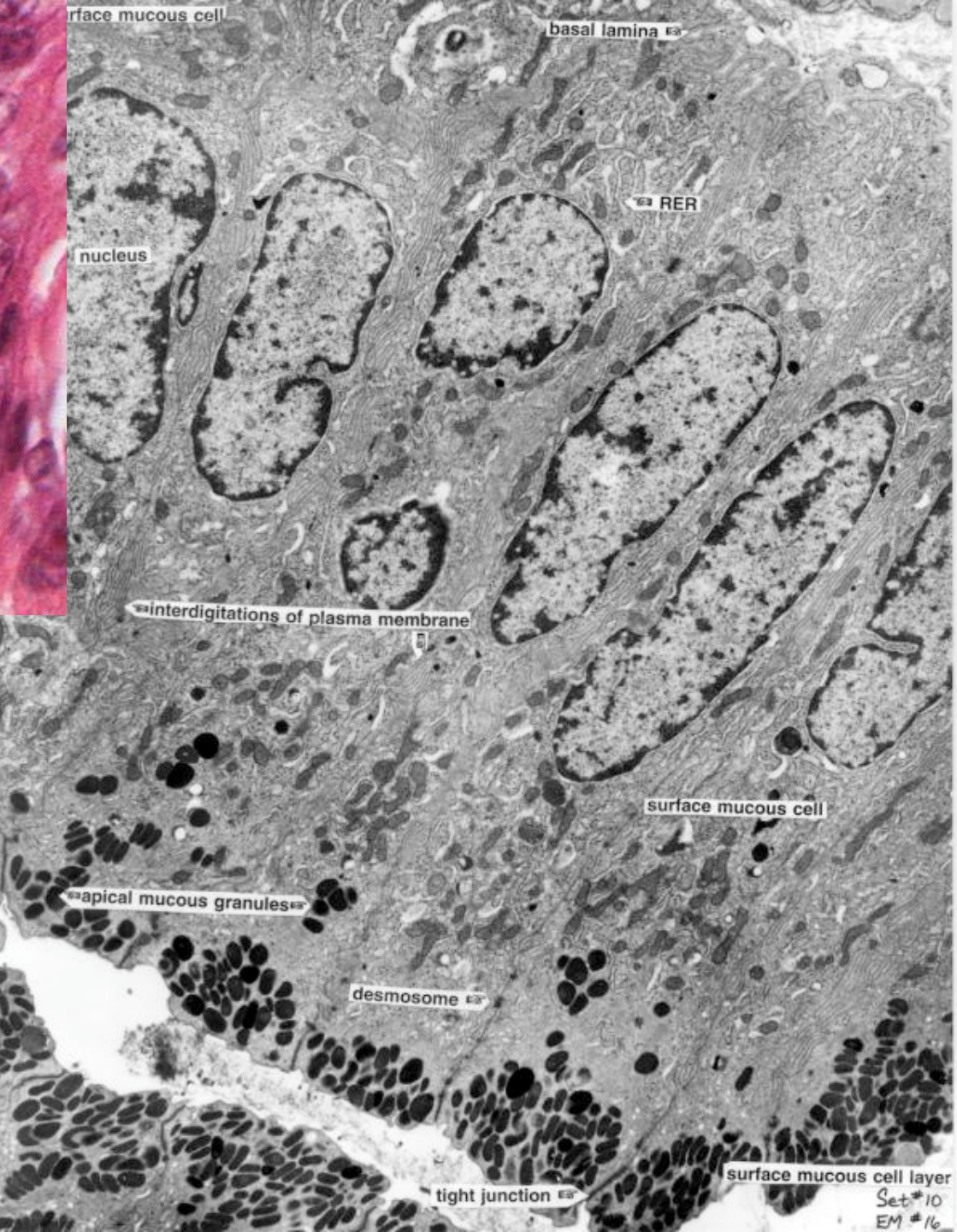
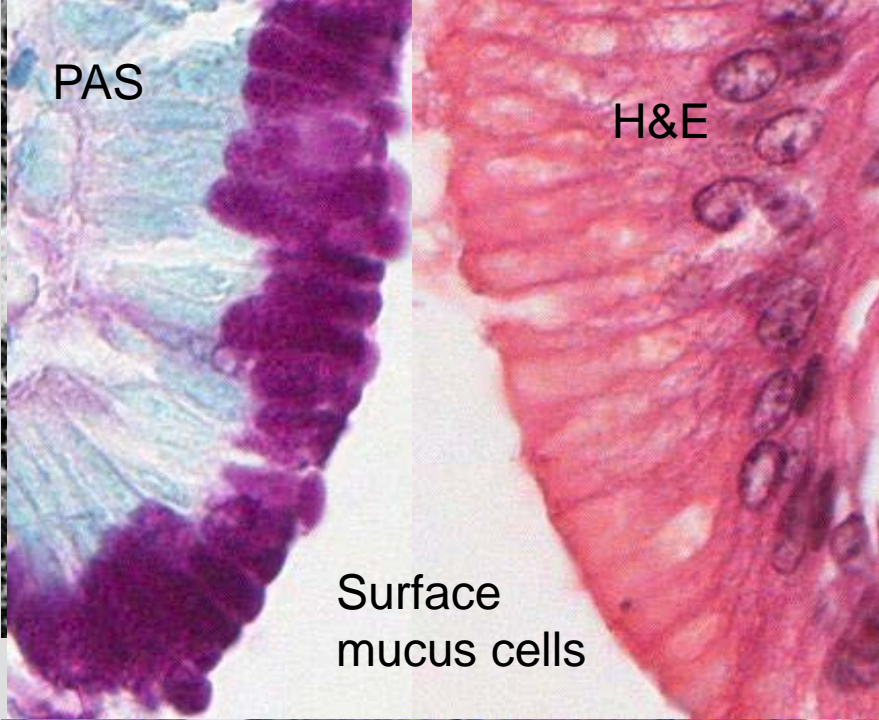


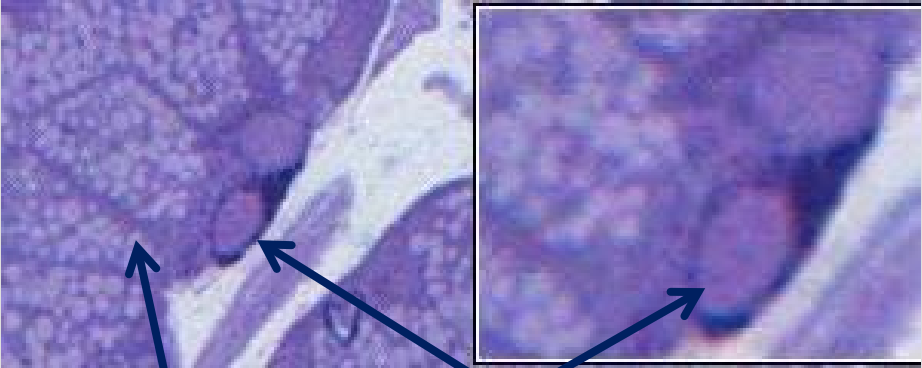
244

Fundic stomach, rabbit (toluidine blue)

Ref code # 6

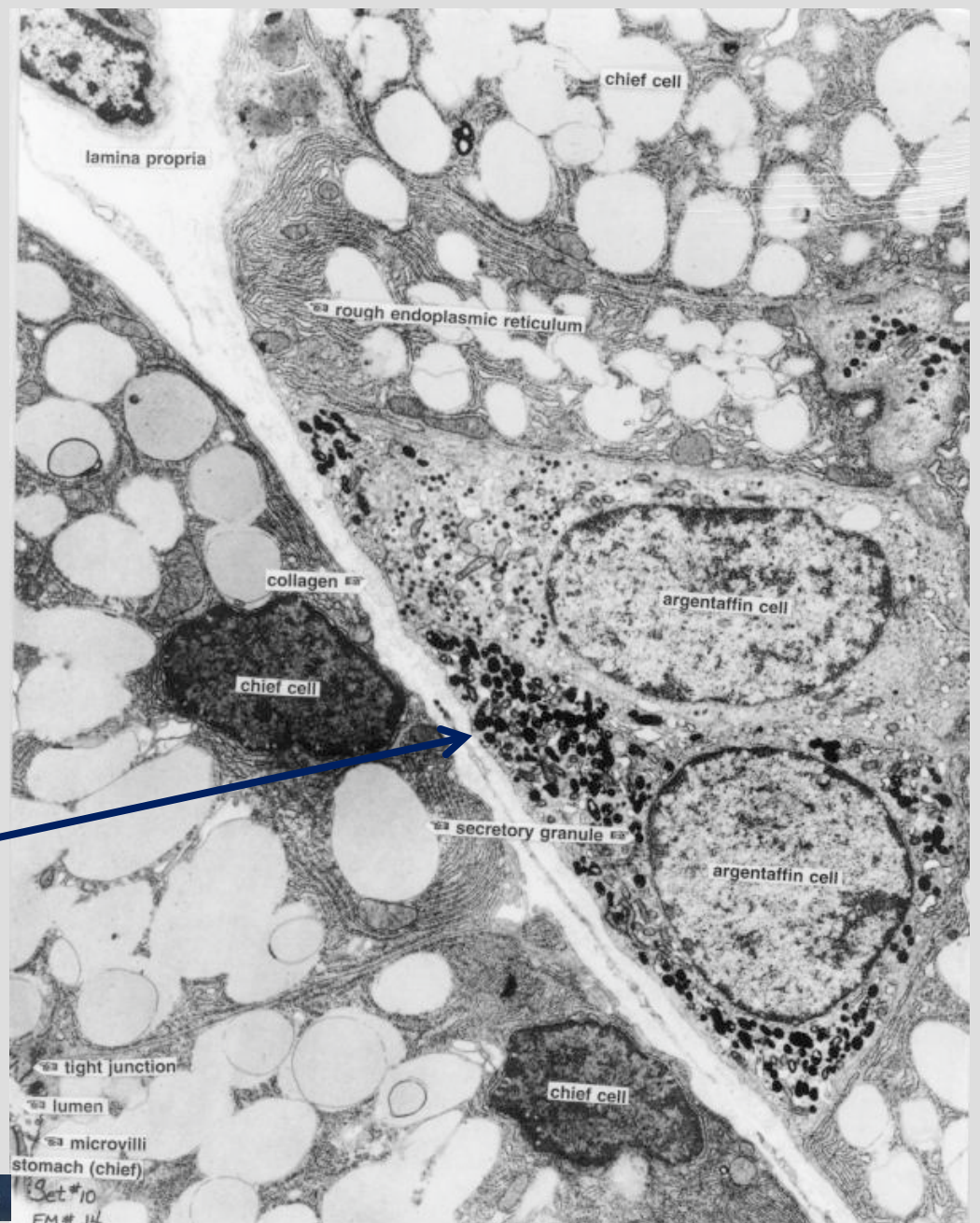
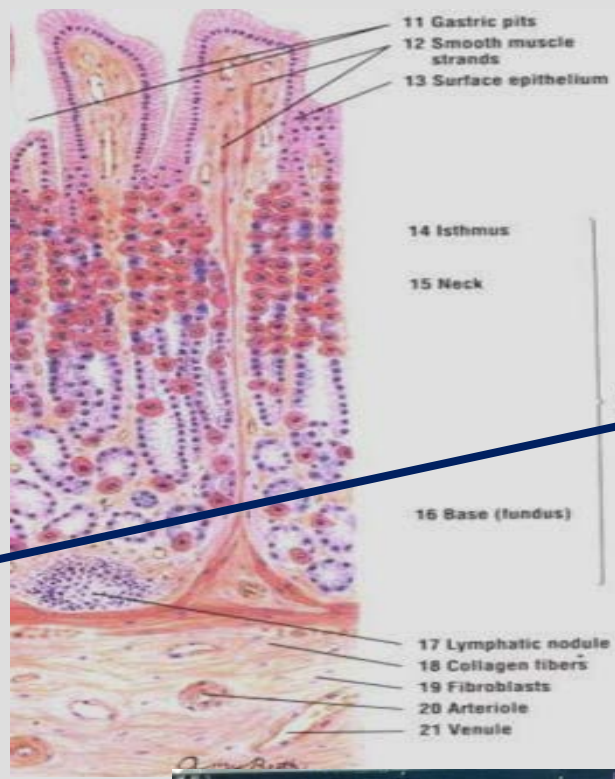






Large granules of chief cell

Granules of an argentaffin cell

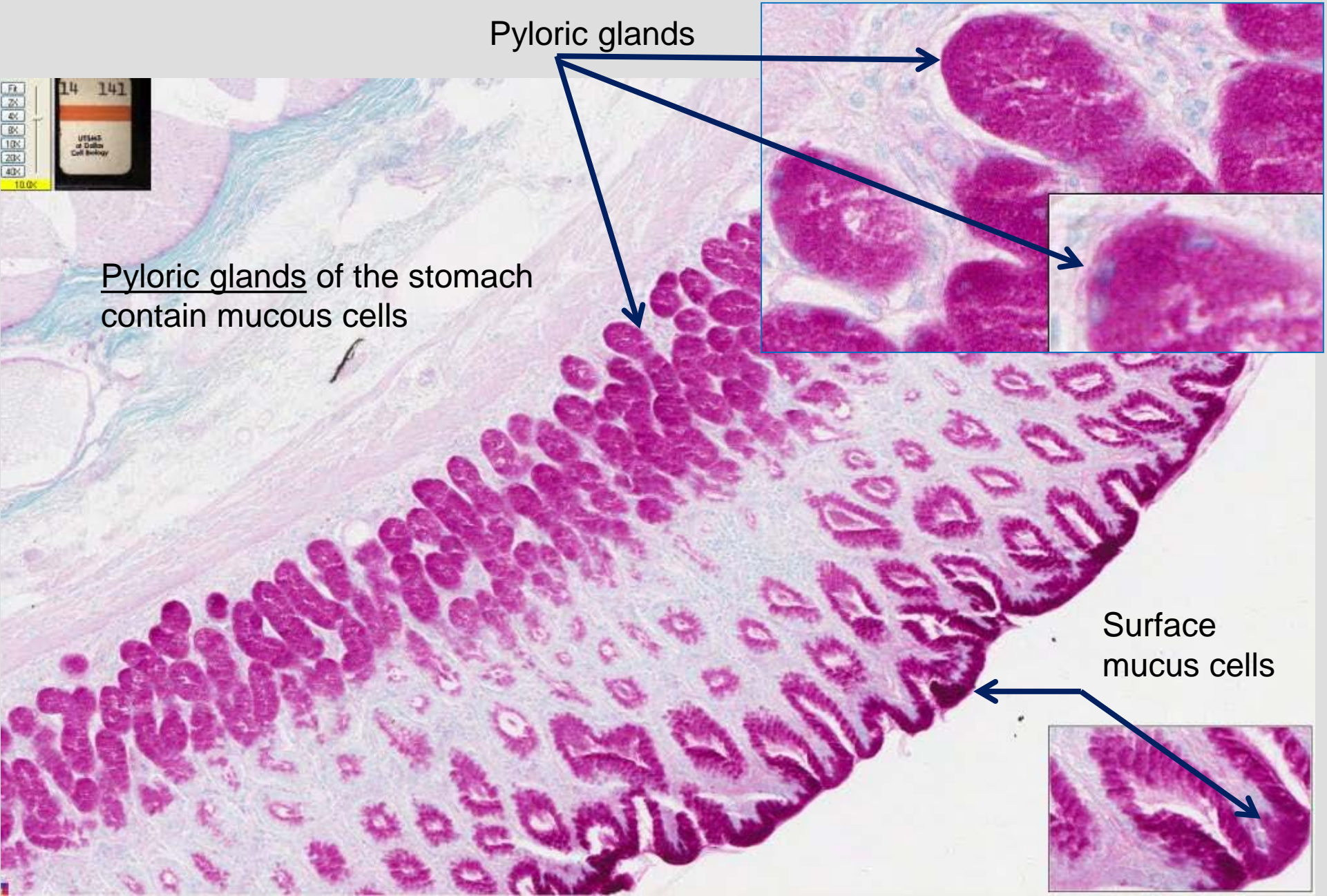


EM 14

- Large granules of chief cell
- Granules of an argentaffin cell
- Lamina propria
- Nuclei

141

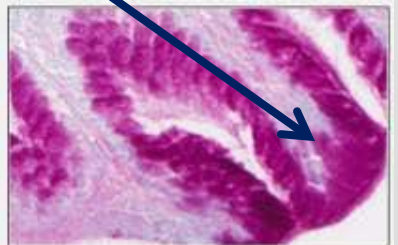
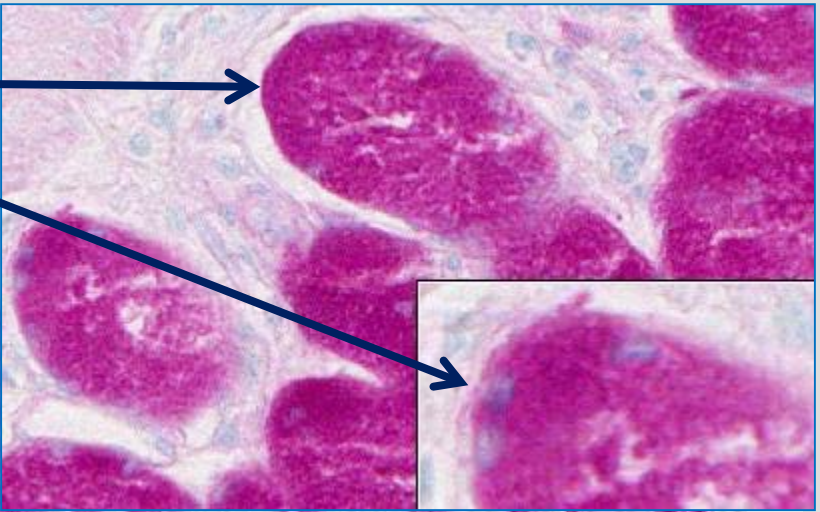
Pyloric stomach, monkey (PAS)



Pyloric glands of the stomach contain mucous cells

Pyloric glands

Surface mucus cells



Ref code
5, 6

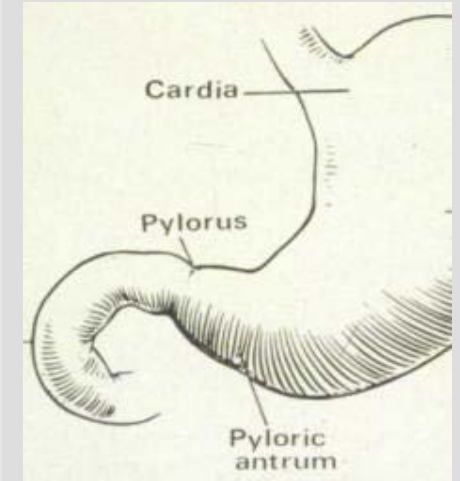
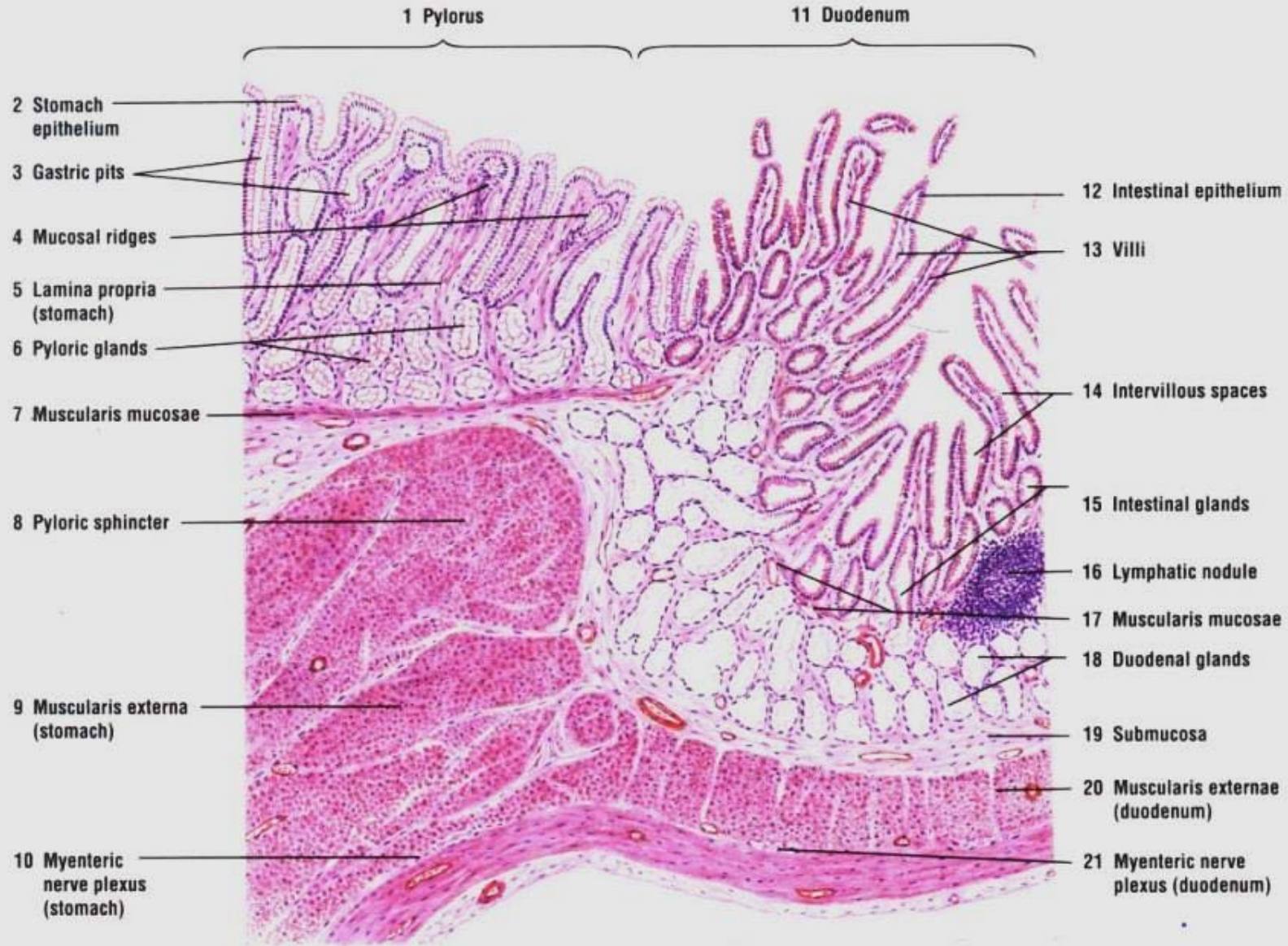


Fig. 11-11 Pyloric-Duodenal Junction (longitudinal section). Stain: hematoxylin-eosin. Low magnification.

147

Pyloroduodenal junction, baboon

Intestine



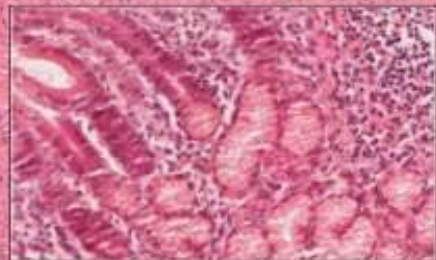
Lymphoid nodule

Stomach

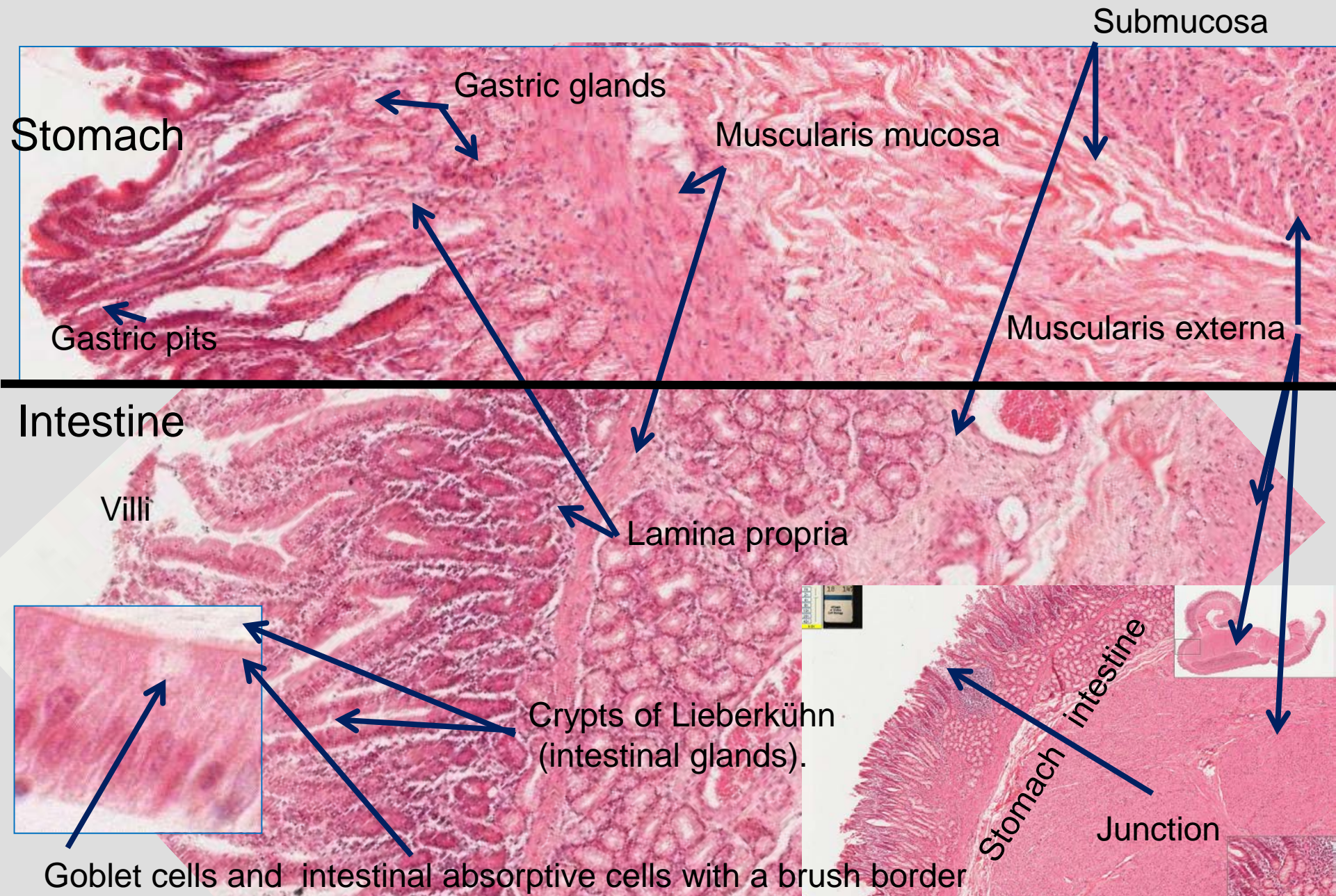
Muscularis mucosa

Lamina propria

Muscularis externa



147 Pyloroduodenal junction, baboon



Ref code # 5

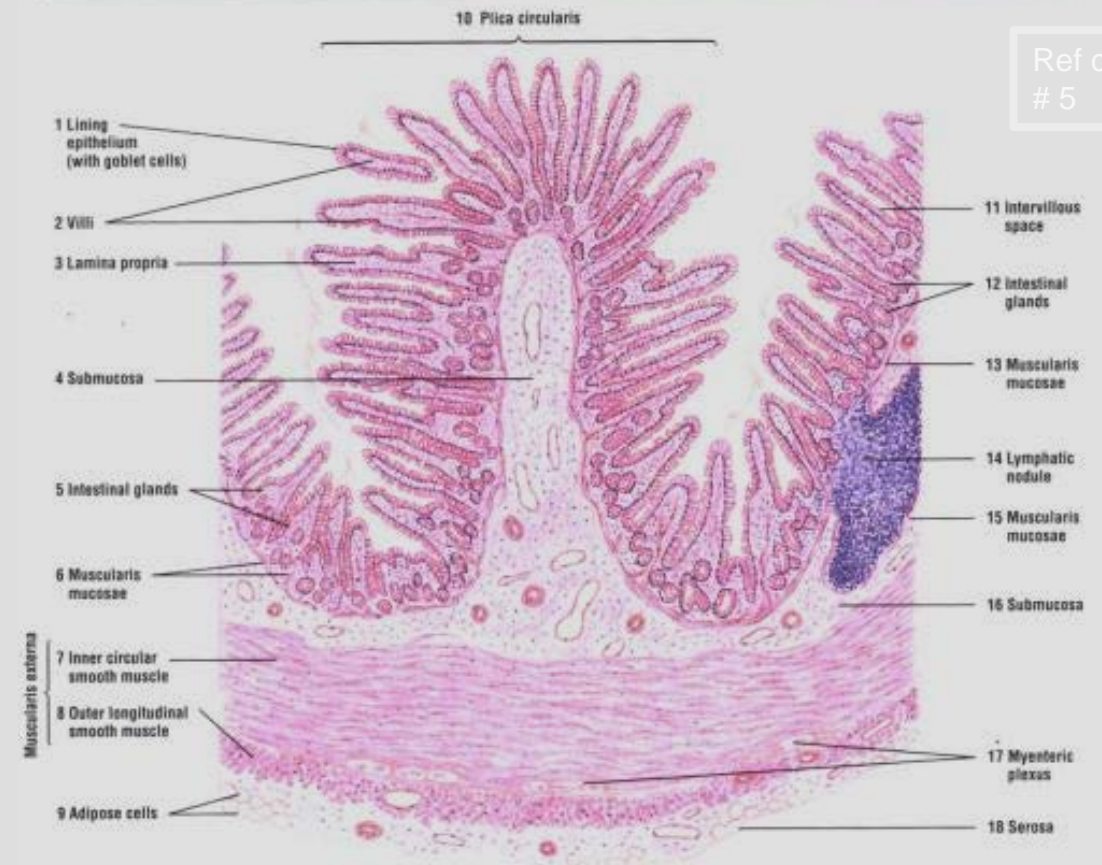
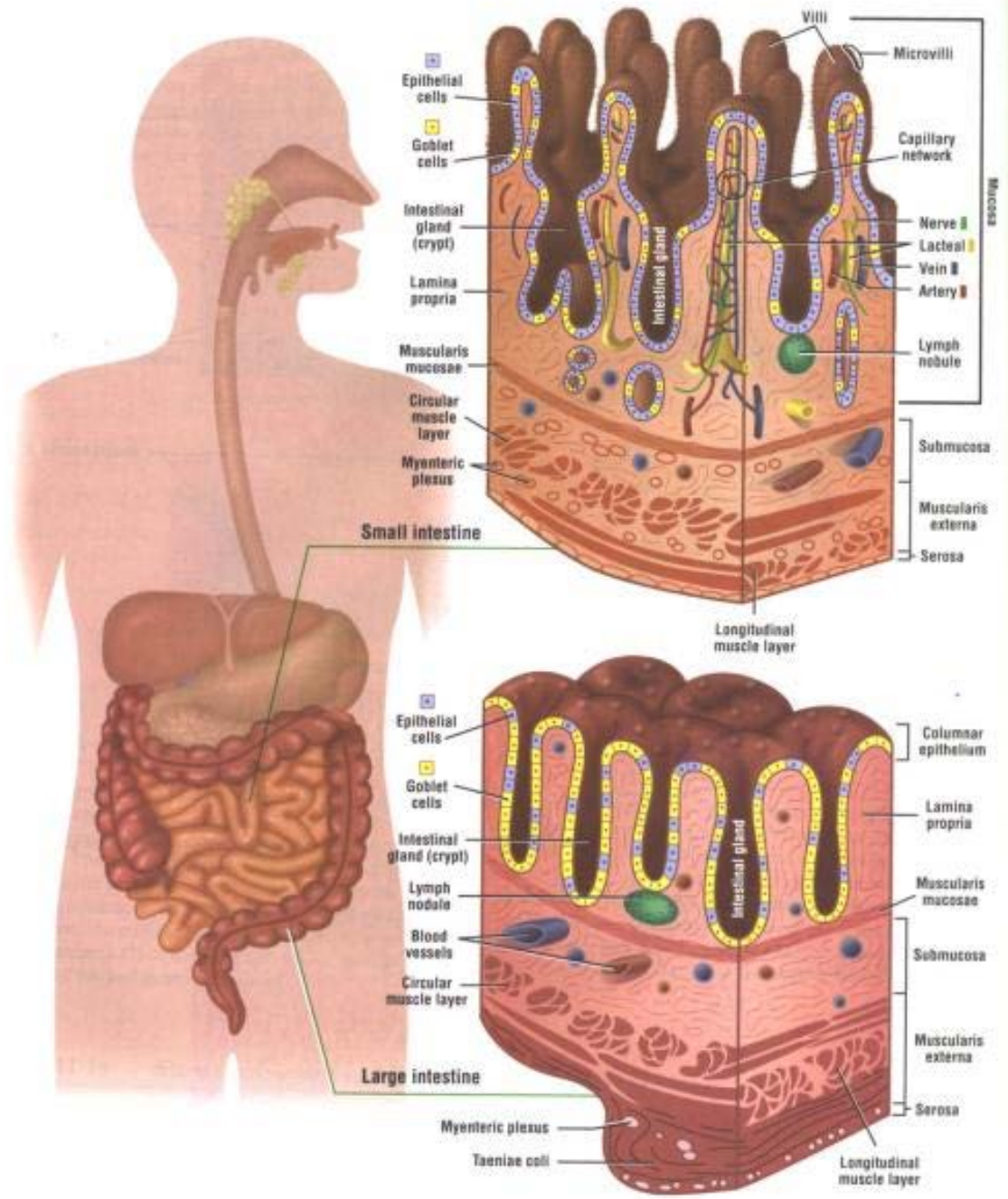


Fig. 12-2 Small Intestine: Jejunum-Ileum (transverse section). Stain: hematoxylineosin. Low magnification.

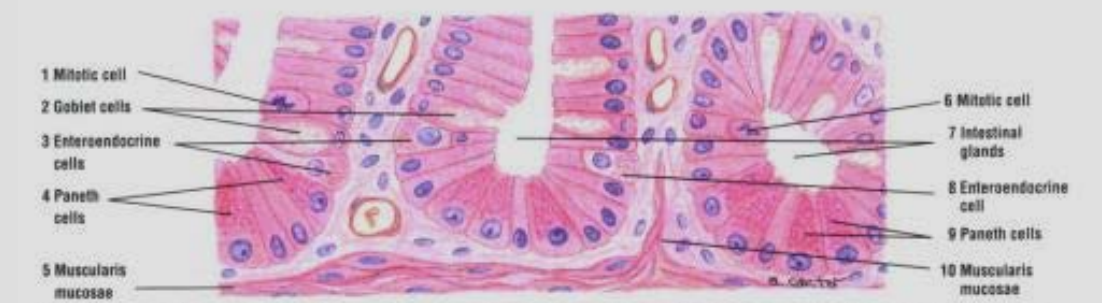


Fig. 12-3 Intestinal Glands With Paneth Cells and Enteroendocrine Cells. Stain: hematoxylin-eosin, plastic section. High magnification.

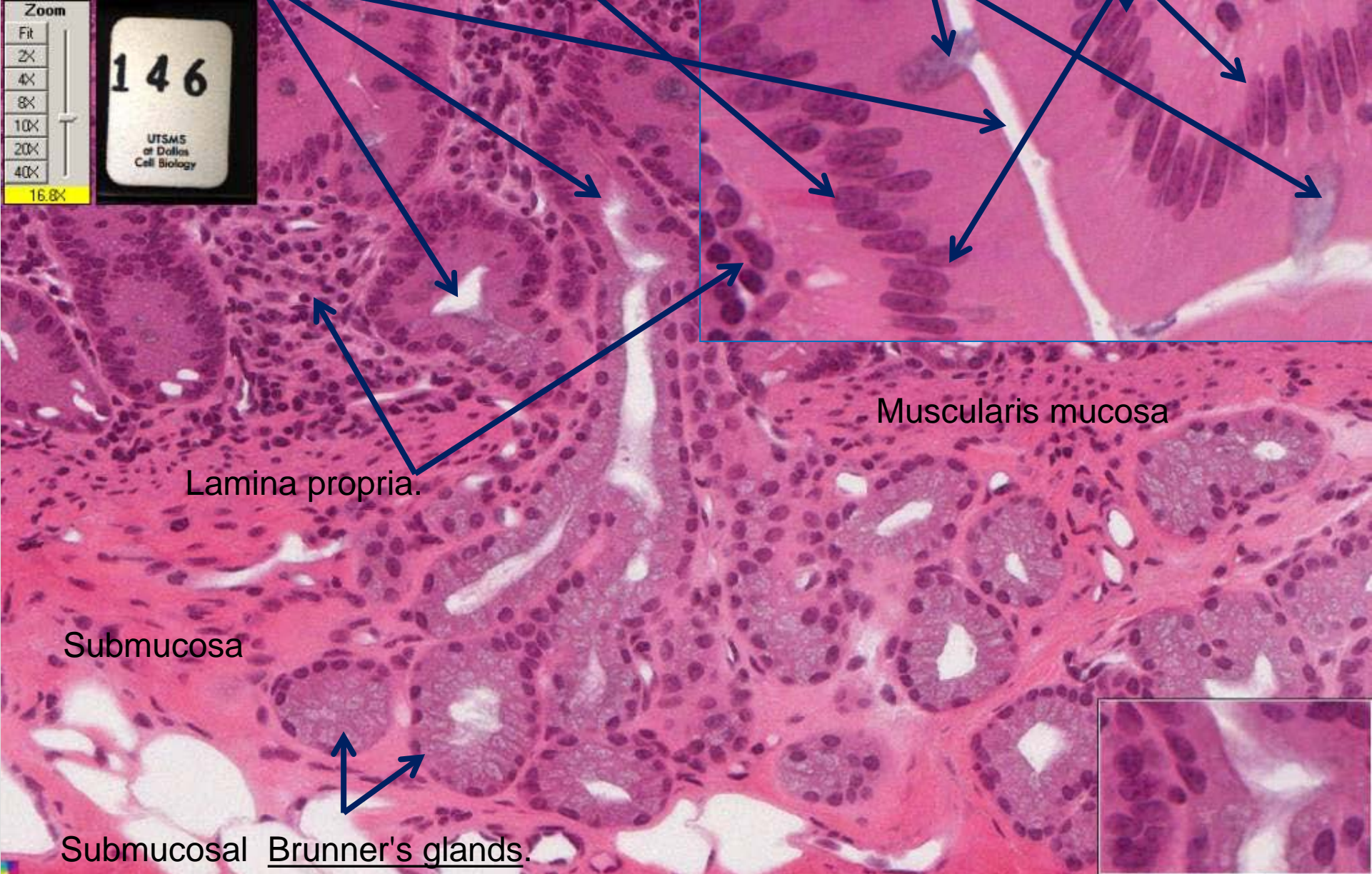
146 Duodenum, monkey

Crypts of Lieberkühn

Enteroendocrine cell

Goblet and absorptive cells,

Zoom
Fit
2X
4X
8X
10X
20X
40X
16.8X

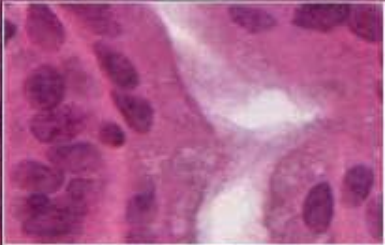


Lamina propria.

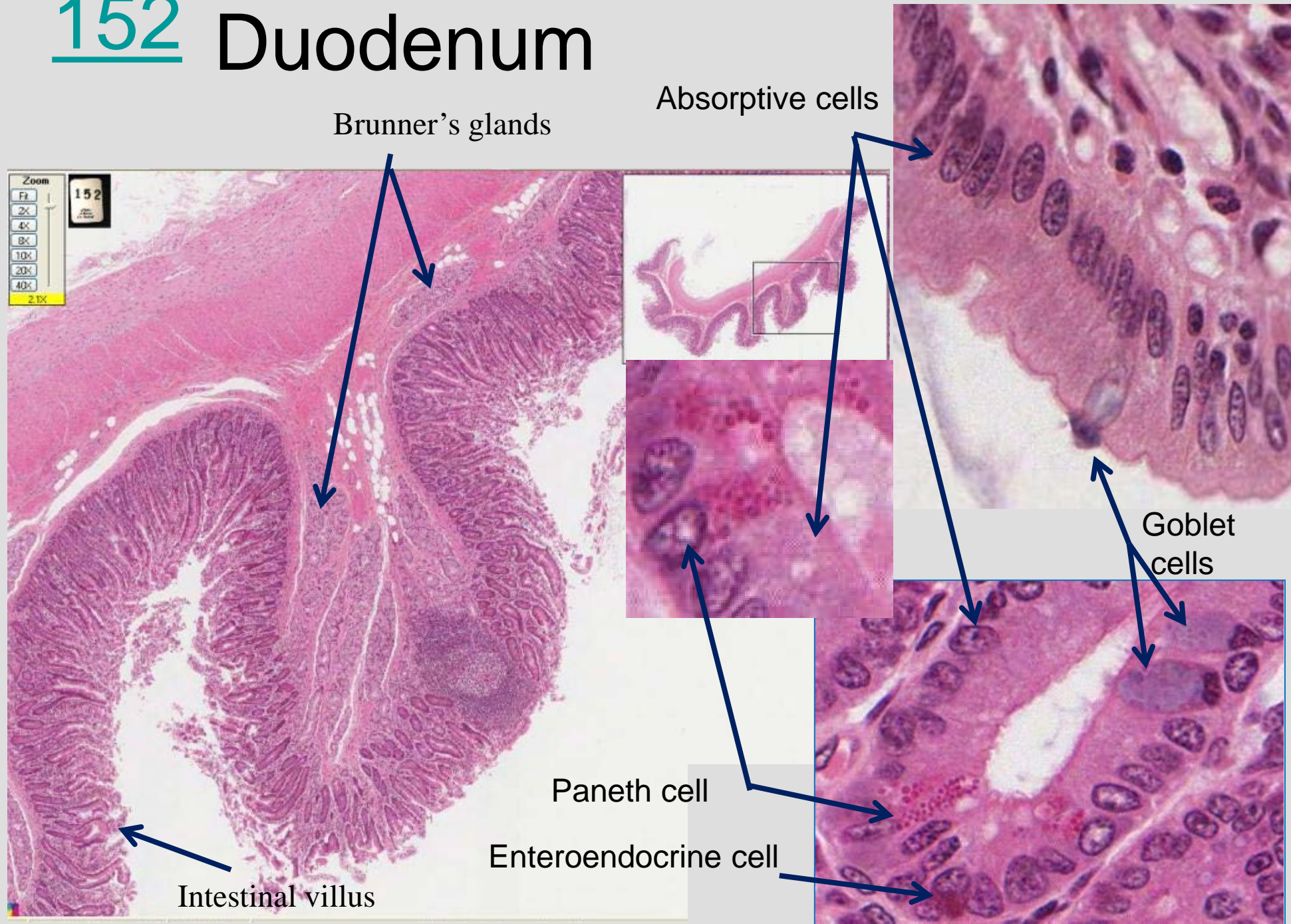
Muscularis mucosa

Submucosa

Submucosal Brunner's glands.



152 Duodenum



447 Small intestine

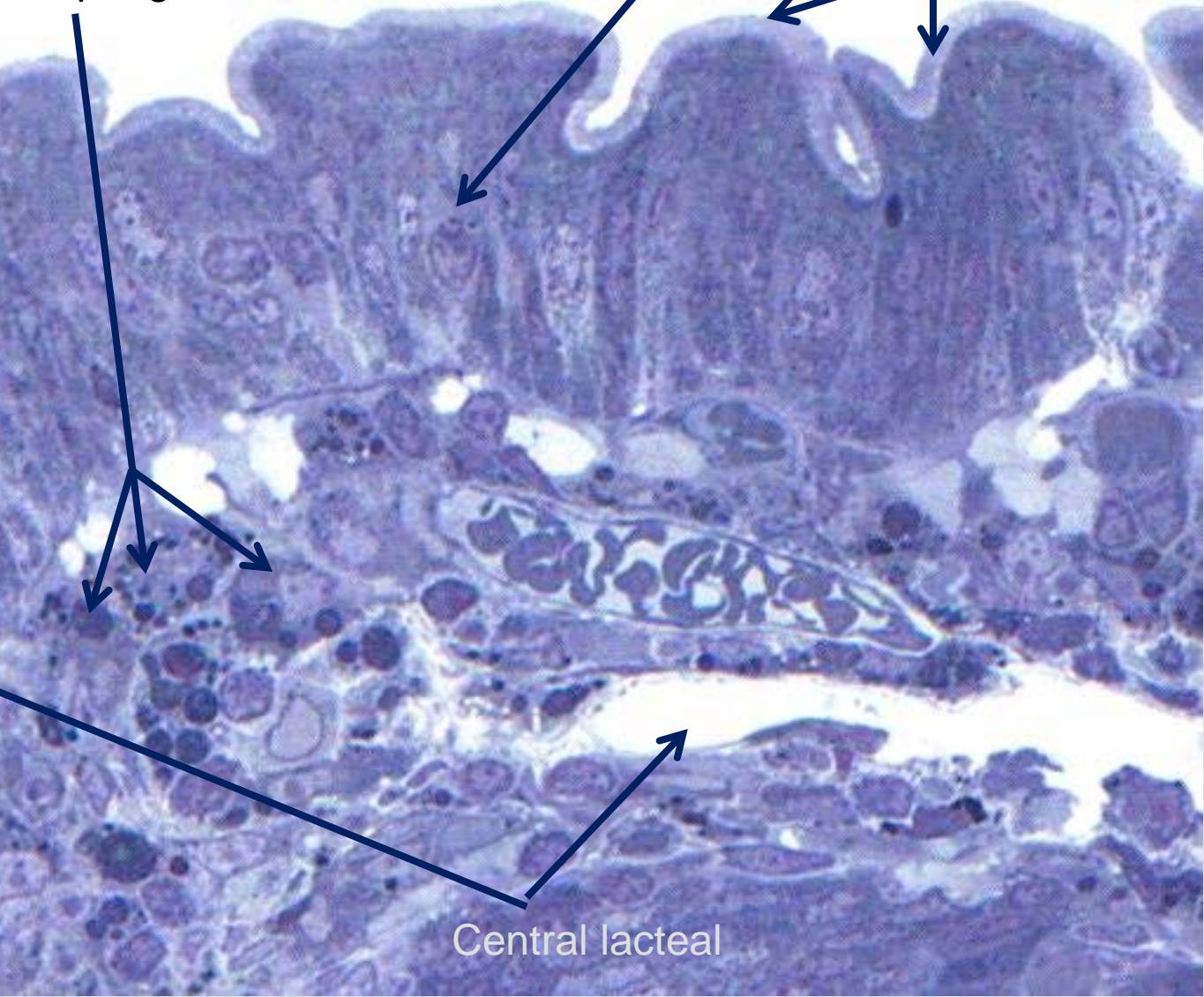
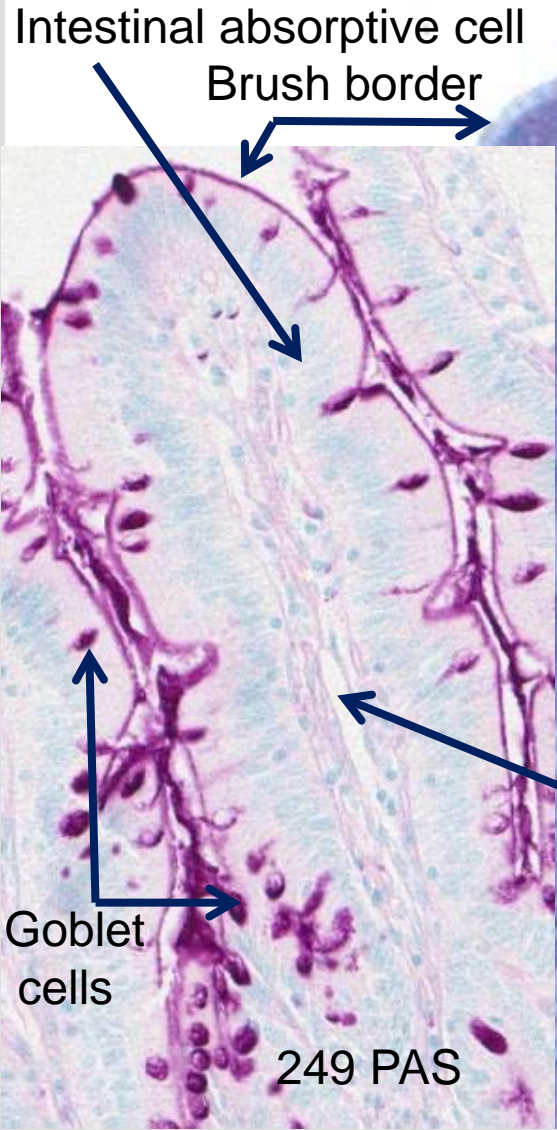
Mucus of goblet cells and the carbohydrates in the brush border are PAS positive for sugars

Intestinal villus

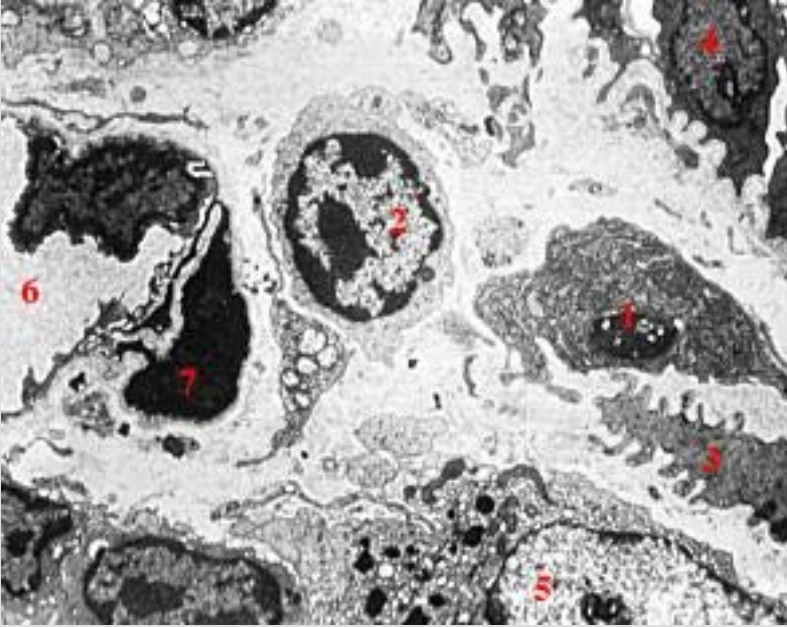
Intestinal absorptive cell
Brush border

Macrophages

Intestinal absorptive cell
Brush border



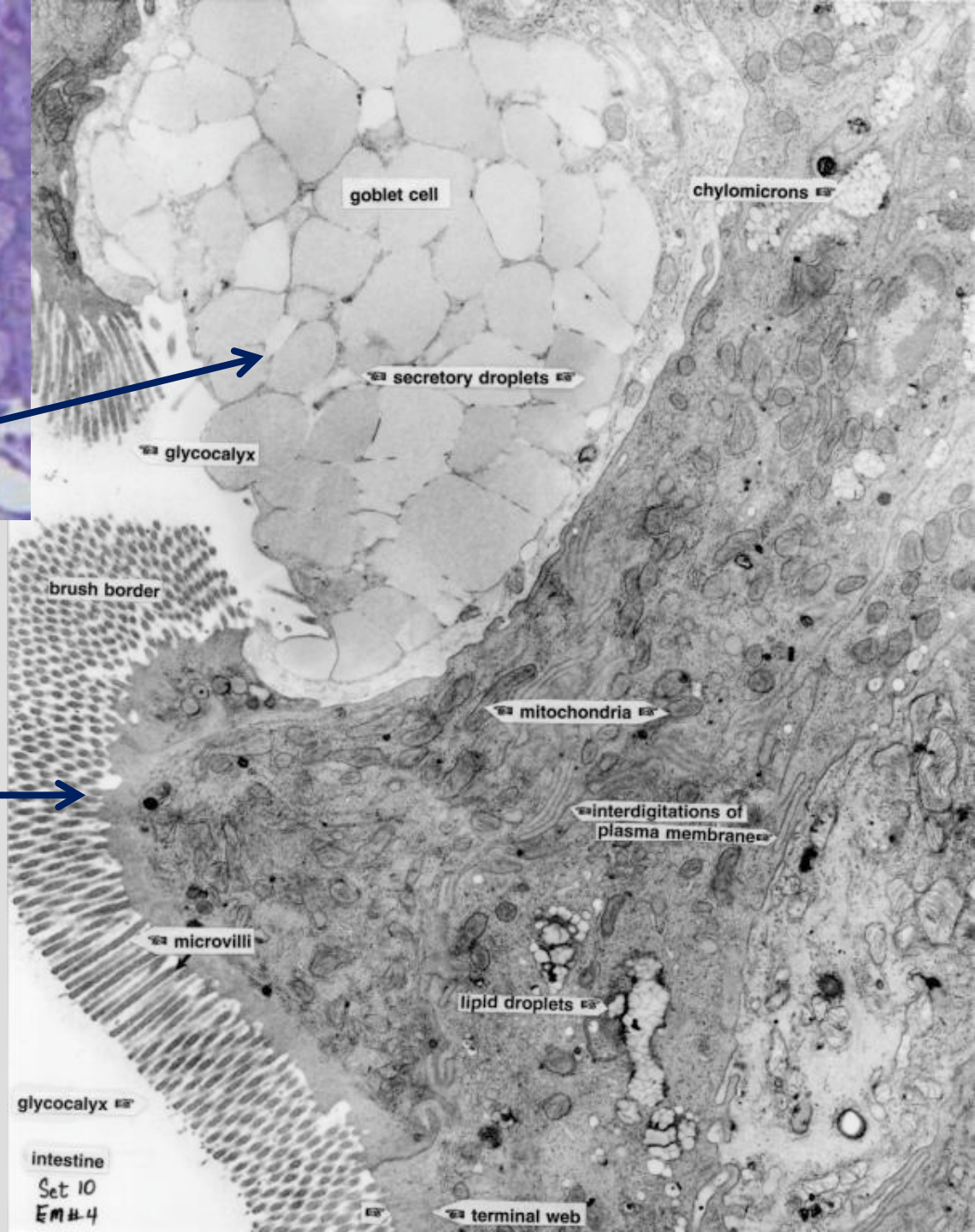
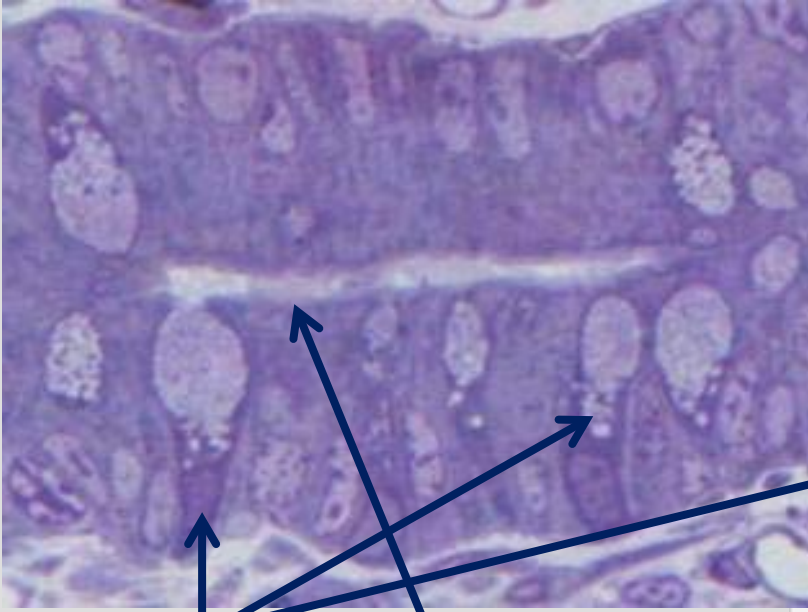
Central lacteal



EM 17 Basal portion of intestinal absorptive cell

1. Plasma cell
2. Lymphocyte
3. Smooth muscle
4. Intestinal absorptive cell
5. Macrophage
6. Lumen of capillary
7. Pericyte of capillary



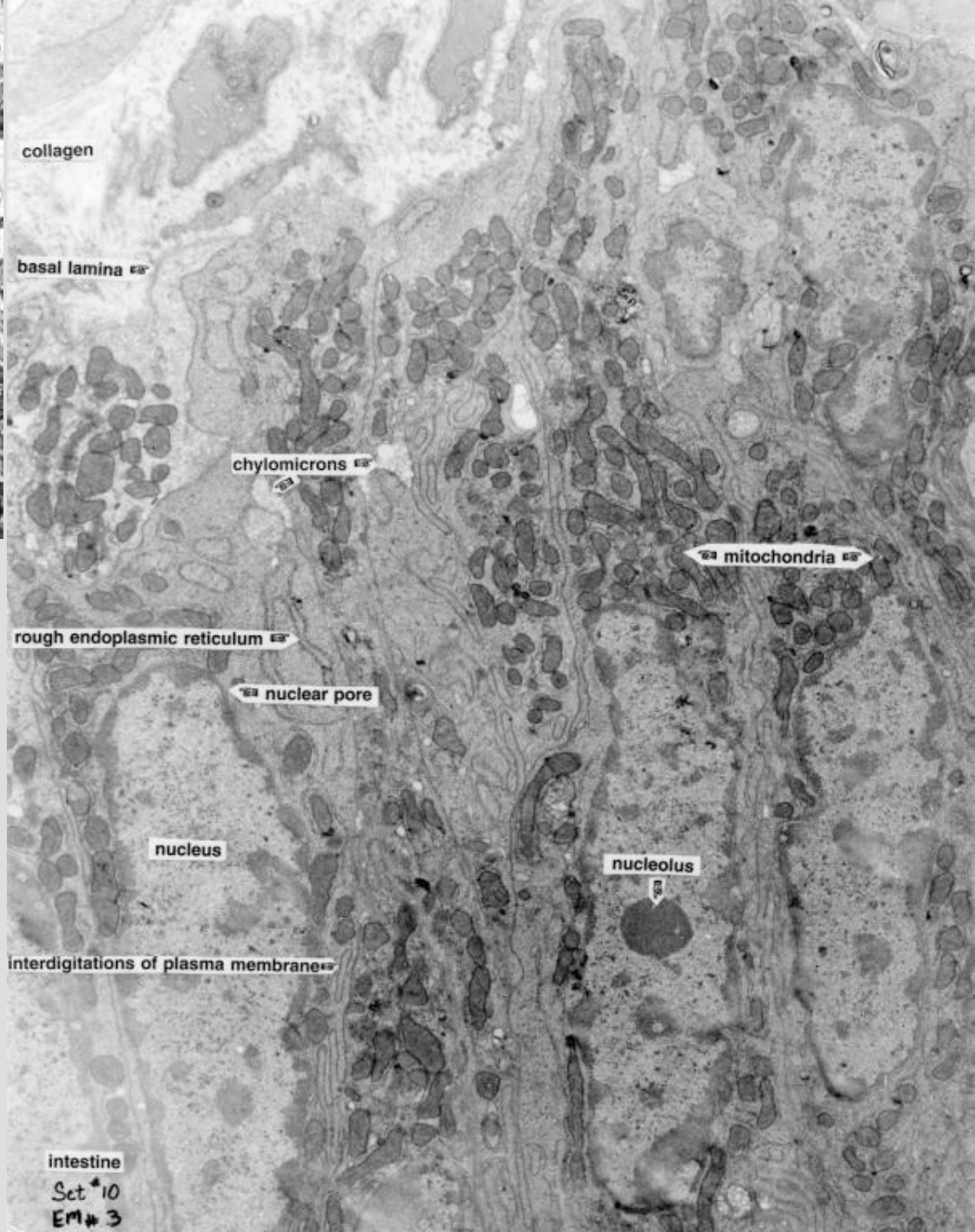
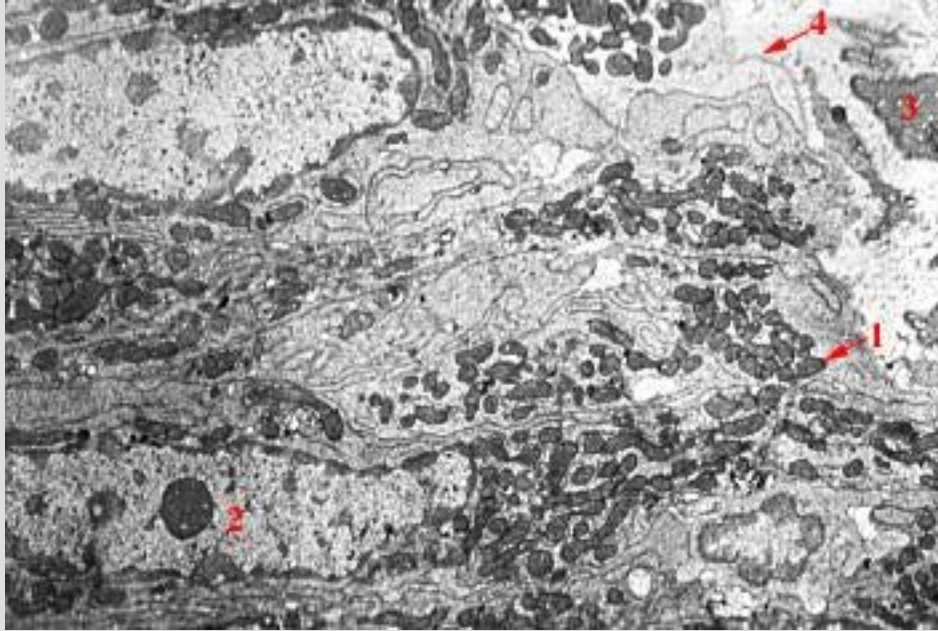


Goblet cell

EM 4. Apical portion of intestinal absorptive cell

1. Microvilli of brush border
2. Droplets of goblet cell
3. Terminal web
4. Lipid in SER
5. lumen

intestine
Set 10
EM #4

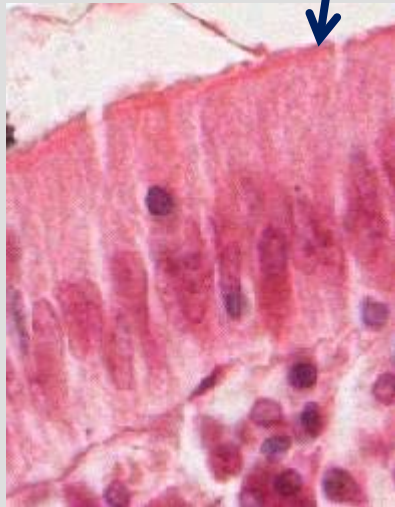


Basal portion of intestinal absorptive cell

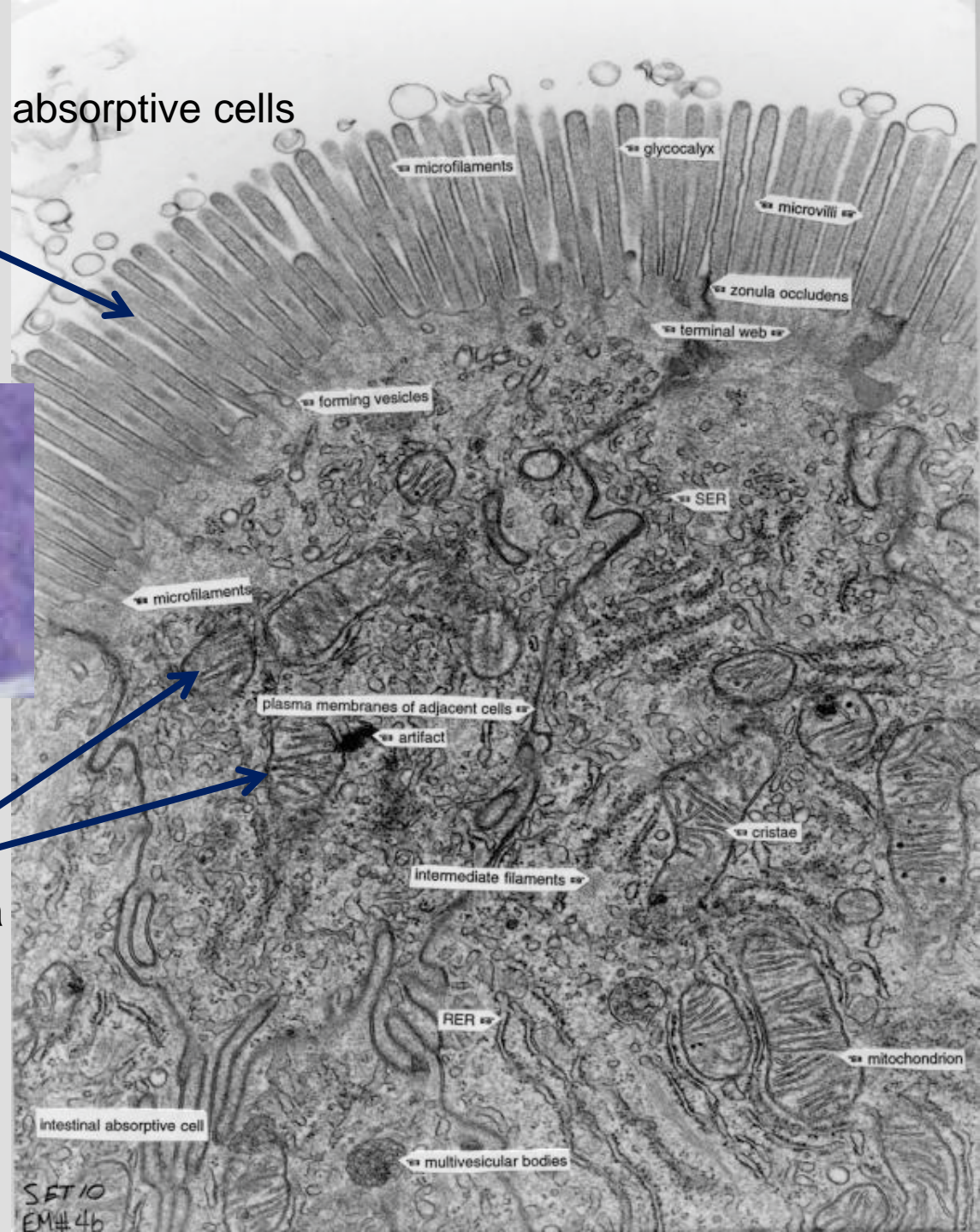
1. Mitochondria
2. Nuclei of intestinal absorptive cell
3. Smooth muscle of muscularis mucosa
4. Basal lamina

EM 4b

Brush border of intestinal absorptive cells



Mitochondria

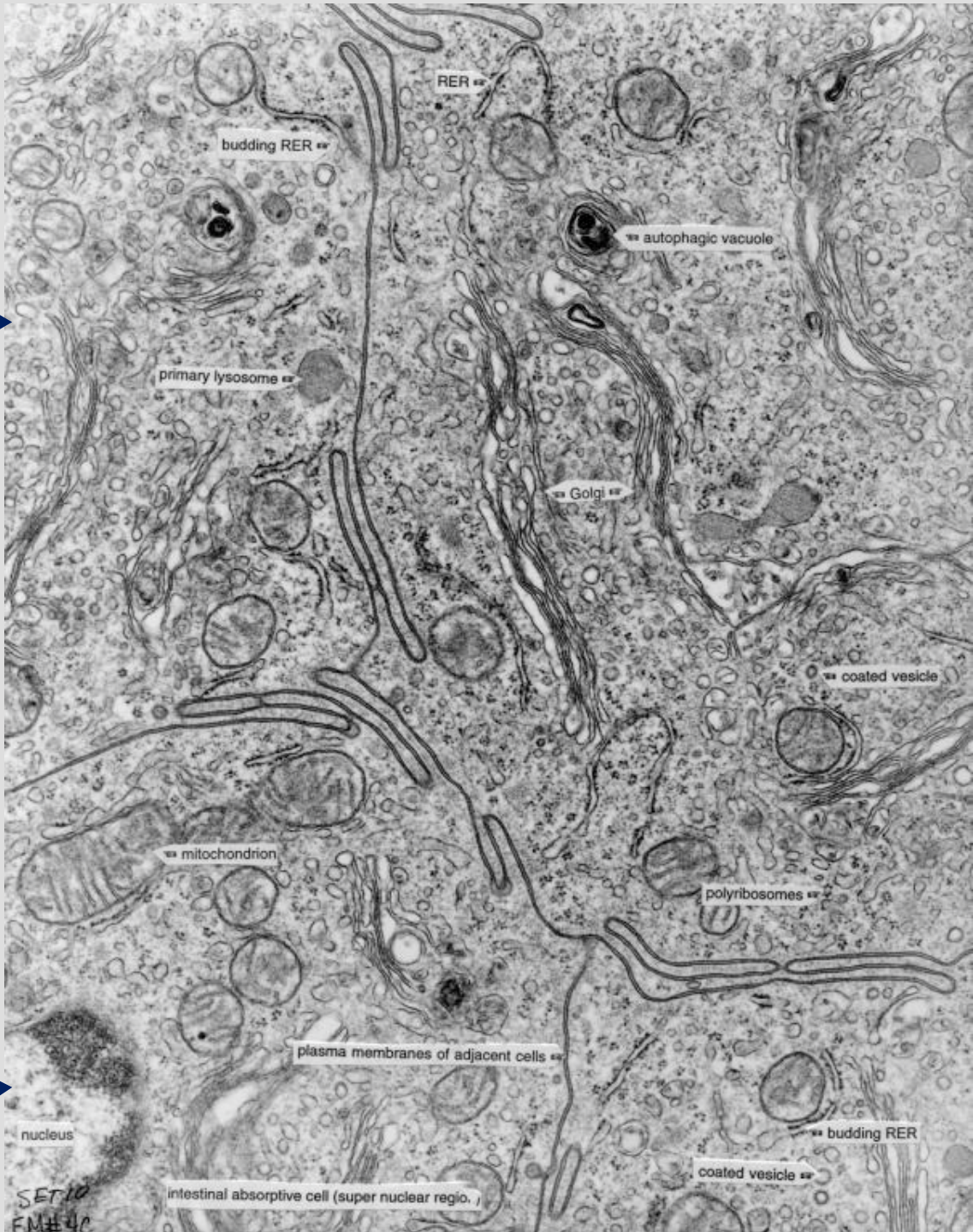


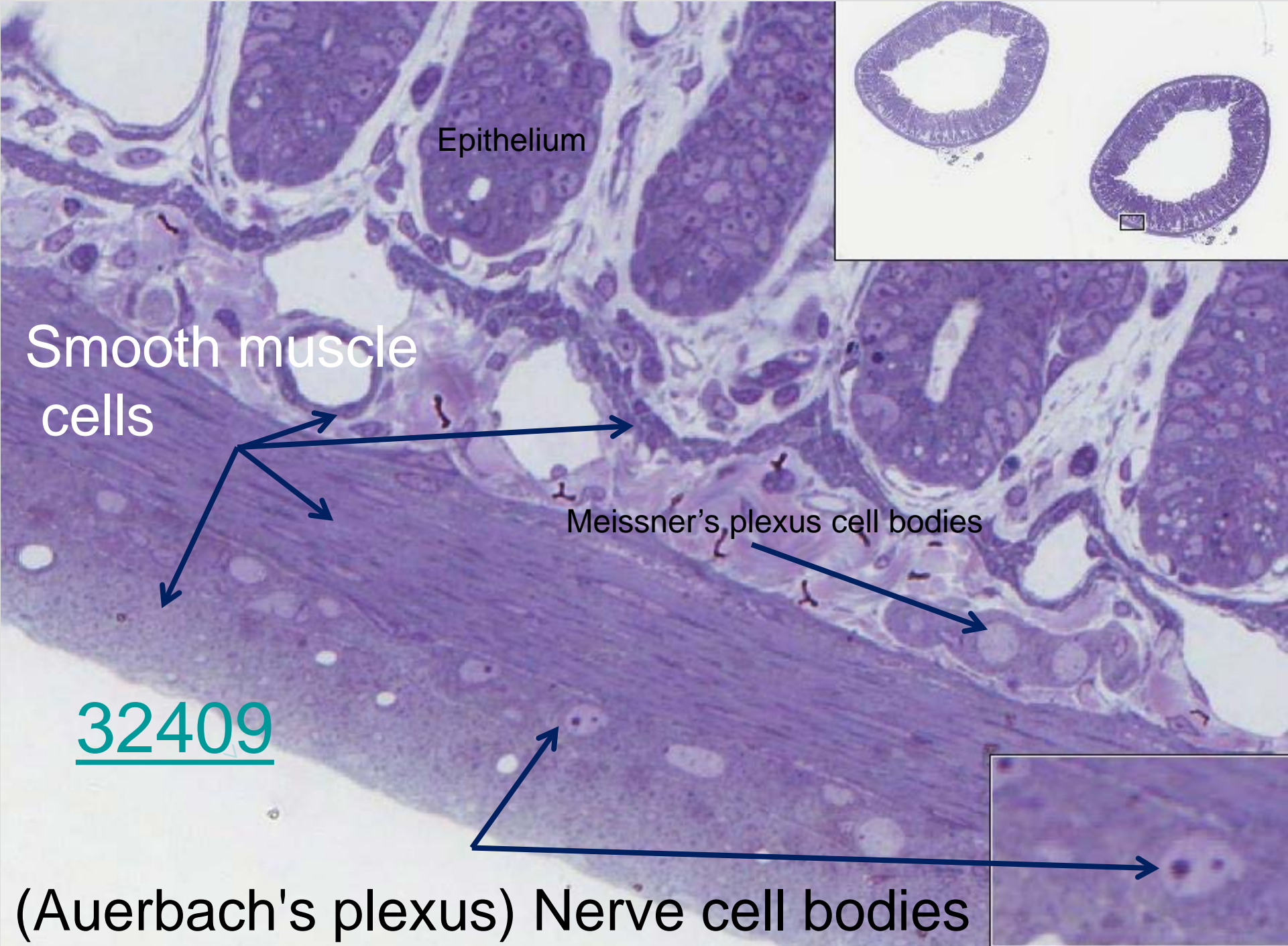
EM 4c

Intestinal absorptive cells in cytoplasm just above the nucleus



Nucleus





Epithelium

Smooth muscle cells

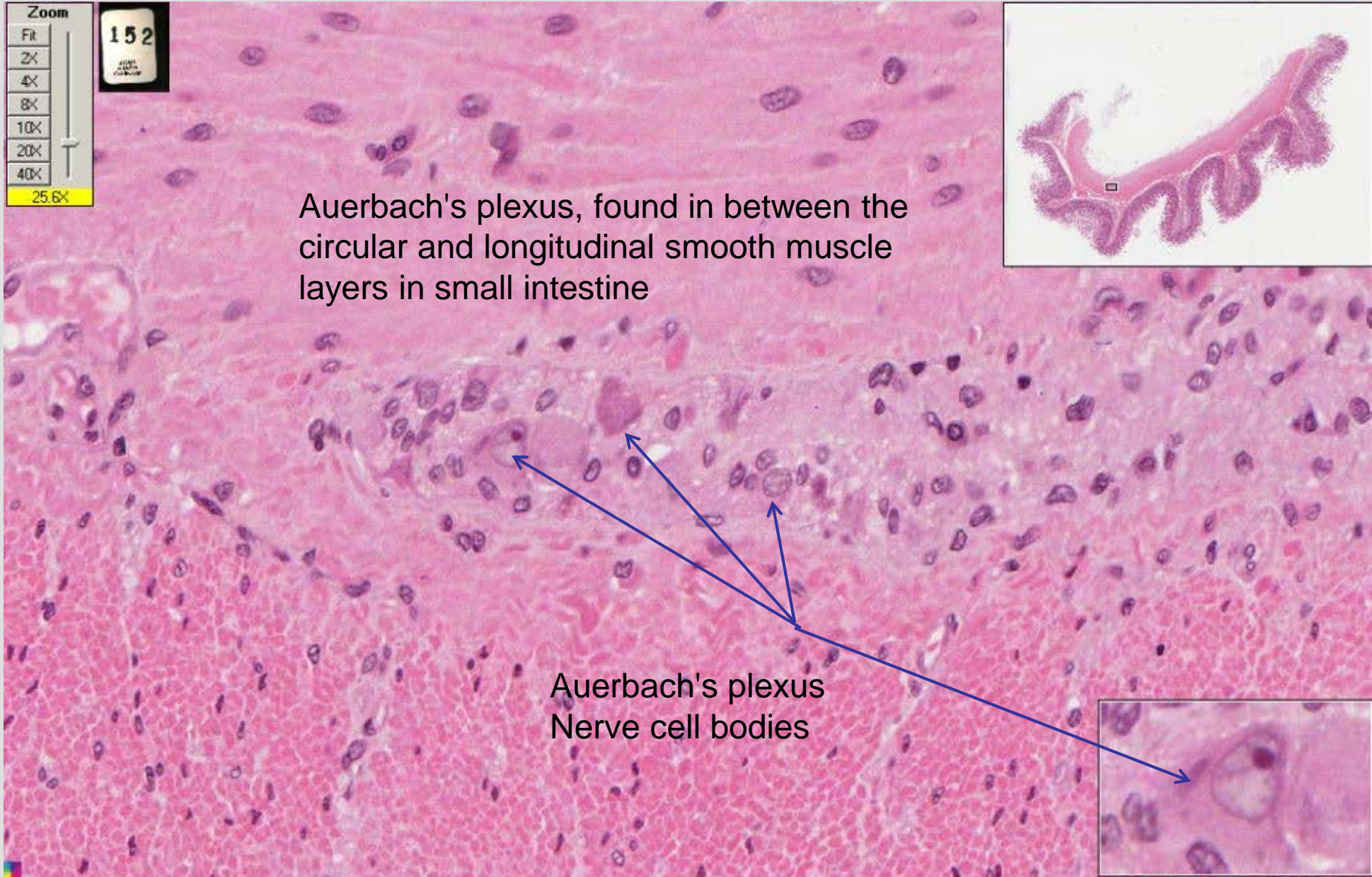
Meissner's plexus cell bodies

32409

(Auerbach's plexus) Nerve cell bodies

152

Duodenum (small intestine)

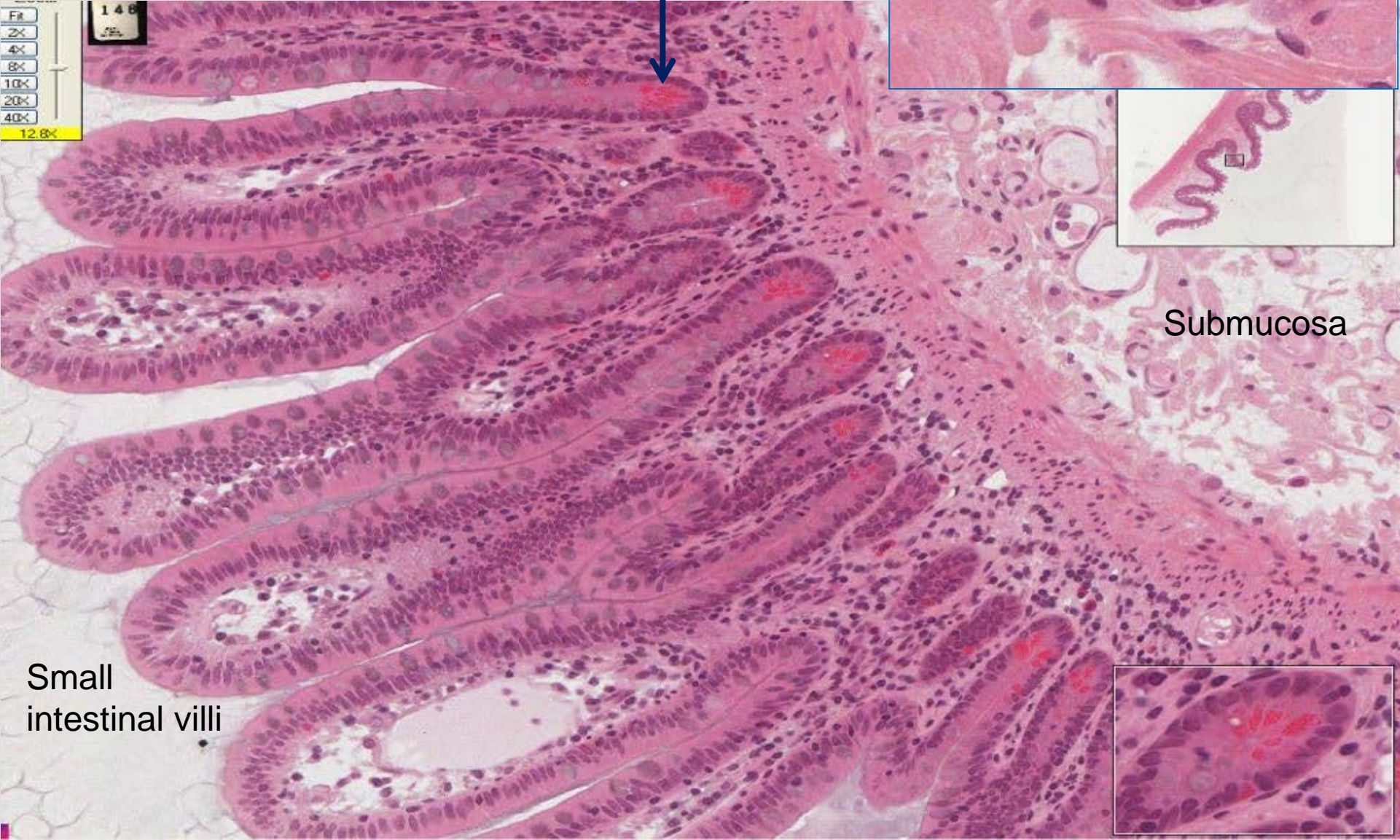


148 Ileum

Meissner's plexus cell bodies in submucosa

Paneth cell

Fit
2x
4x
8x
10x
20x
40x
12.8x



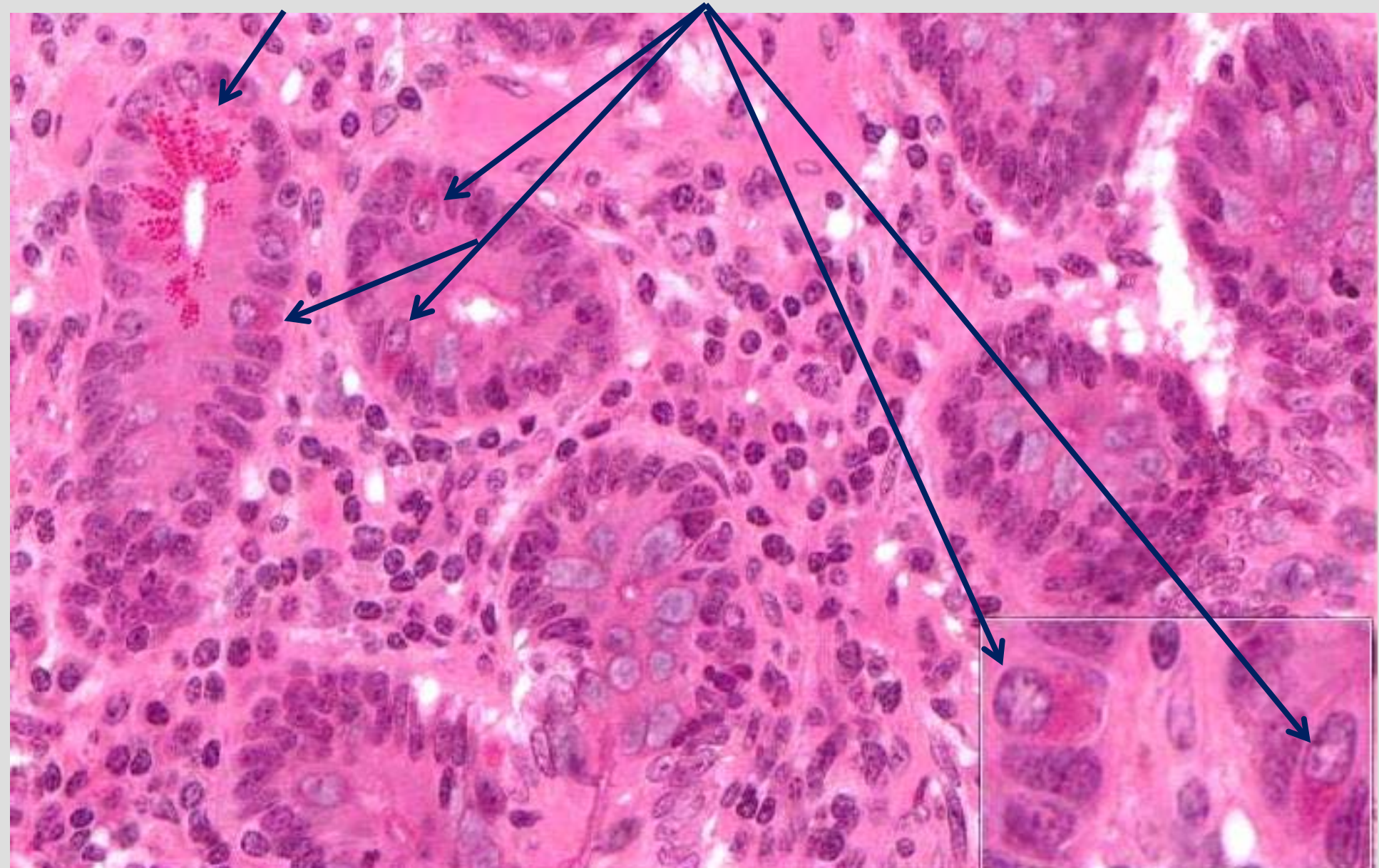
Submucosa

Small intestinal villi

250 Argentaffin cells of Ileum, monkey

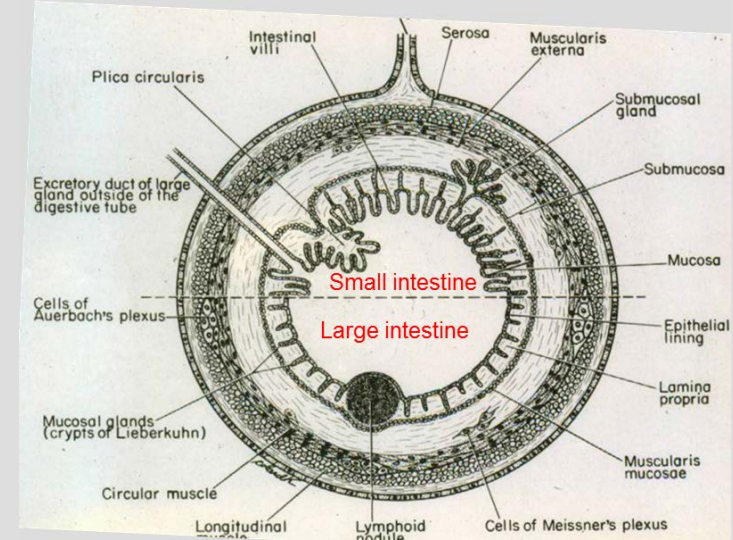
Paneth cell

Enteroendocrine cells also called Argentaffin cells



Compare luminal surfaces of the small and large intestines

Ref code # 6



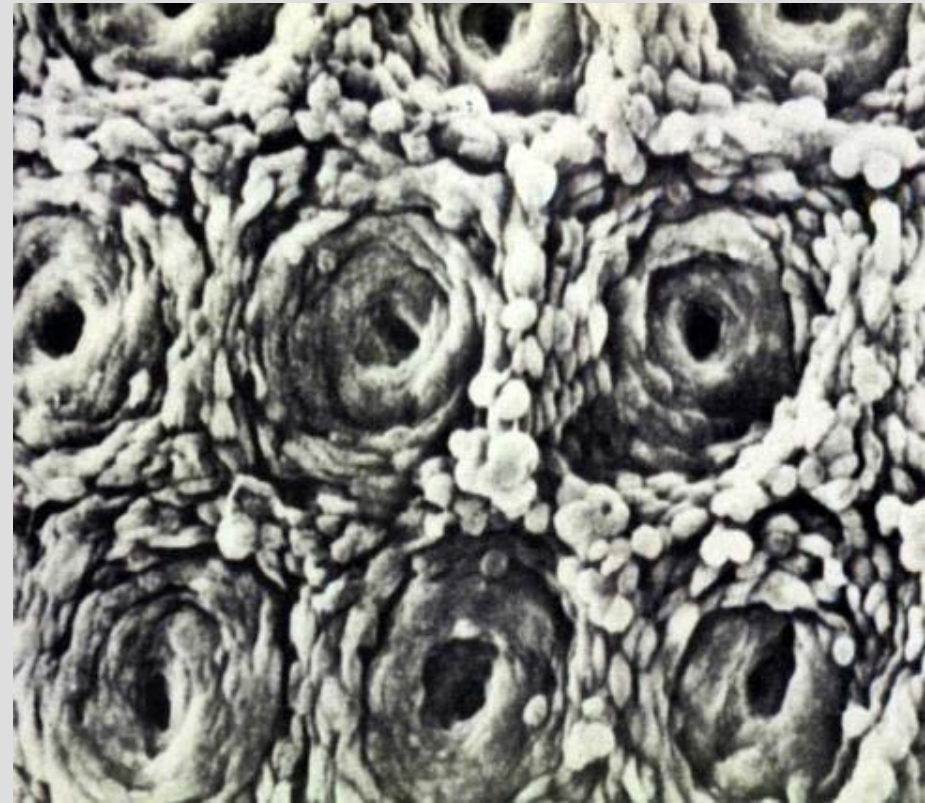
small intestines

large intestines

Villi



NO Villi



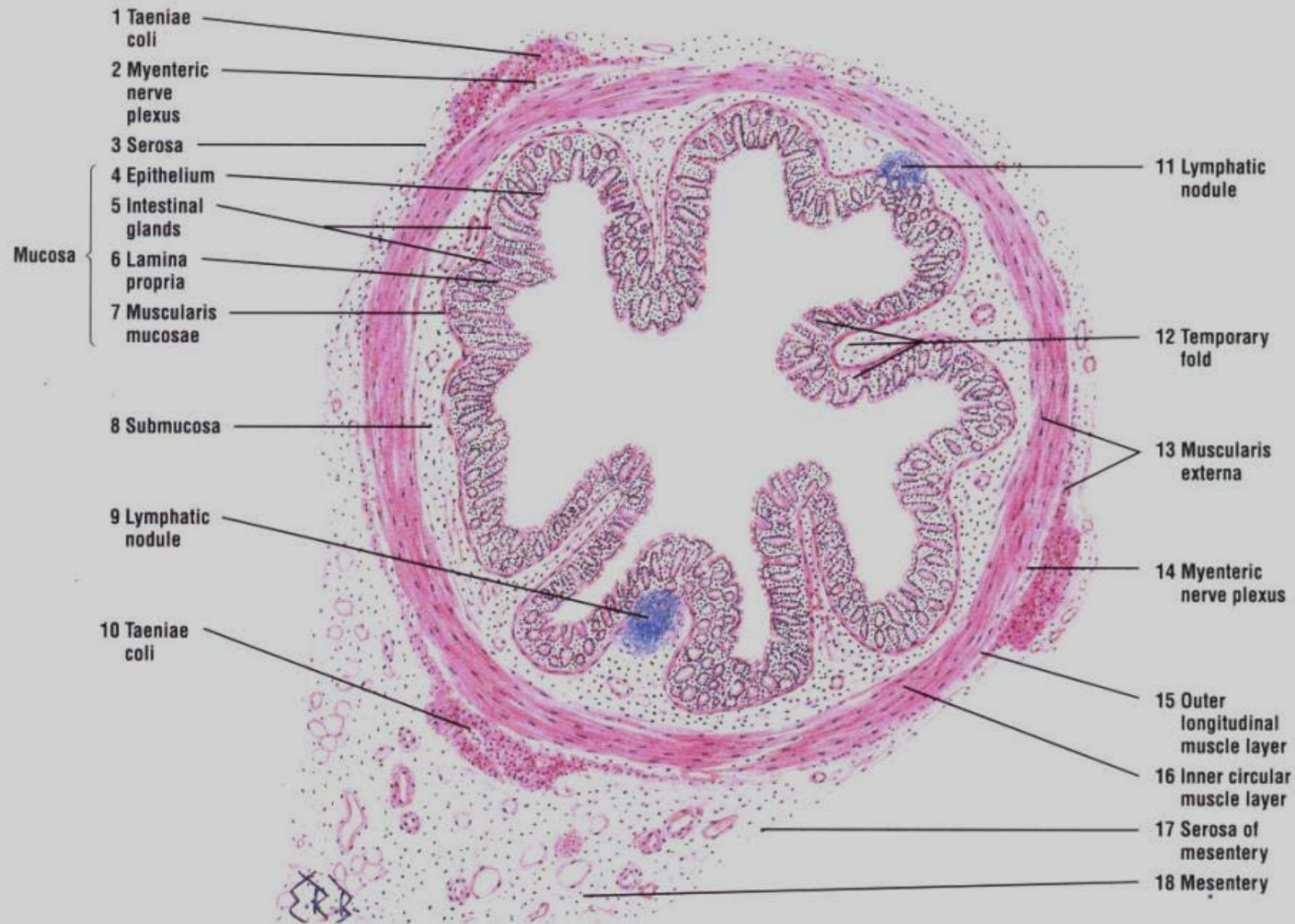
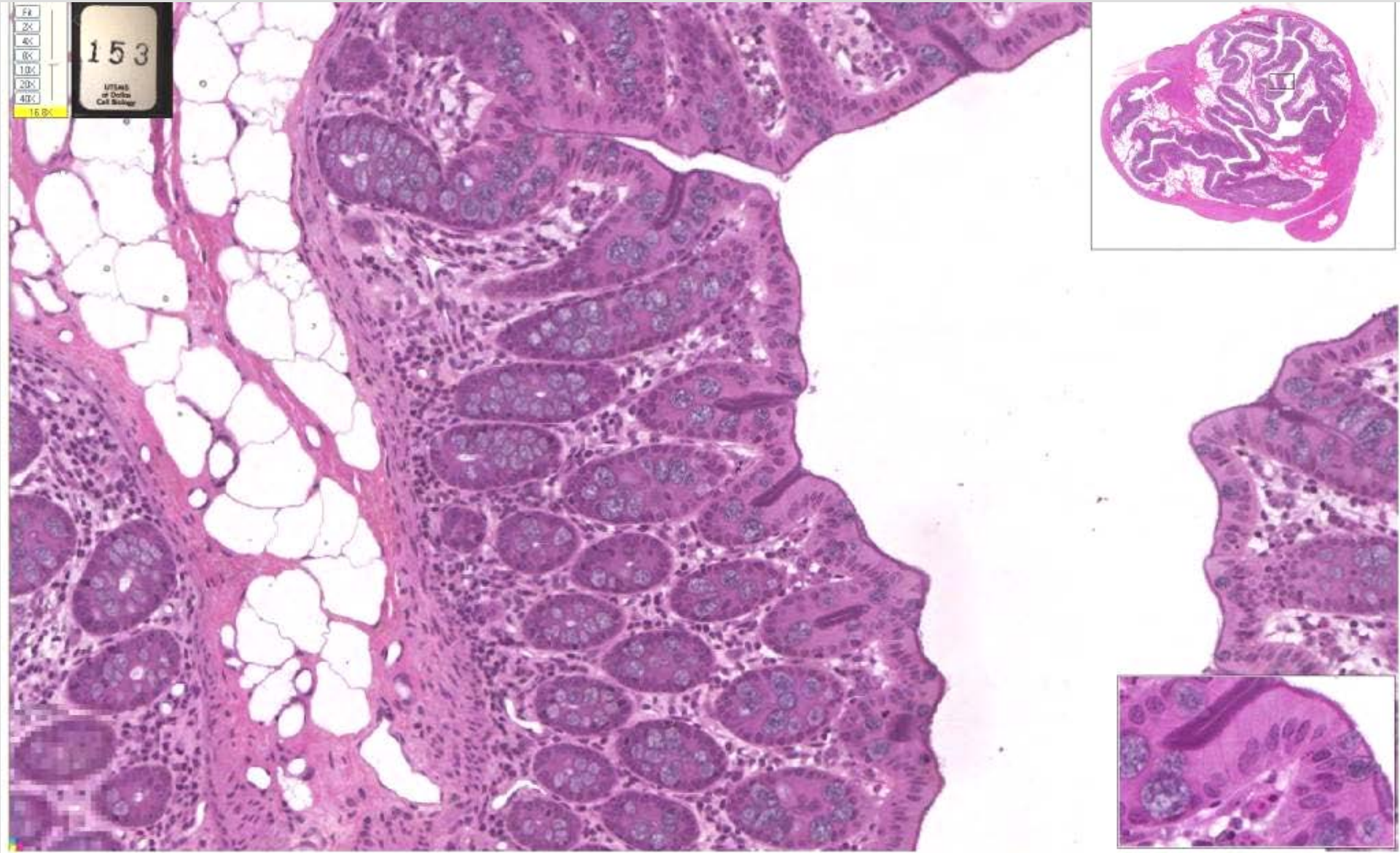
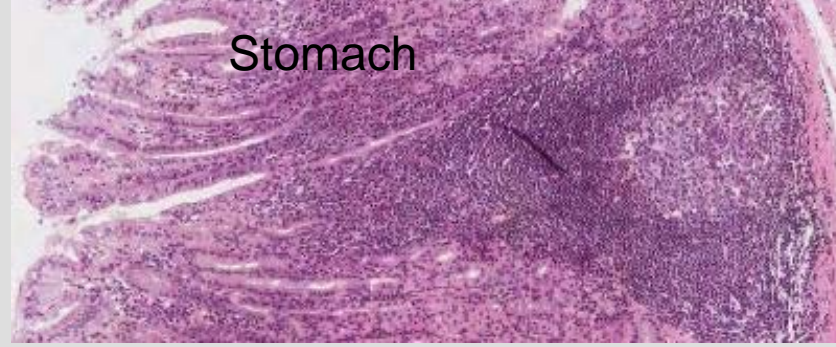


Fig. 12-6 Large Intestine: Colon and Mesentery (panoramic view, transverse section). Stain: hematoxylin-eosin. Low magnification.

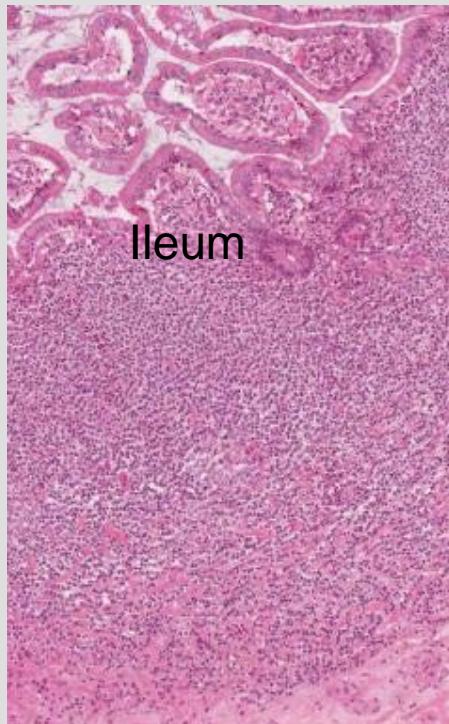
153

Large intestine or Colon, monkey

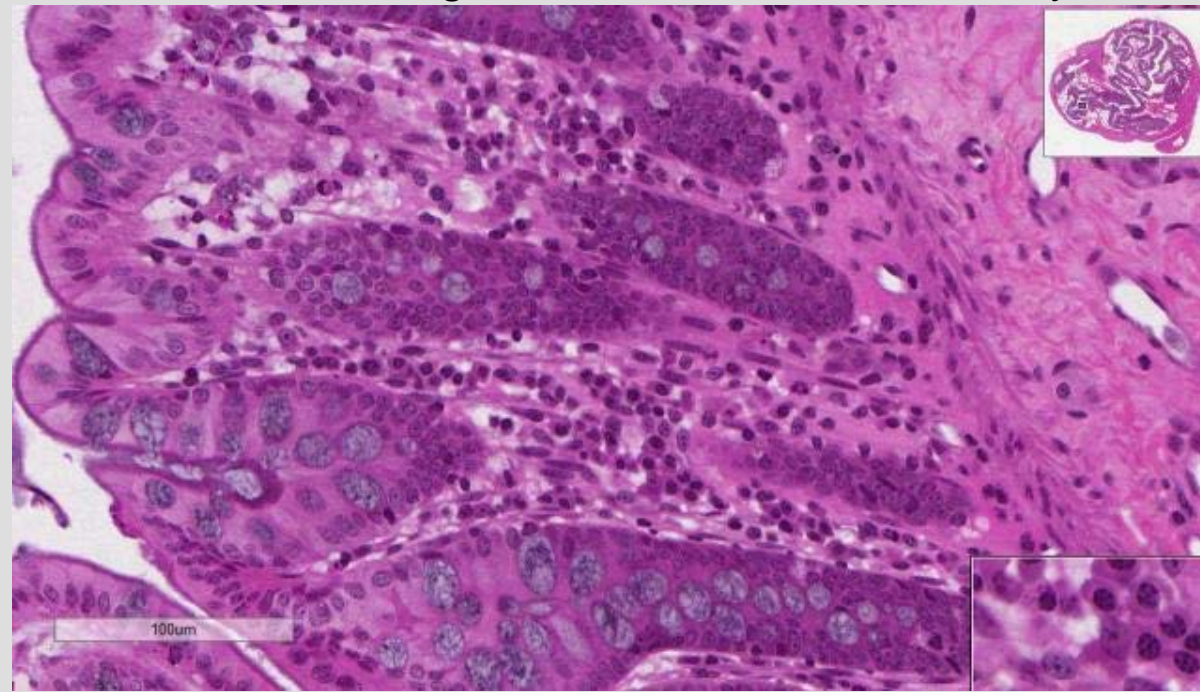


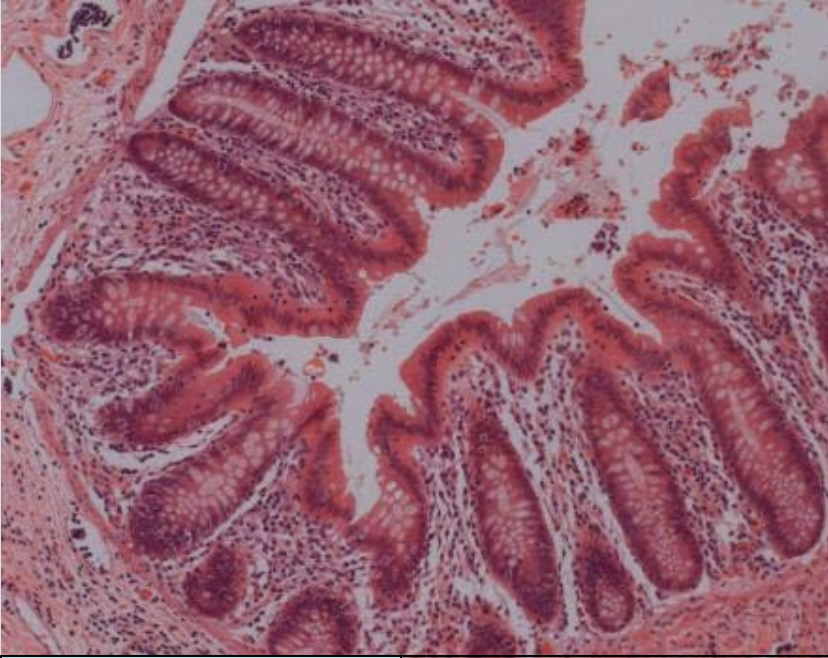


Solitary lymph follicles in the lamina propria seen throughout the GI tract help the immune system maintain a barrier between the environment and the internal milieu of the body. Other contributors include luminal epithelium, HCl in the stomach, and mucus produced by many goblet cells in the intestines.



Large intestine or Colon, monkey [153](#)

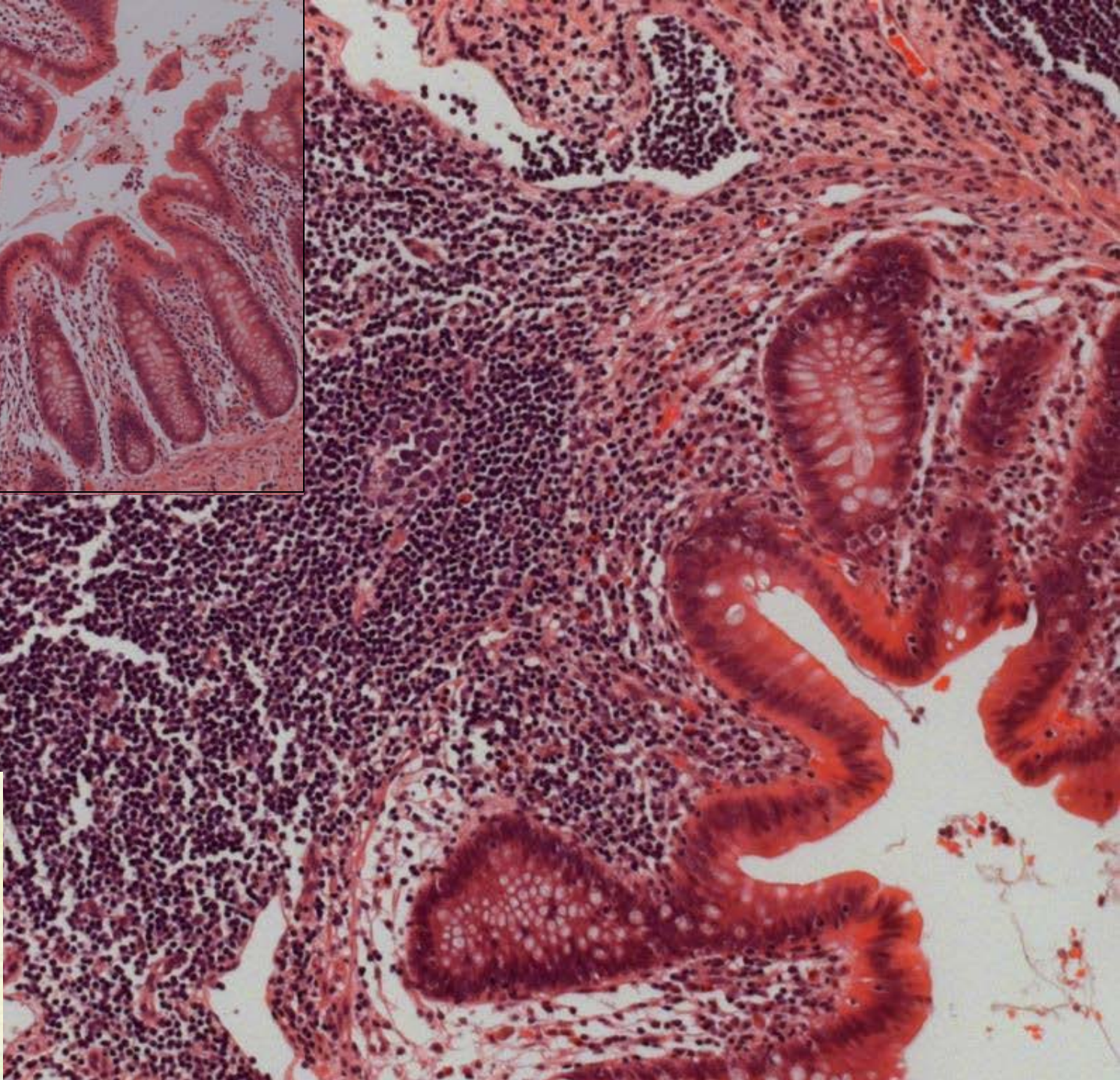




Human appendix



[32412](#)



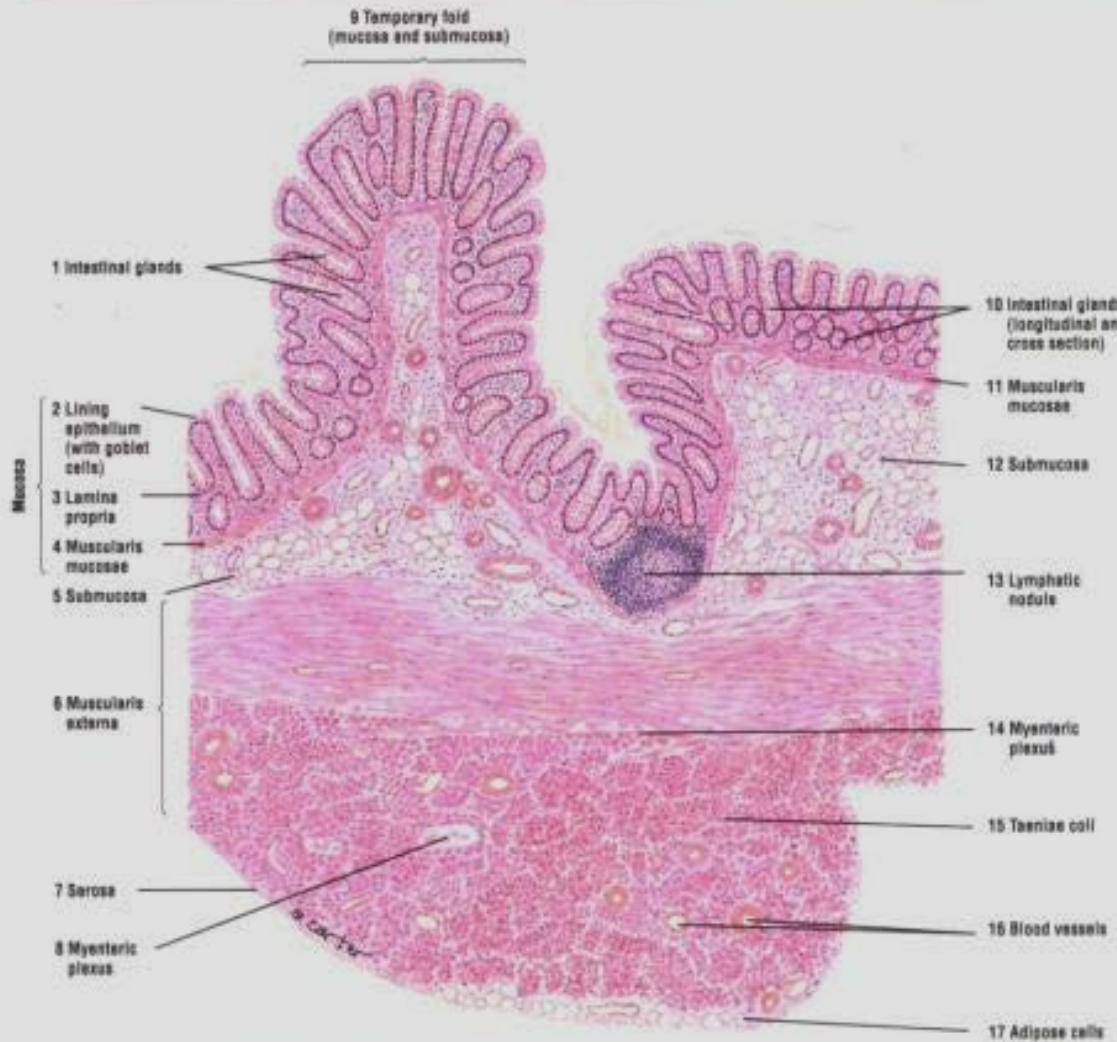


Fig. 12-7 Large Intestine: Colon Wall (transverse section). Stain: hematoxylin-eosin. Medium magnification.

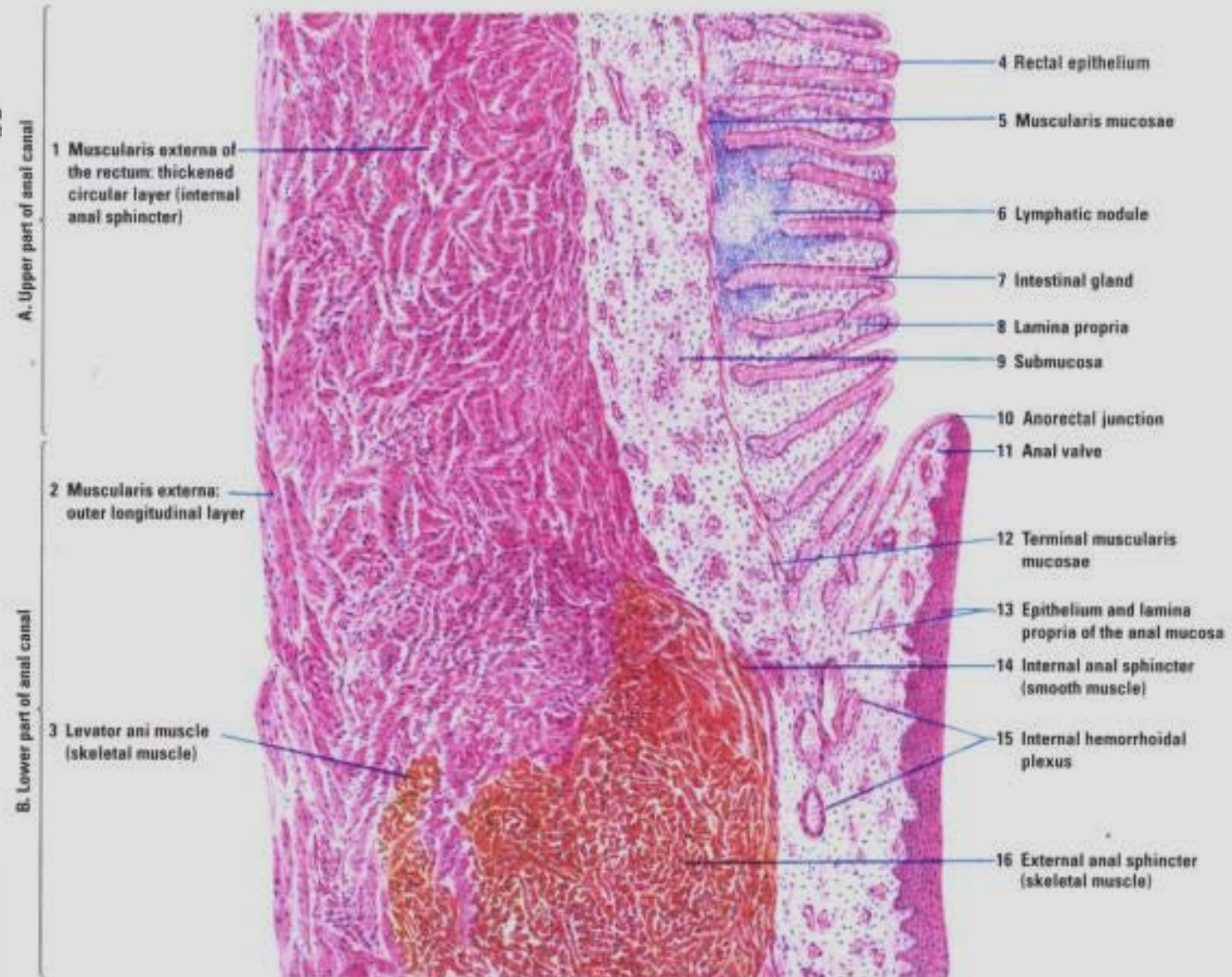


Fig. 12-10 Anal Canal (longitudinal section). Stain: hematoxylin-eosin. Low magnification.

Large intestines

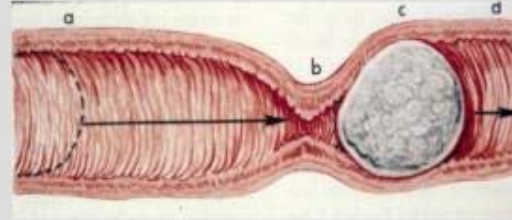
Anal skin



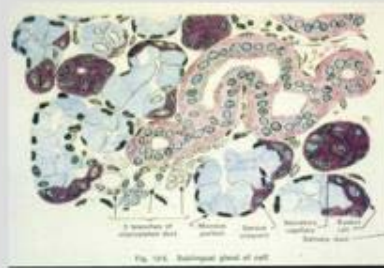
In summary

Function of the Digestive System

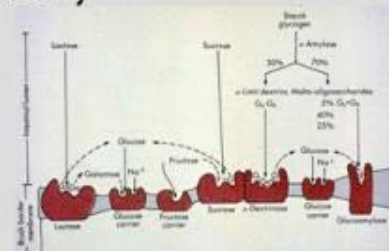
Movement of food



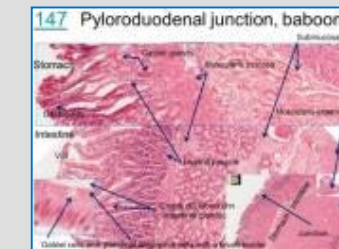
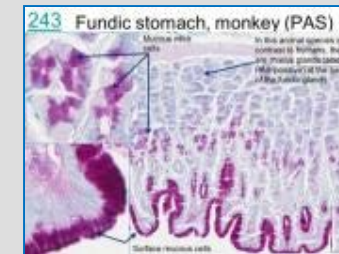
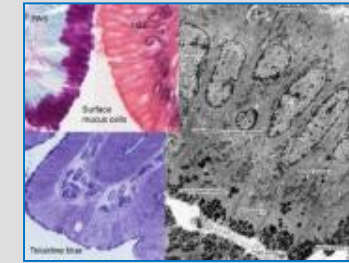
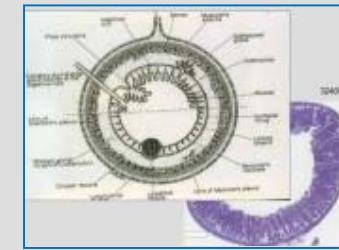
Secretion of digestive juices



Absorption of digested foods, water, and electrolytes



The digestive system functions to obtain metabolites, yet maintain a barrier between the environment and the internal milieu of the body.



Many illustrations in these VIBS Histology YouTube videos were modified from the following books and sources: Many thanks to original sources!

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16. Tuttle, W.W. and Schottelius, B.A. 1969. Textbook of Physiology. 16th Edition. The C.V. Mosby Company. Saint Louis. Library of Congress # 75-89848.
17. Varner, D. et al. 1991. Diseases and Management of Breeding Stallions. American Veterinary Publications. Goleta, California. ISBN 0-939674-33-5.
18. Von Hagens, Gunther and A. Whalley, 2007. Body Worlds – The Anatomical Exhibition of Real Human Bodies. ISBN 978-3-937256-04-7
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20. Weiss, L. and Greep, R. 1977. Histology. 4th Edition. McGraw-Hill Book Company. New York. ISBN 0-07-069091-X.

Questions on the Digestive system

1. Which of these cells is/are found both in the stomach and intestines?

- a. enteroendocrine (argentaffin cells)
- b. fibroblasts
- c. goblet cell
- d. **a and b**
- e. a, b, and c

2. The digestive system functions to obtain metabolites necessary for growth and energy needs; however, it must maintain a barrier between the environment and the internal milieu of the body. Which of the following is the least effective feature of this barrier?

- a. composition of saliva
- b. acid environment of the stomach
- c. large volume of mucus produced into the lumen of the large intestine
- d. **the chylomicron fat absorption mechanism via central lacteal**
- e. nearby and abundant immune defense structures and mechanisms

China





China

The end of

Medical School Histology Basics Digestive System

VIBS 243 lab

