



**UCDAVIS**  
**VETERINARY MEDICINE**  
*California Animal Health and  
Food Safety Laboratory System*



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# Equine surgical alimentary pathology

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California Animal Health and Food Safety Laboratory System,  
UCDavis



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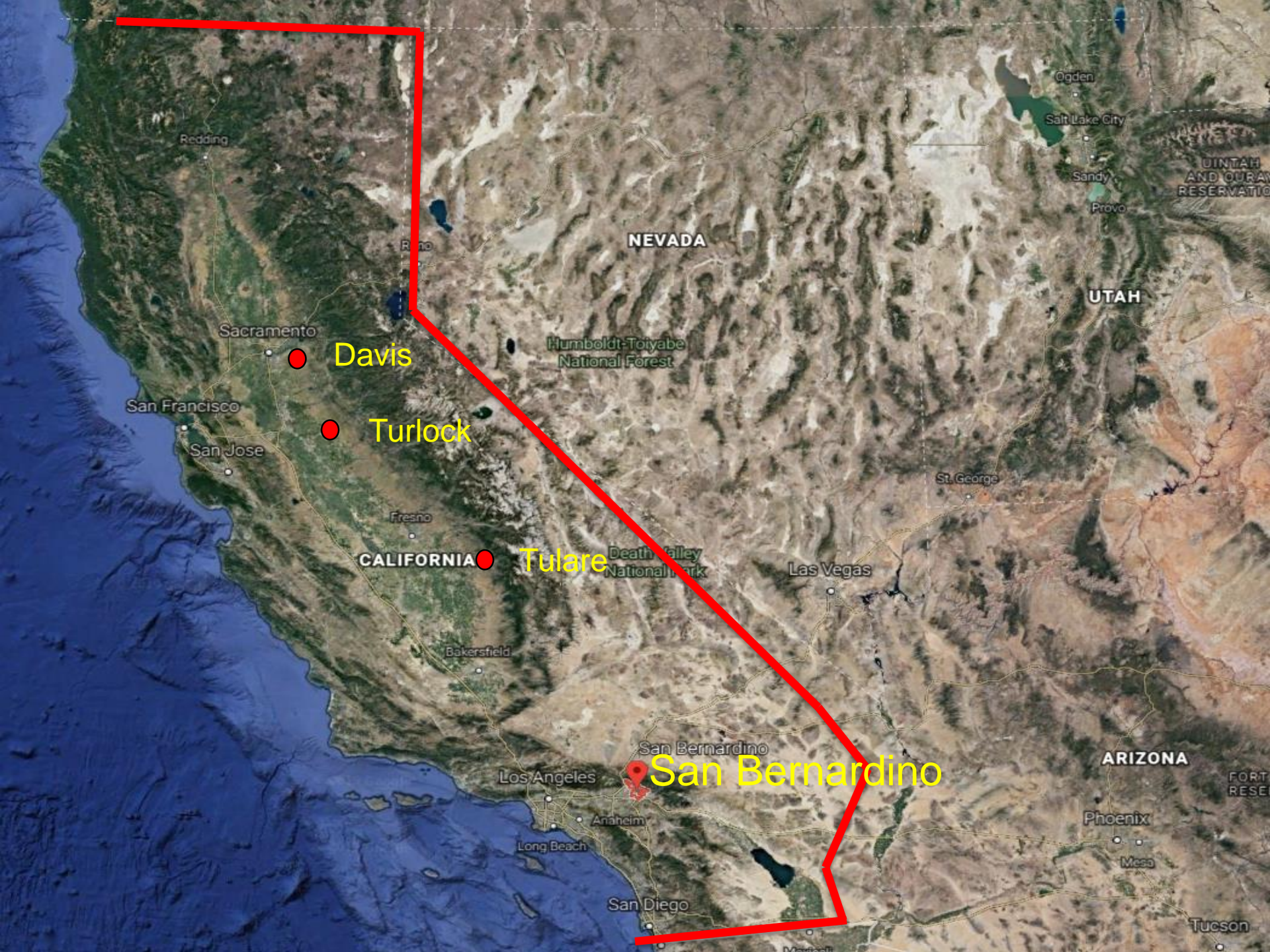
TAMAULIPAS

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# California Animal Health and Food Safety Laboratory

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SIERRA LAKES

Highland

San Bernardino

Rialto

Fontana

Kaiser

Mountain Home Village

Forest Falls

Bloomington

Colton

Mentone

Redlands

Oak Glen

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Cherry Valley

MIRA LOMA

Riverside

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**When You're In A Cell,  
Yell Like Hell For Big Brother**

**OPEN  
24  
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**← 3/8 Mile Across From Jail**

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DON'T STAY IN JAIL  
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# Second major earthquake rattles Southern California in two days

Updated 6:20 AM; Posted Jul 5, 10:56 PM



**BREAKING  
NEWS**

Breaking news from The Oregonian/OregonLive



# Southern California reels from magnitude 7.1 quake

By JOHN ANTCAK, ASSOCIATED PRESS LOS ANGELES — Jul 6, 2019, 4:05 AM ET

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The Associated Press

Some shelves are nearly empty as volunteers assist with cleanup at the Ridgecrest, Calif., branch of the Kern County Library on Friday, July 5, 2019, following... [more +](#)





**UCDAVIS**  
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# California Animal Health and Food Safety Laboratory

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# CAHFS Mission

## Health Management



## Disease Control



## Food Safety



**UCDAVIS**  
**VETERINARY MEDICINE**  
California Animal Health and  
Food Safety Laboratory System

## Public Health

**One bacteria,  
30,000 deaths**

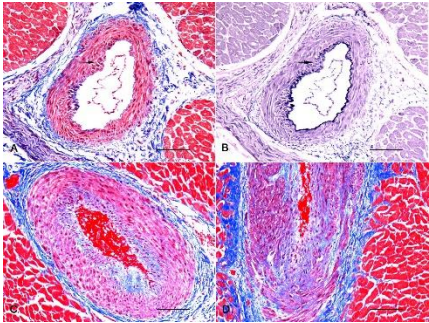
By ROBERT MAZURKIN, USA TODAY  
**Survivor** Bailey, now 16, contracted C. diff after brain surgery.

An infection called C. diff is wreaking havoc in the USA's hospitals, nursing homes and other medical facilities — and officials could be doing far more to stop it

## Equine Health



## New Knowledge











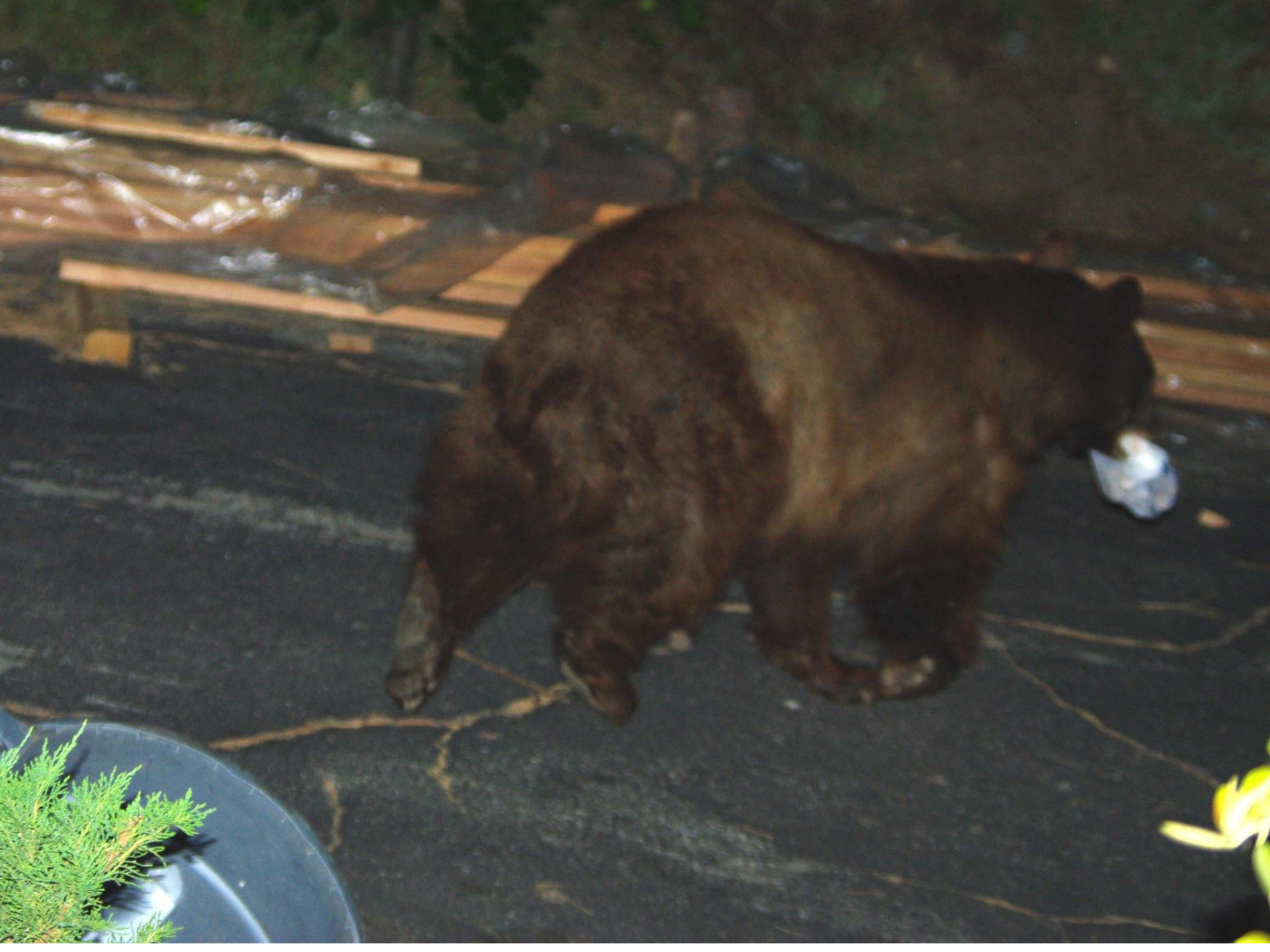




















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# Small animals – less frequently





# **Gastrointestinal biopsies**

\* Endoscopic

\* Surgical



# Gastrointestinal biopsies

\* Endoscopic

\* Surgical



# Endoscopic

## Pros

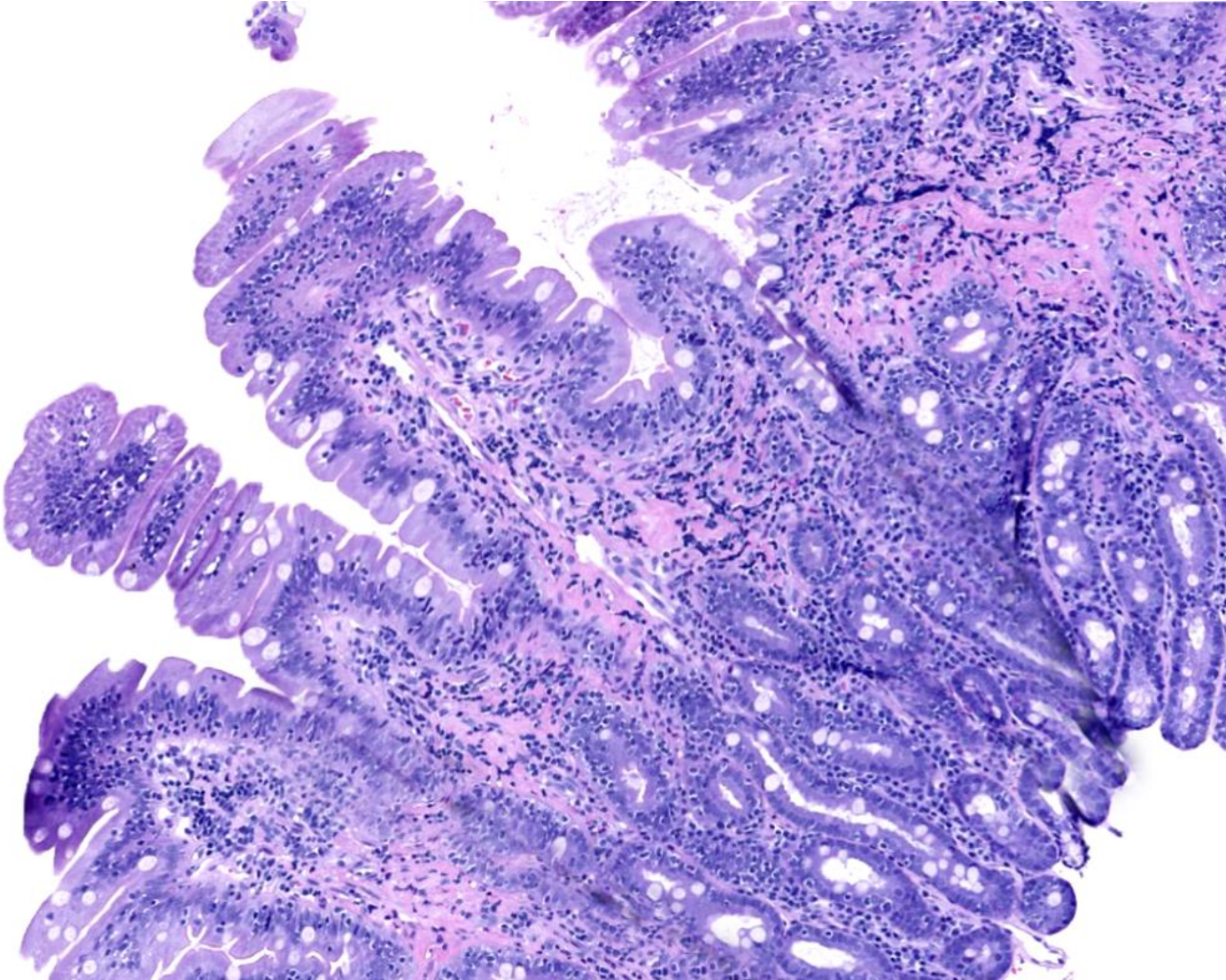
- Less invasive
- Works well in rectum/colon

## Cons

- Mainly mucosal
- Tissue distortion/orientation
- Processing artifact
- Operator expertise dependent

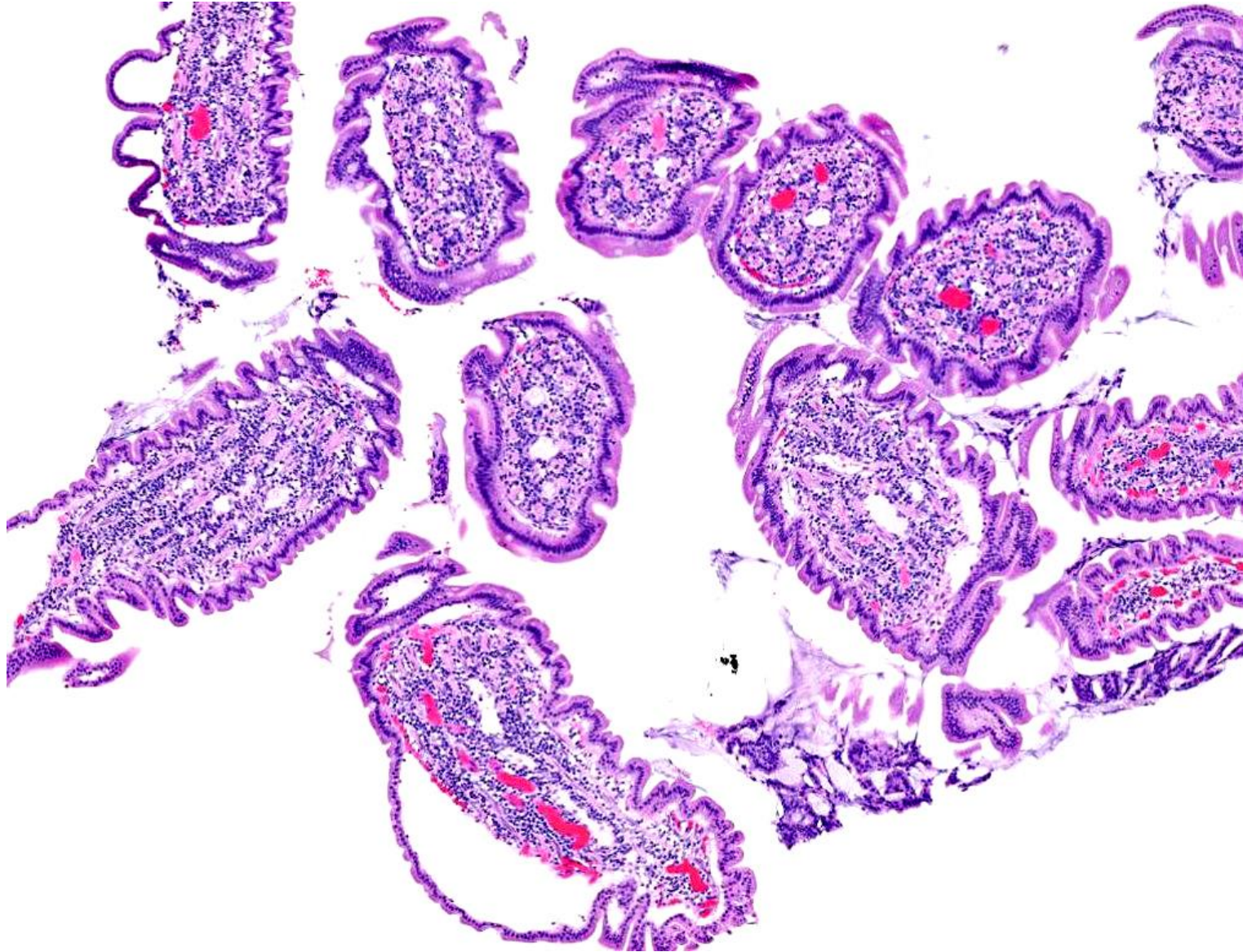


**Duodenum: good one**



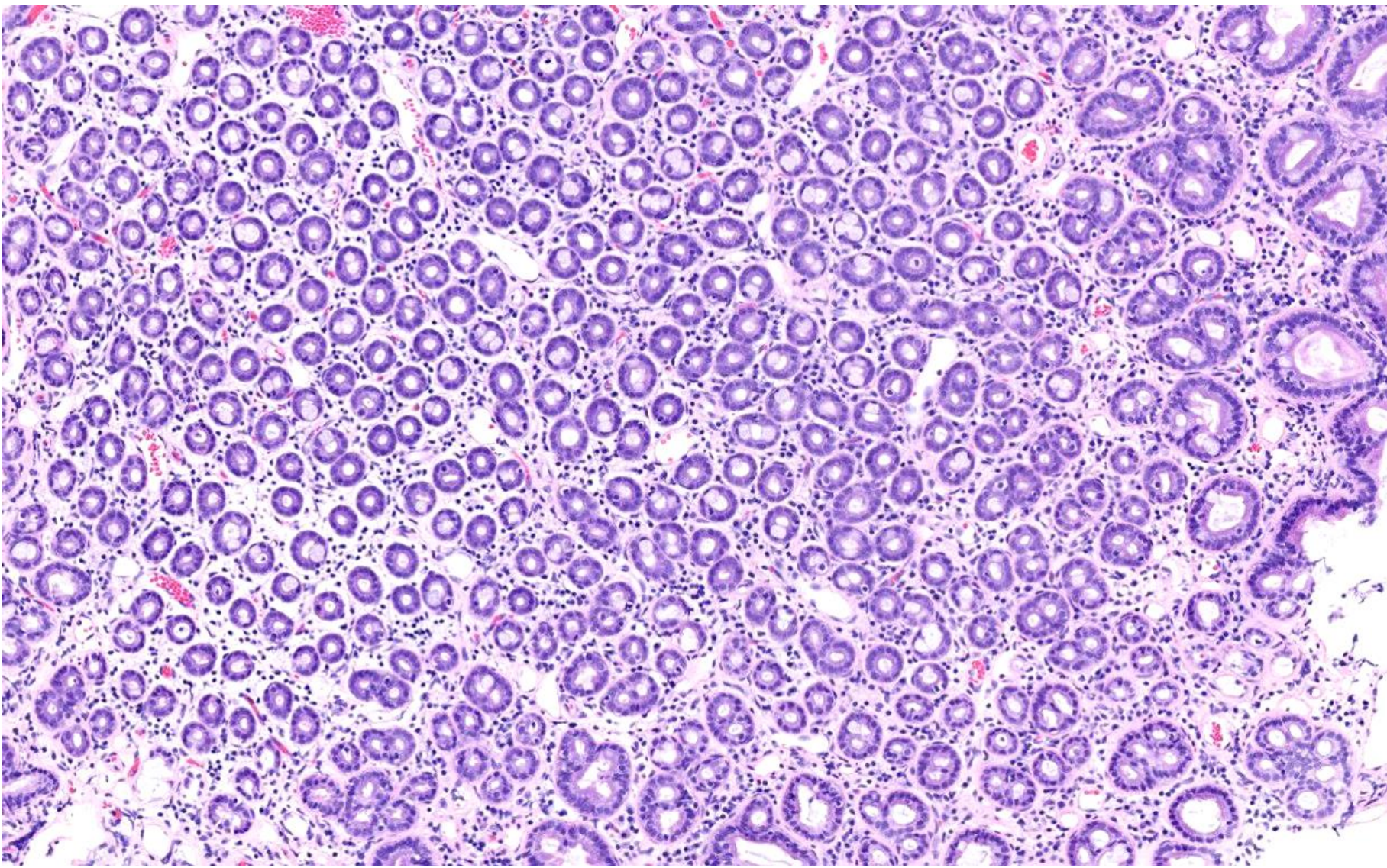


# Duodenum: bad one



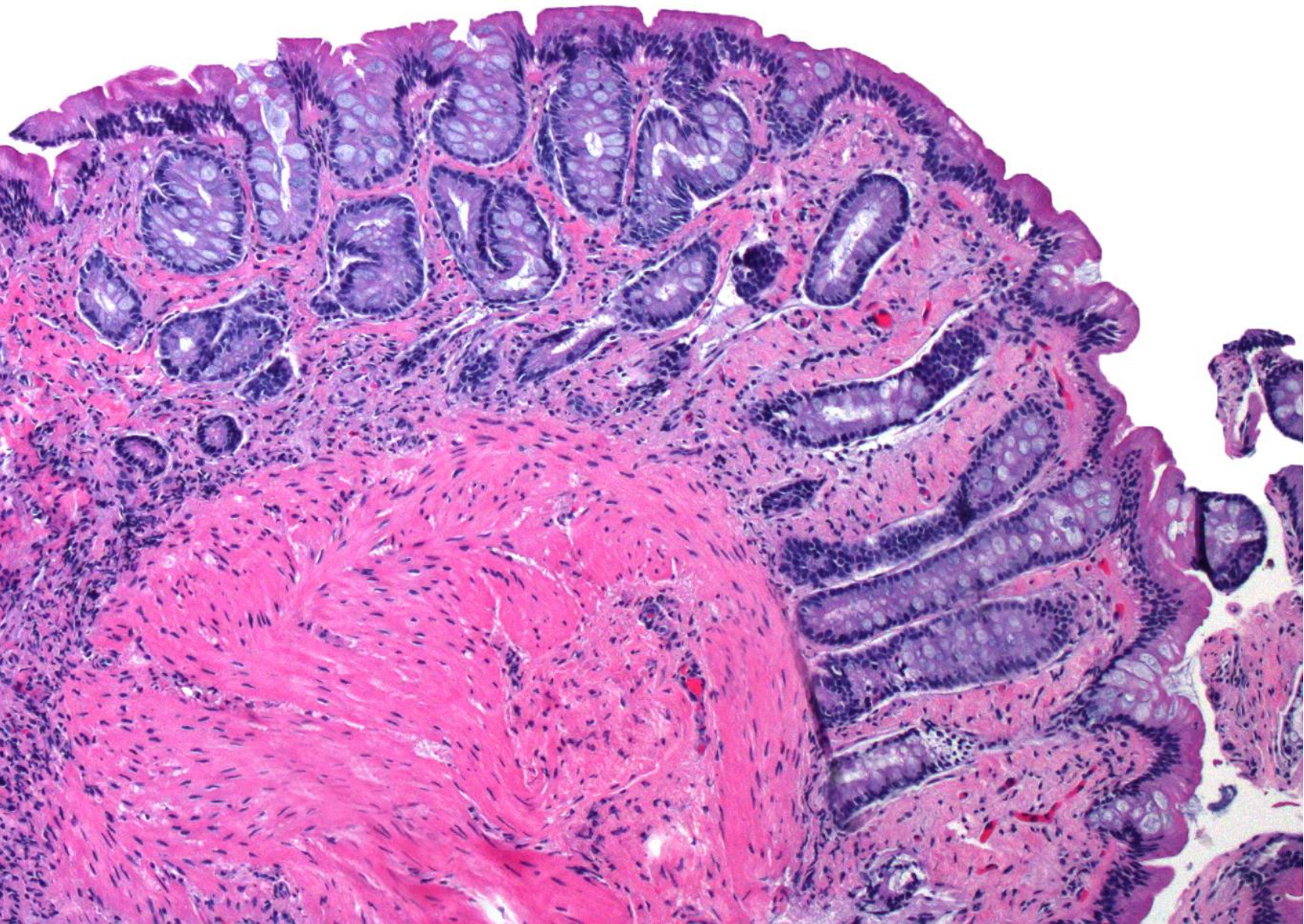


Rectum: ???





Rectum:????





# Surgical

## Pros

- More tissue
- Architecture intact, often good quality
- Usually full thickness

## Cons

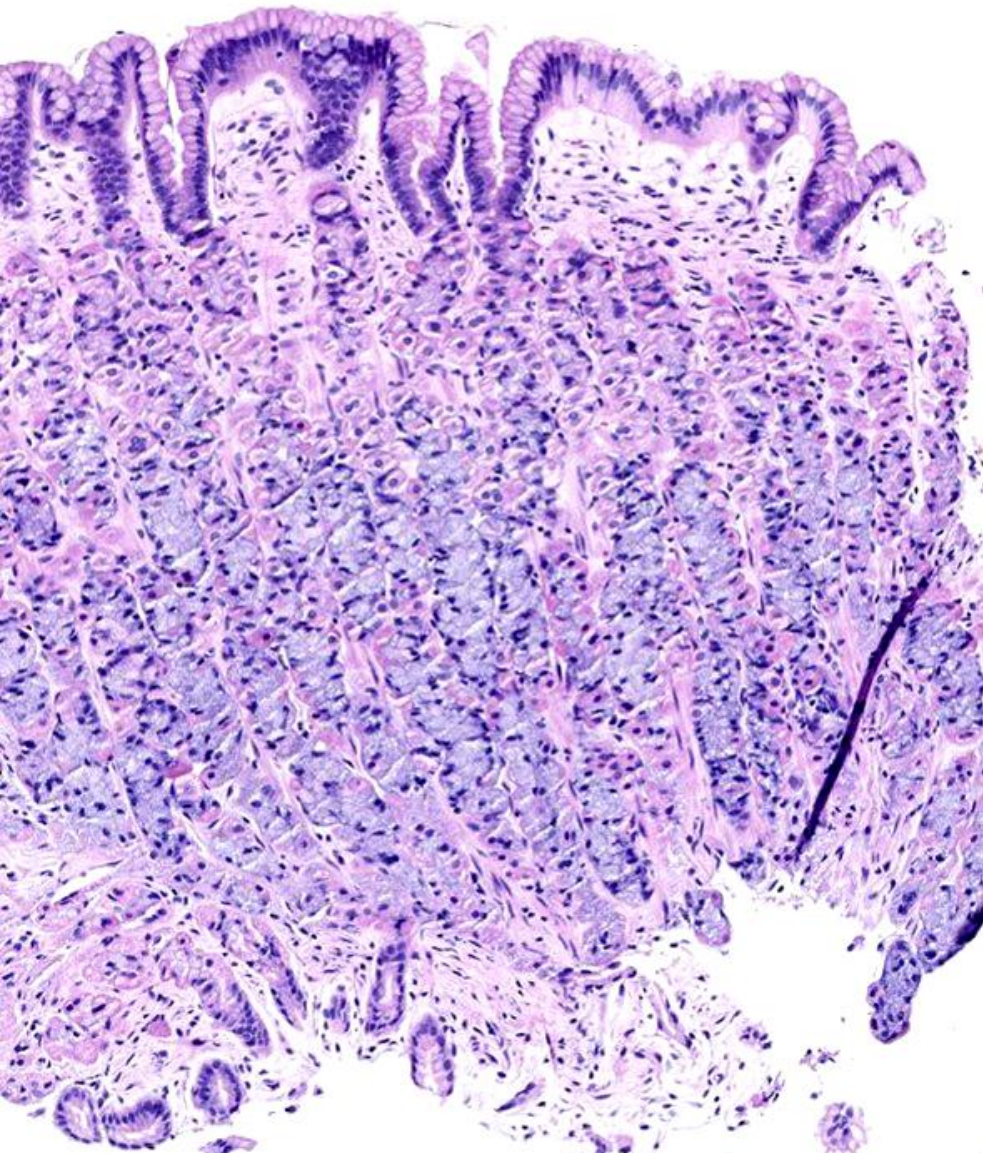
- Invasive
- Fewer biopsies to evaluate
- Colon more difficult



# Normal mucosa

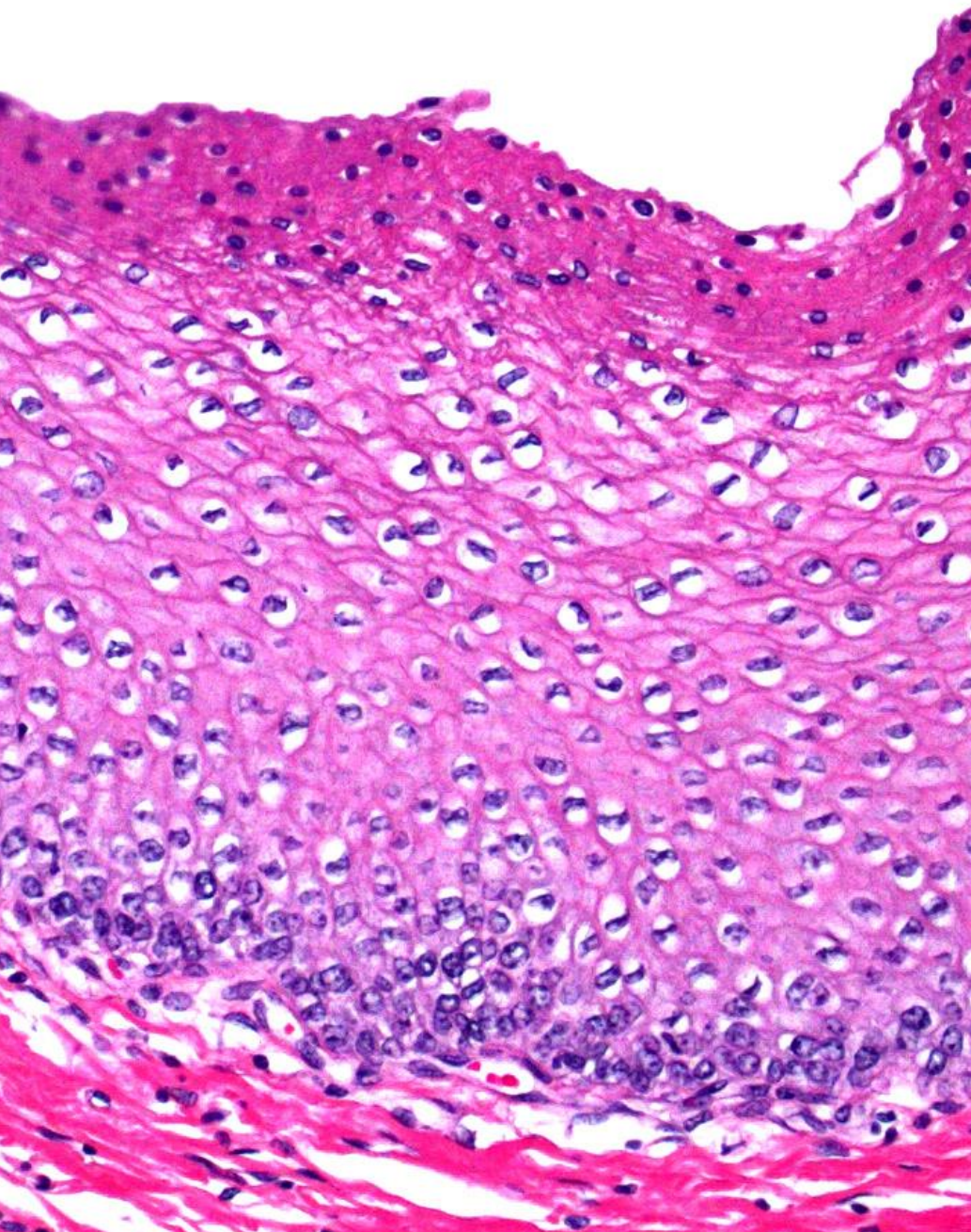
- Stomach
- Small intestine
- Colon





**Normal stomach  
(glandular)**



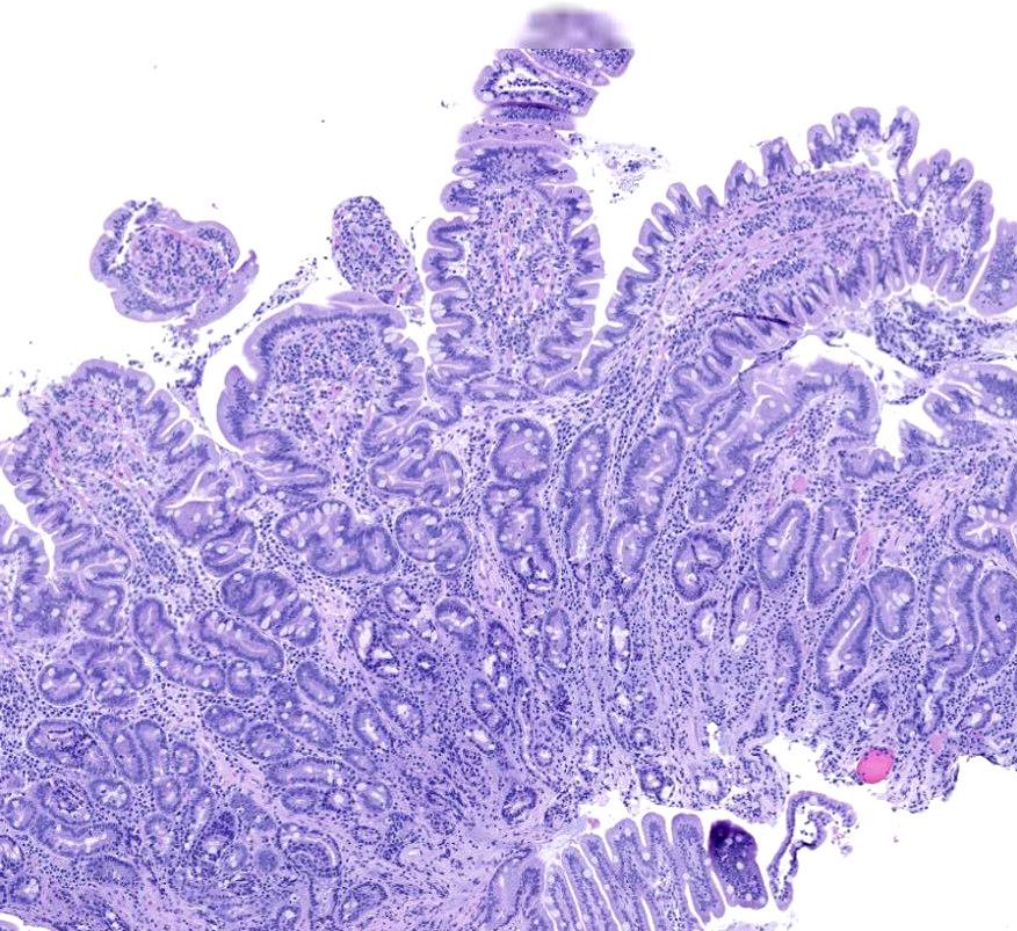


**Normal stomach horse  
(squamous)**

# Normal mucosa

- Stomach
- Small intestine
- Colon





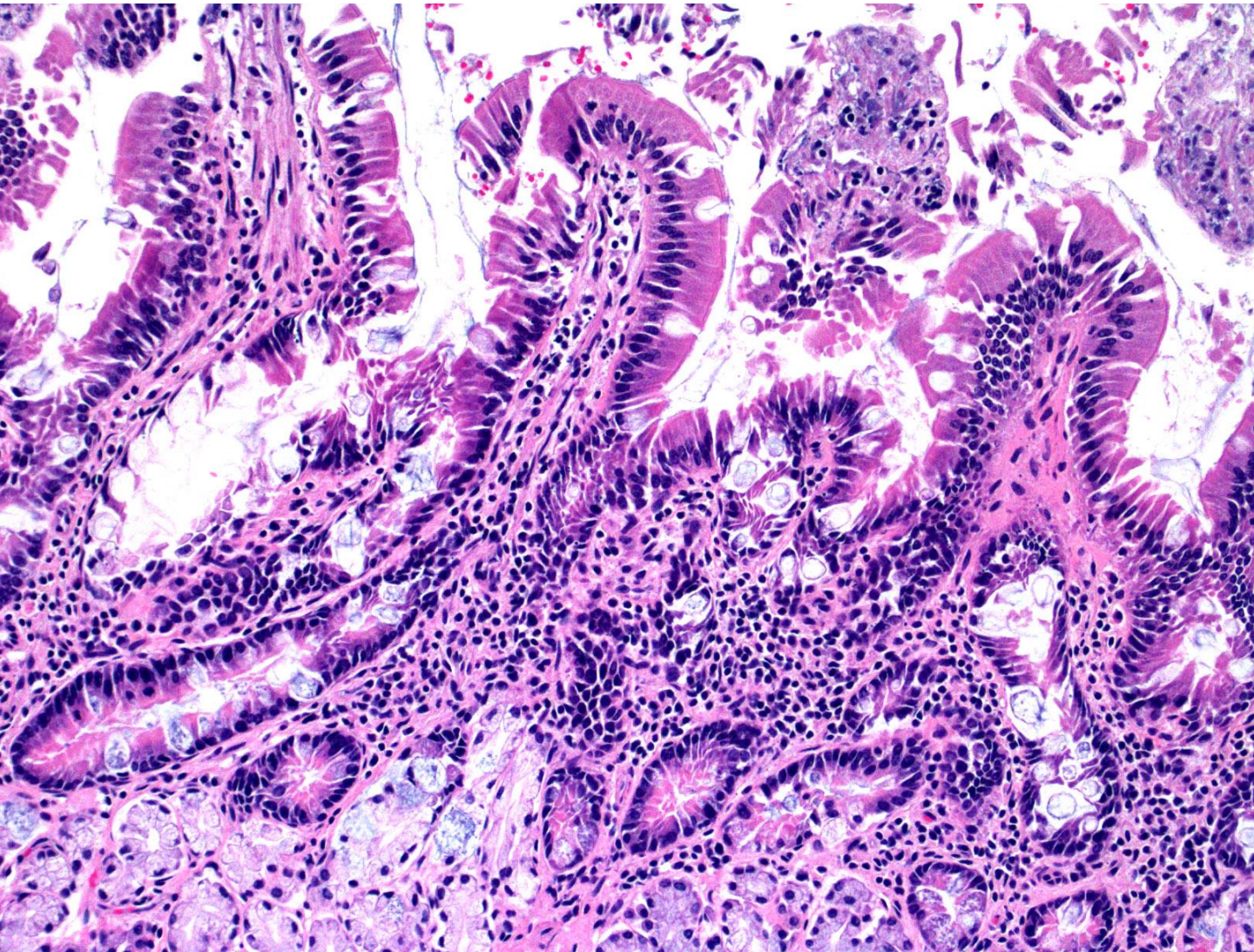
## Normal duodenum dog

- \* Lymphocytes and plasma cells (*1-2 between crypts, <25% 40x field villi*)
- \* Low number IEL (*5-10/40x field*)
- \* Low numbers of eosinophils (*2-3/40x field*)
- \* 1-2 fibrocytes between crypts



# Normal duodenum horse

What is normal?





# Normal mucosa

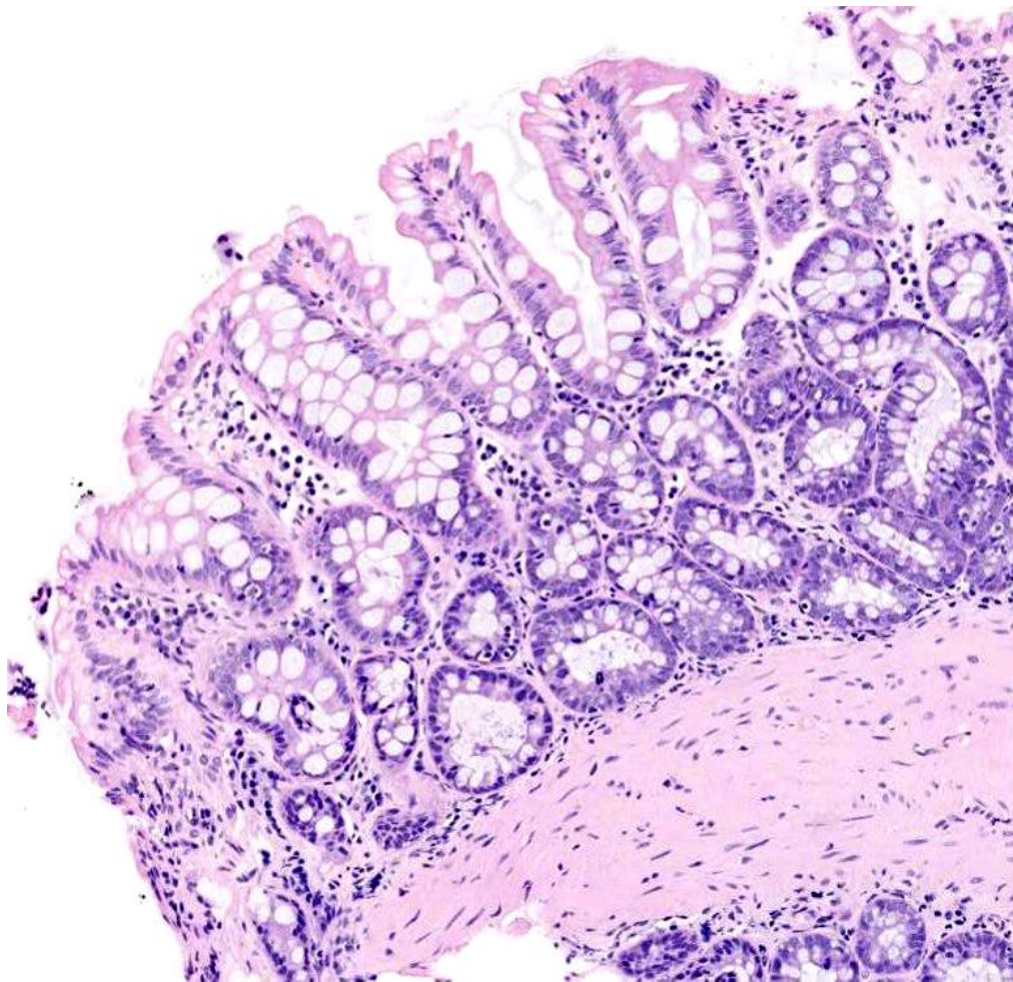
- Stomach
- Small intestine
- Colon

# Normal colon dog

\* Low numbers of lymphocytes/plasma cells (*<5 between glands*)

\* Low numbers of IEL

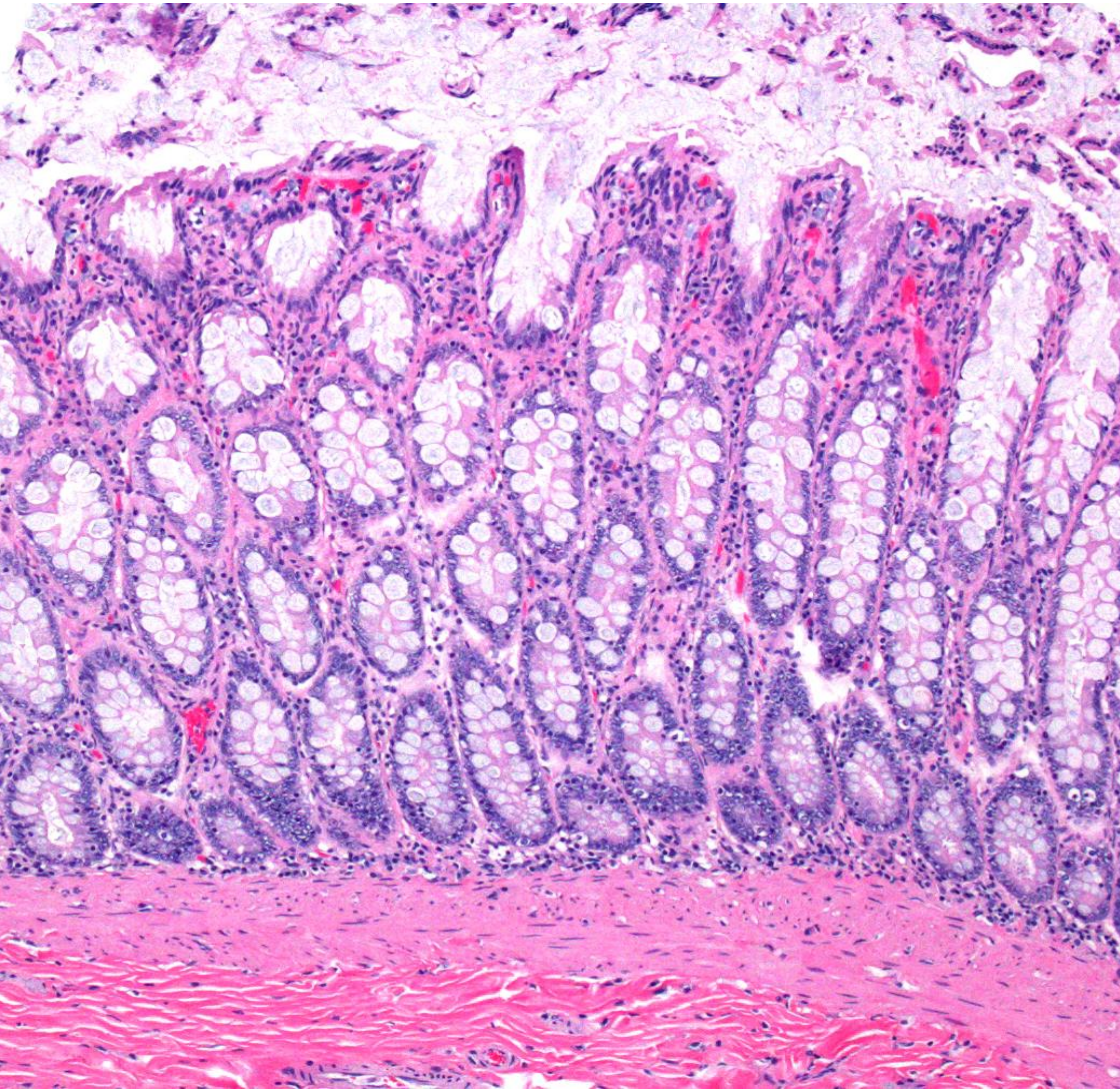
\* Low number of eosinophils (*1-2/40x field*)





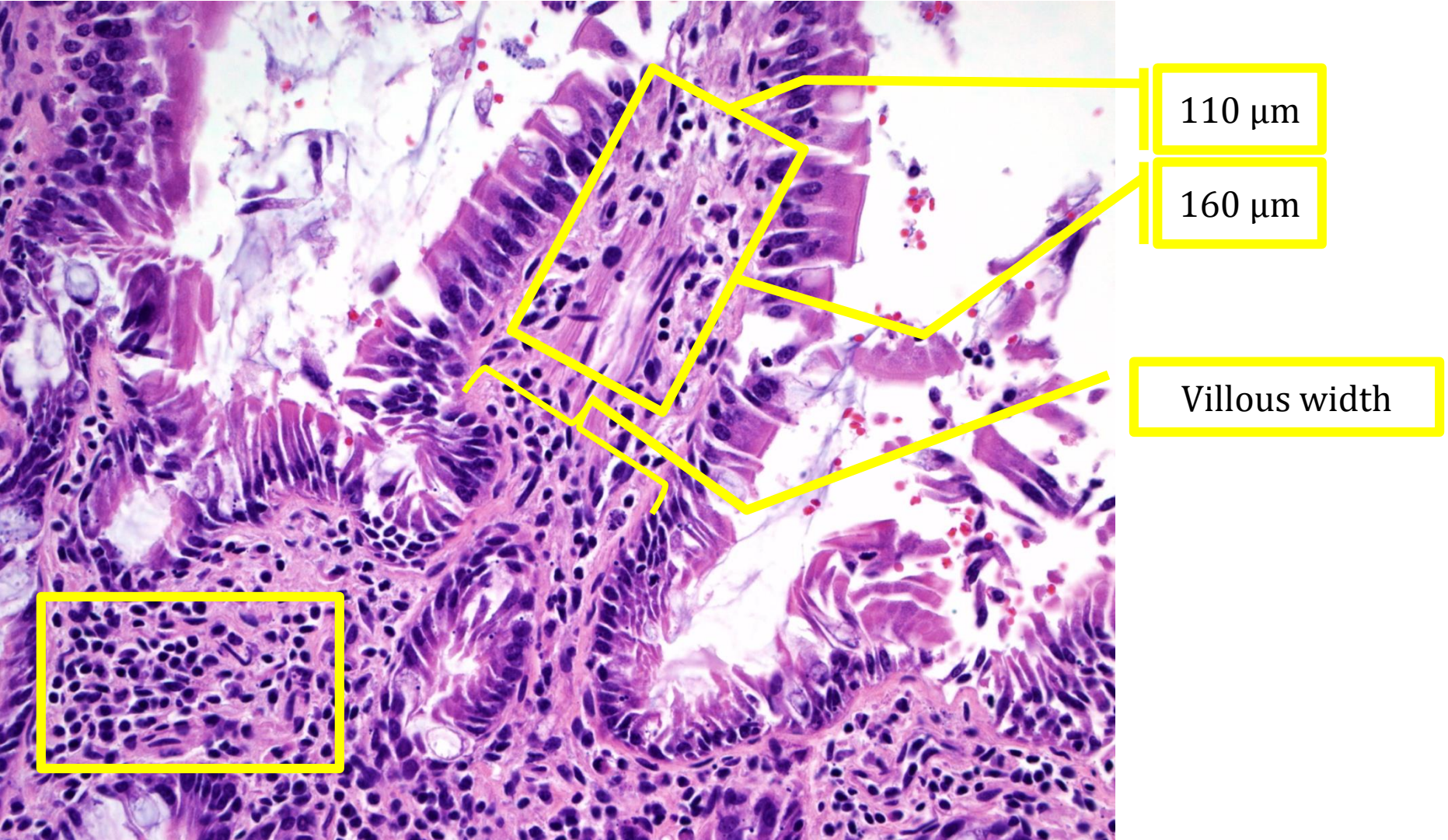
# Normal colon horse

What is normal?



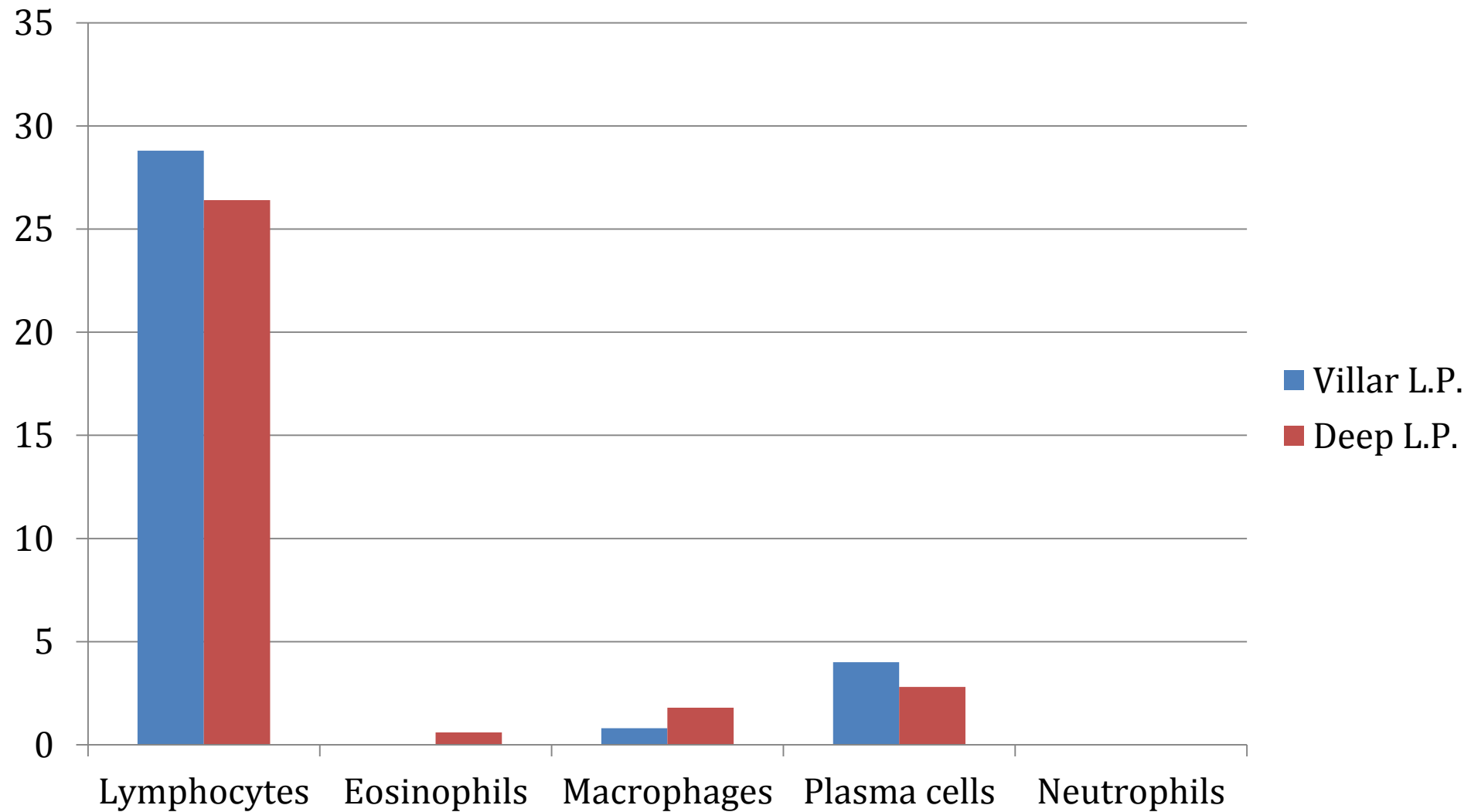


# Counting cells.....

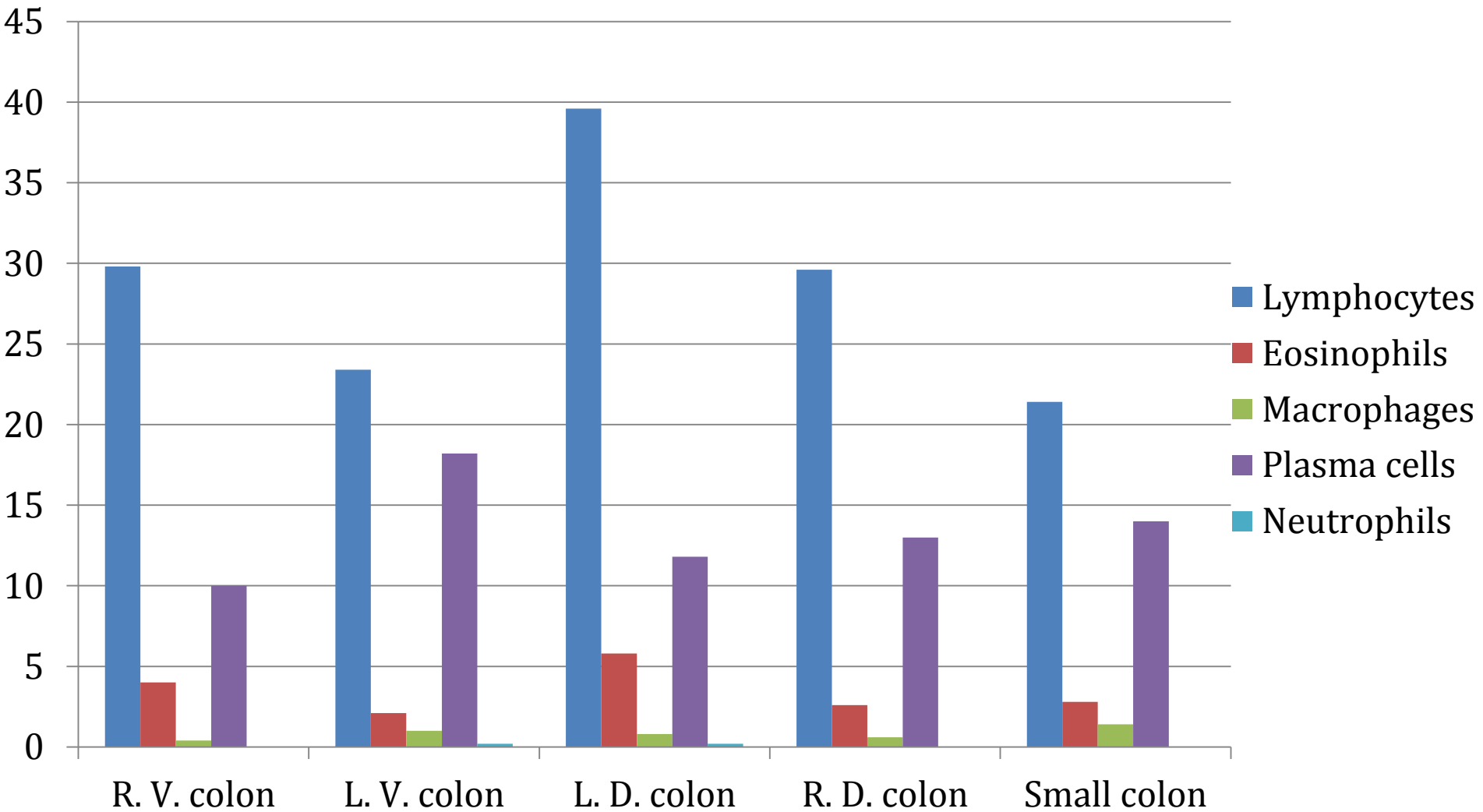




# DUODENUM



# COLON







# **Histopathology Parameters**

Architectural changes

Cellular changes

# Interpretation: histopathology criteria/score: WSAVA

## Architecture

- Epithelium
- Villus stunting
- Crypt distortion
- Lacteals
- Fibrosis
- Goblet cells - colon

## Cellular infiltrates

- Intraepithelial lymphocytes
- LP lymphocytes plasma cells
- LP eosinophils
- LP neutrophils
- LP macrophages
- Follicular hyperplasia



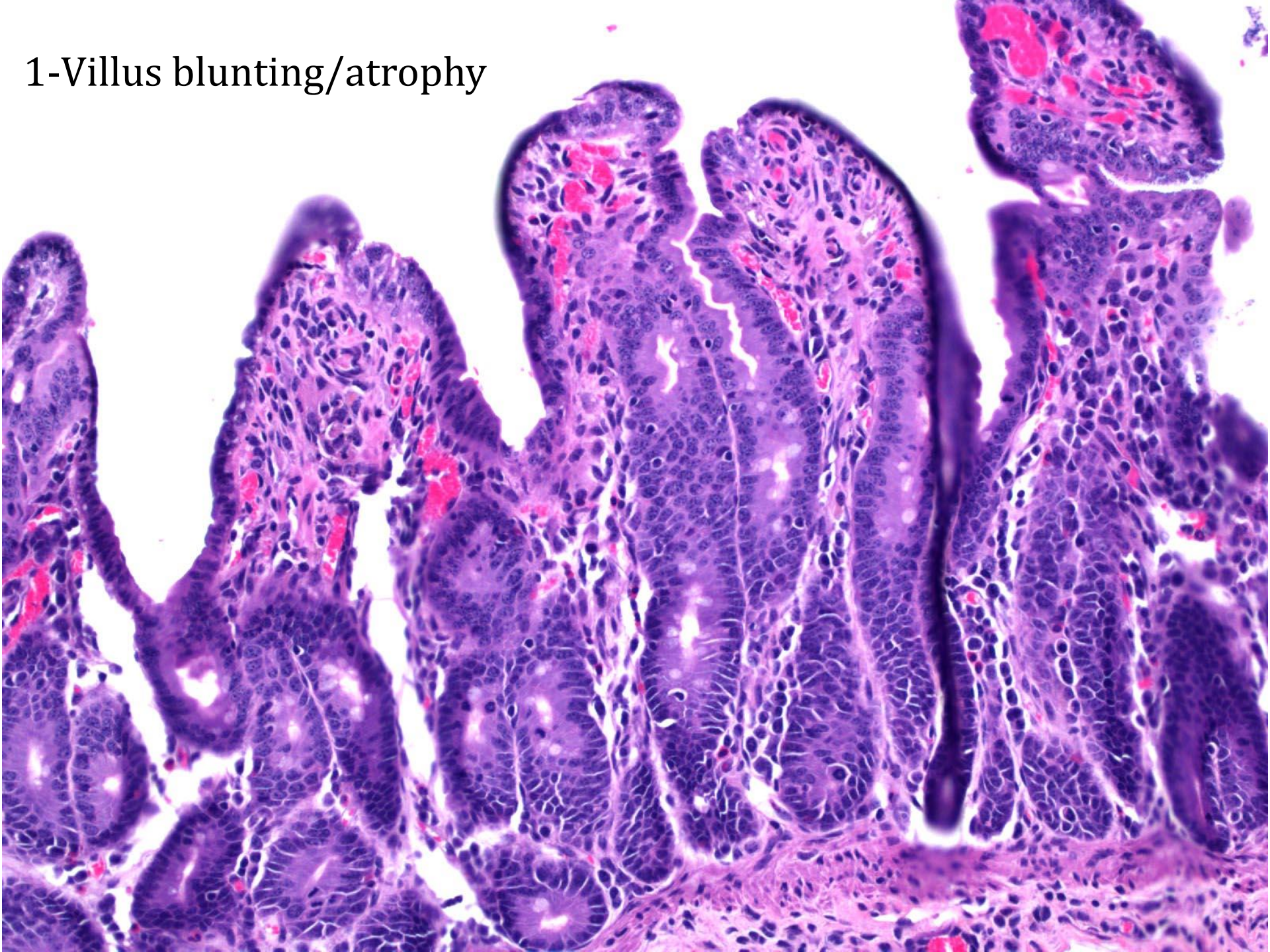


# COMMON RESPONSES OF THE INTESTINE TO DISEASE

- 1-Villus blunting/atrophy
- 2-Vilus fusion
- 3-Epithelial attenuation/necrosis
- 4-Lamina propria necrosis
- 5-Thrombosis
- 6-Pseudomembranes
- 7-Volcano lesions
- 8-Submucosal edema
- 9-Dilated lymphatics
- 10-Hemorrhage
- 11-Crypt dilation/necrosis/cryptitis
- 12-Mucosal hyperplasia
- 13-Bacteria/parasites/fungi
- 14-Neoplasia

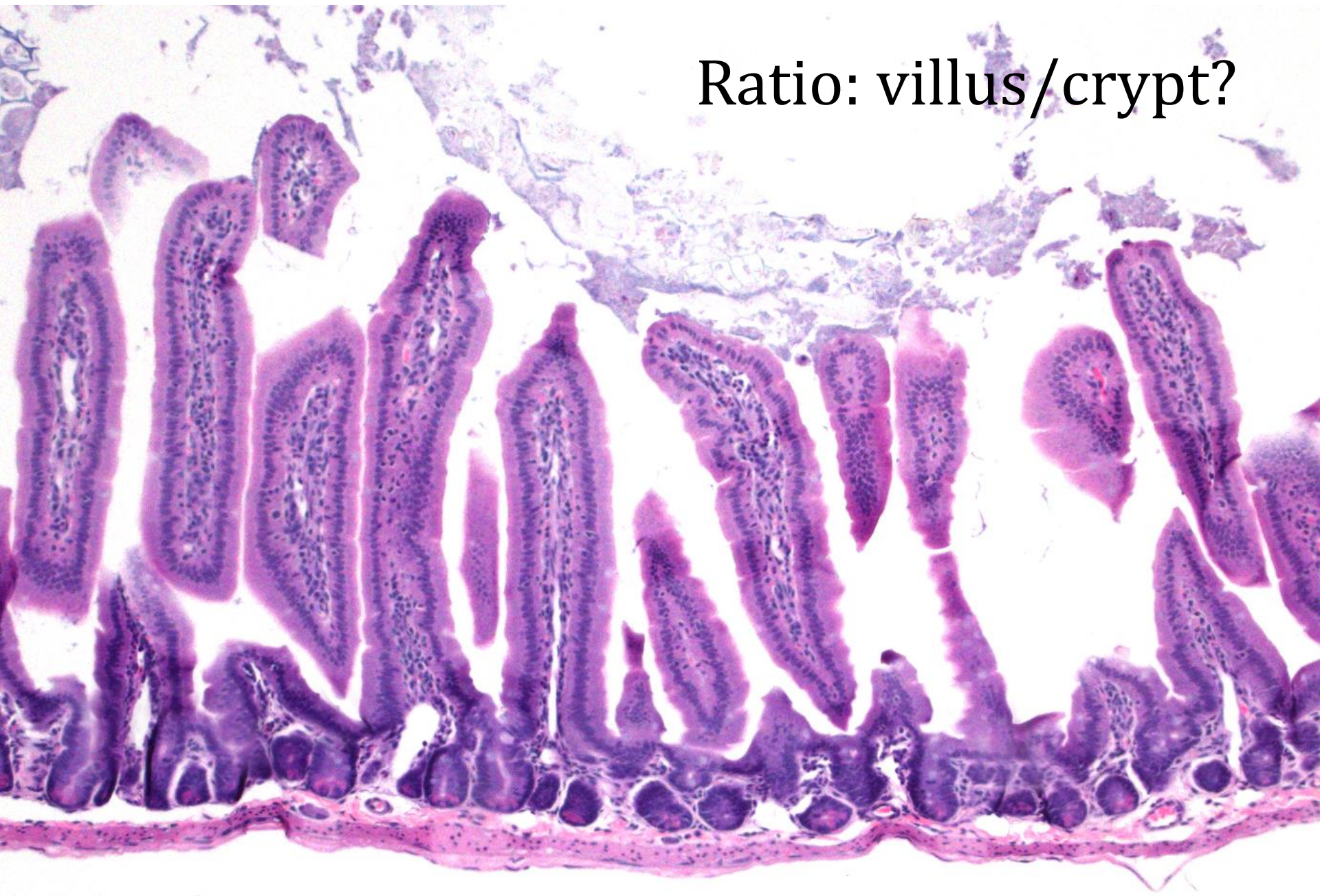


1-Villus blunting/atrophy

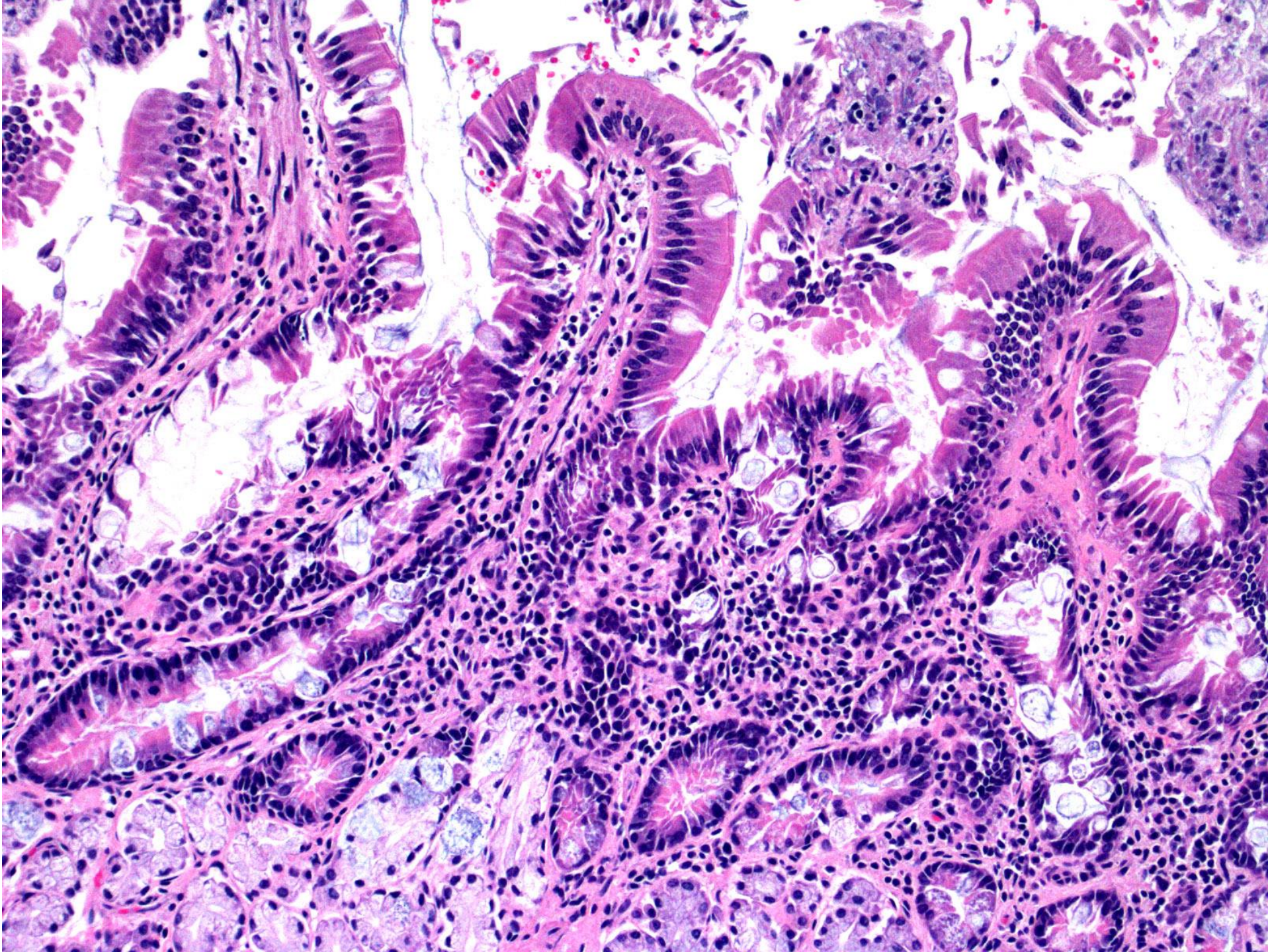




Ratio: villus/crypt?

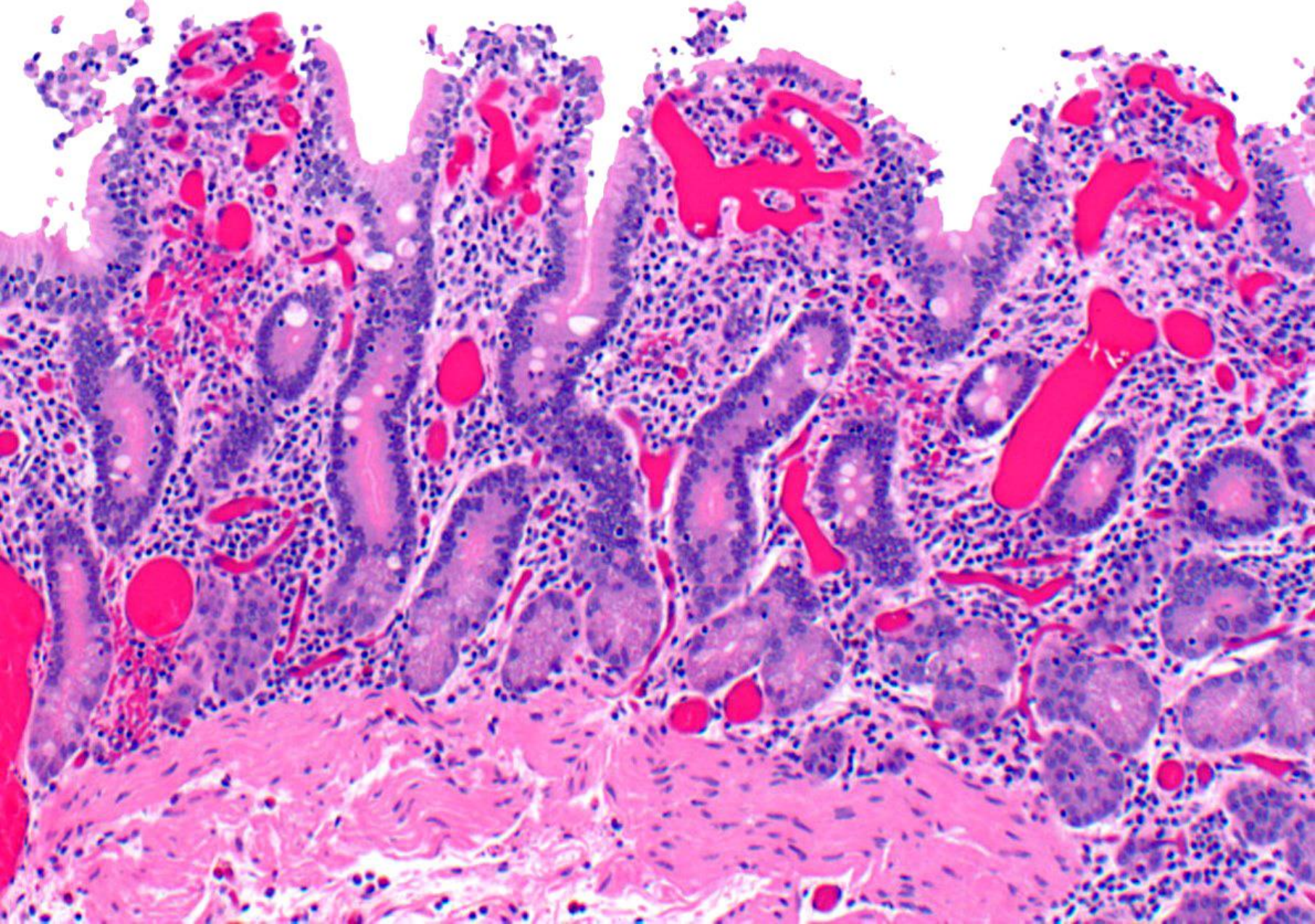








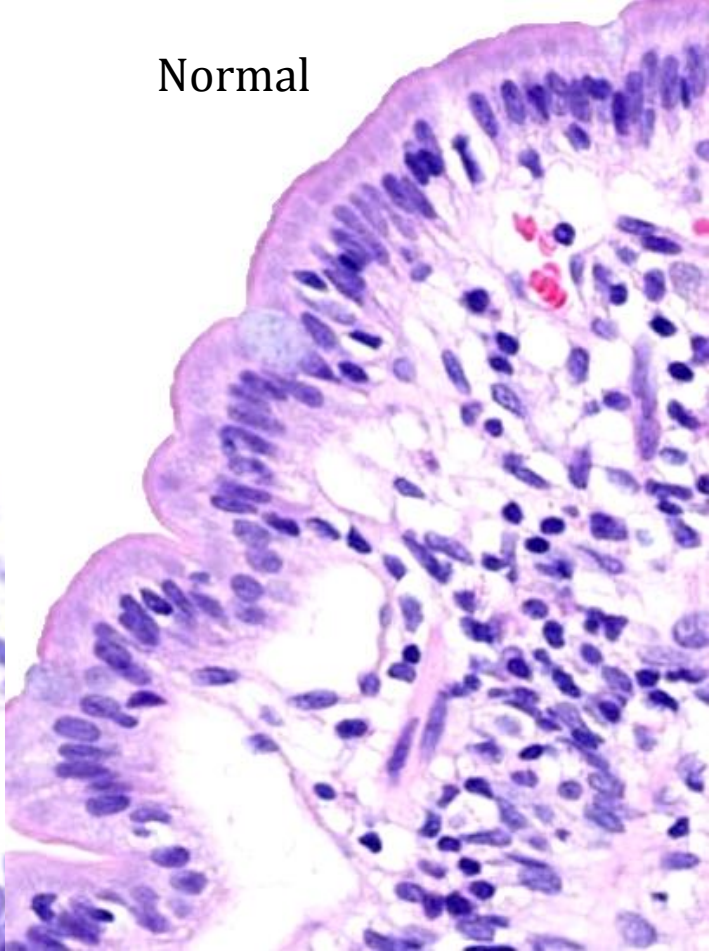
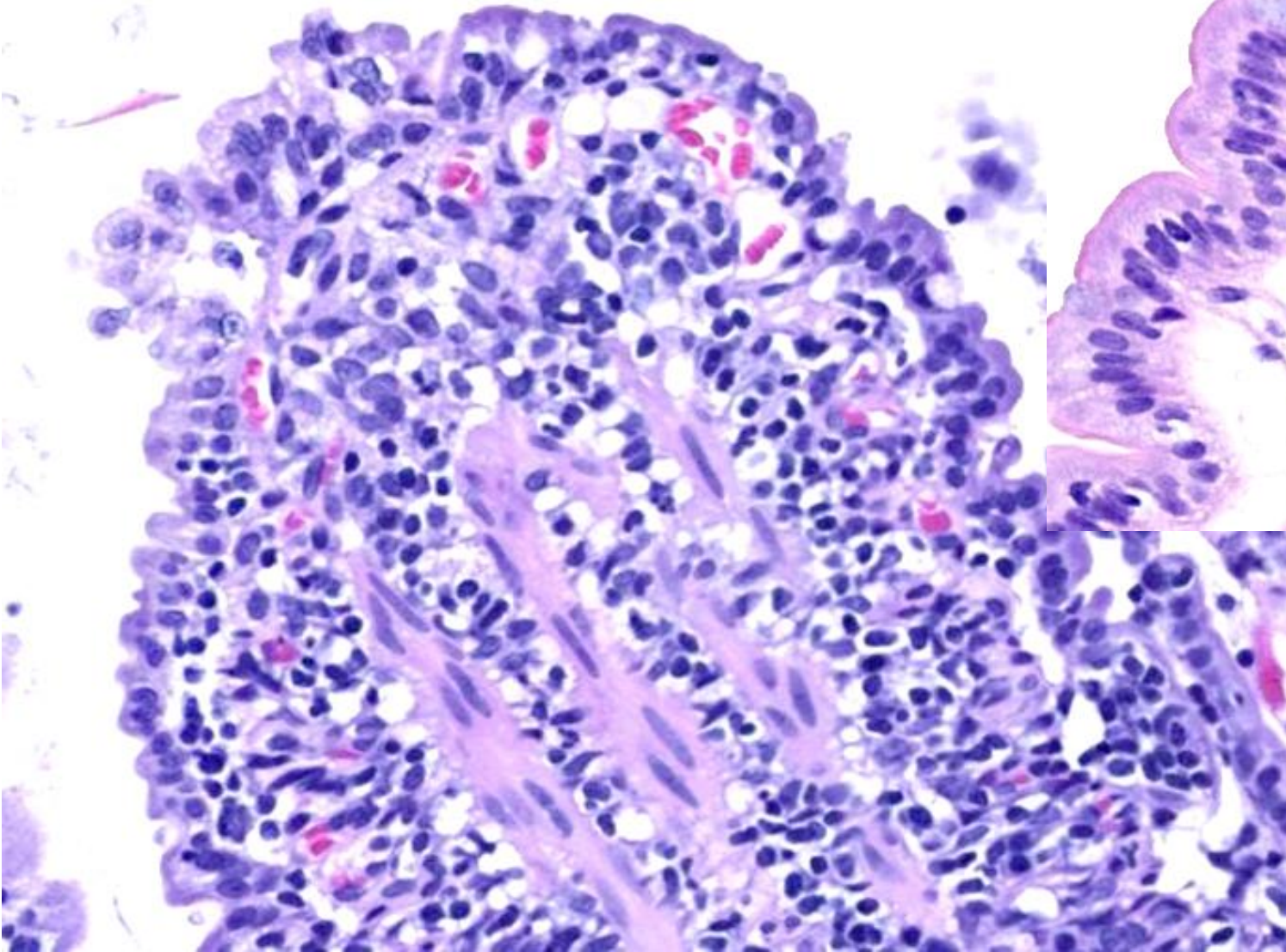
2-Vilus fusion





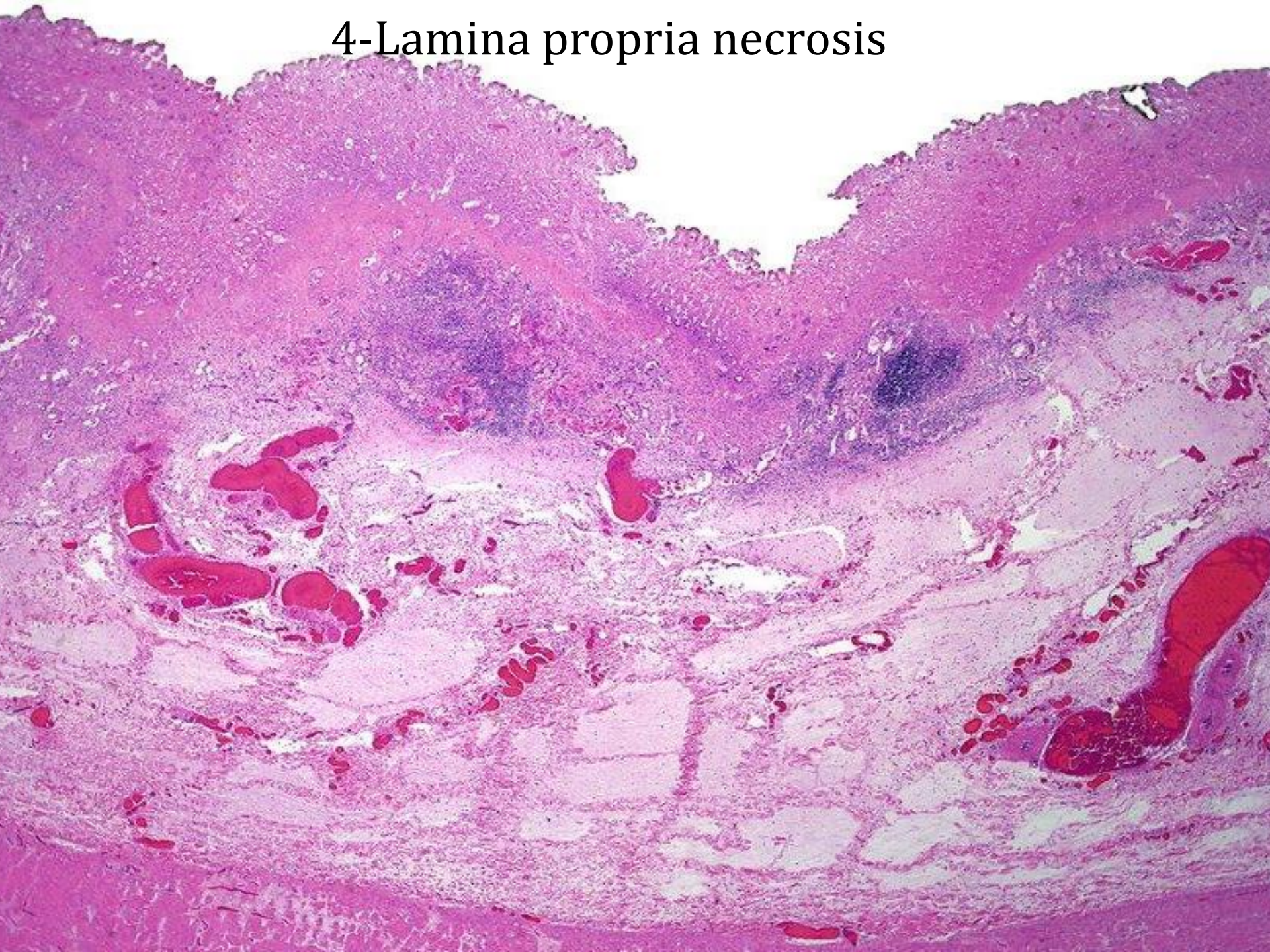
### 3-Epithelial attenuation/necrosis

Normal



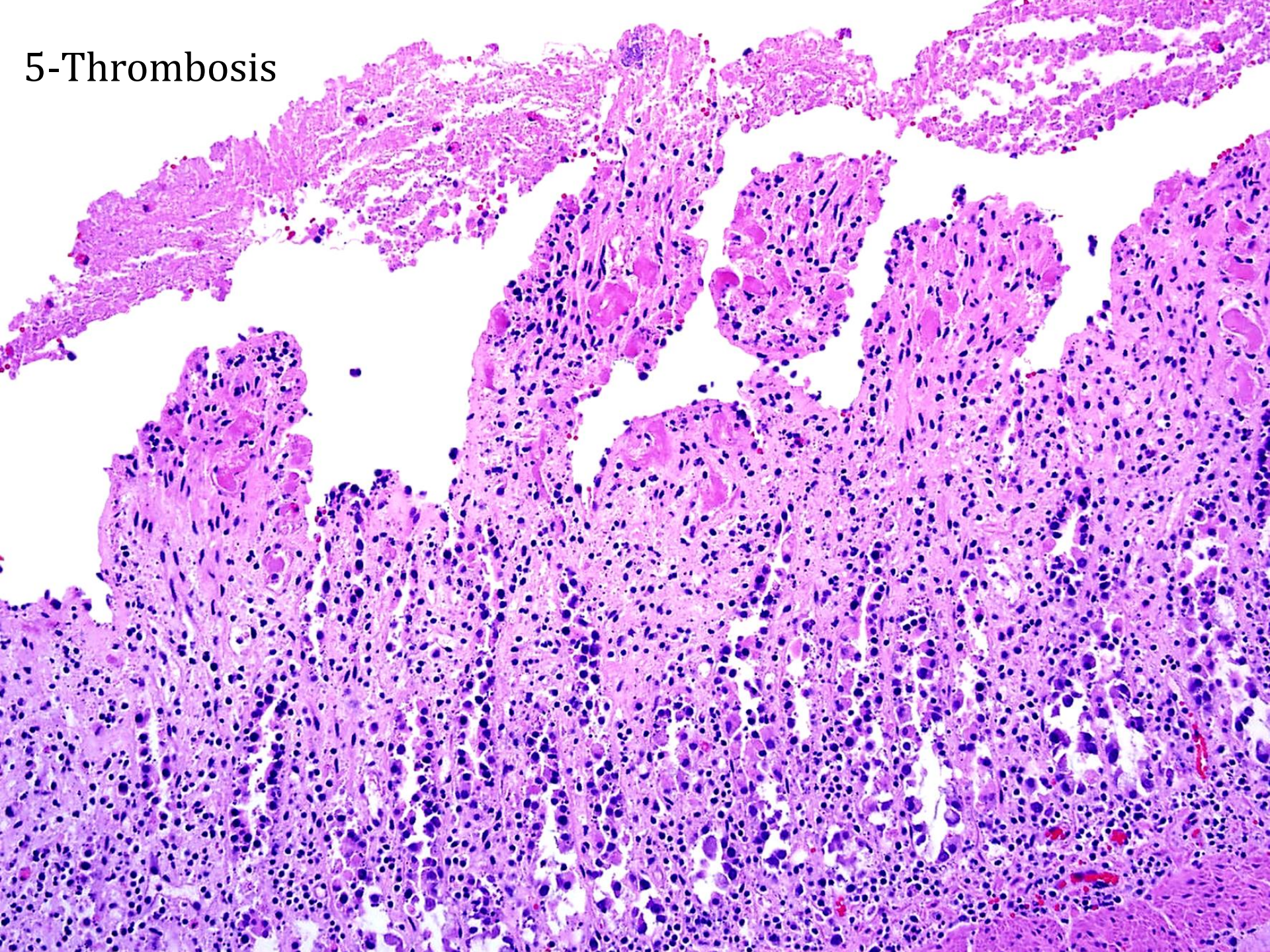


# 4-Lamina propria necrosis





5-Thrombosis



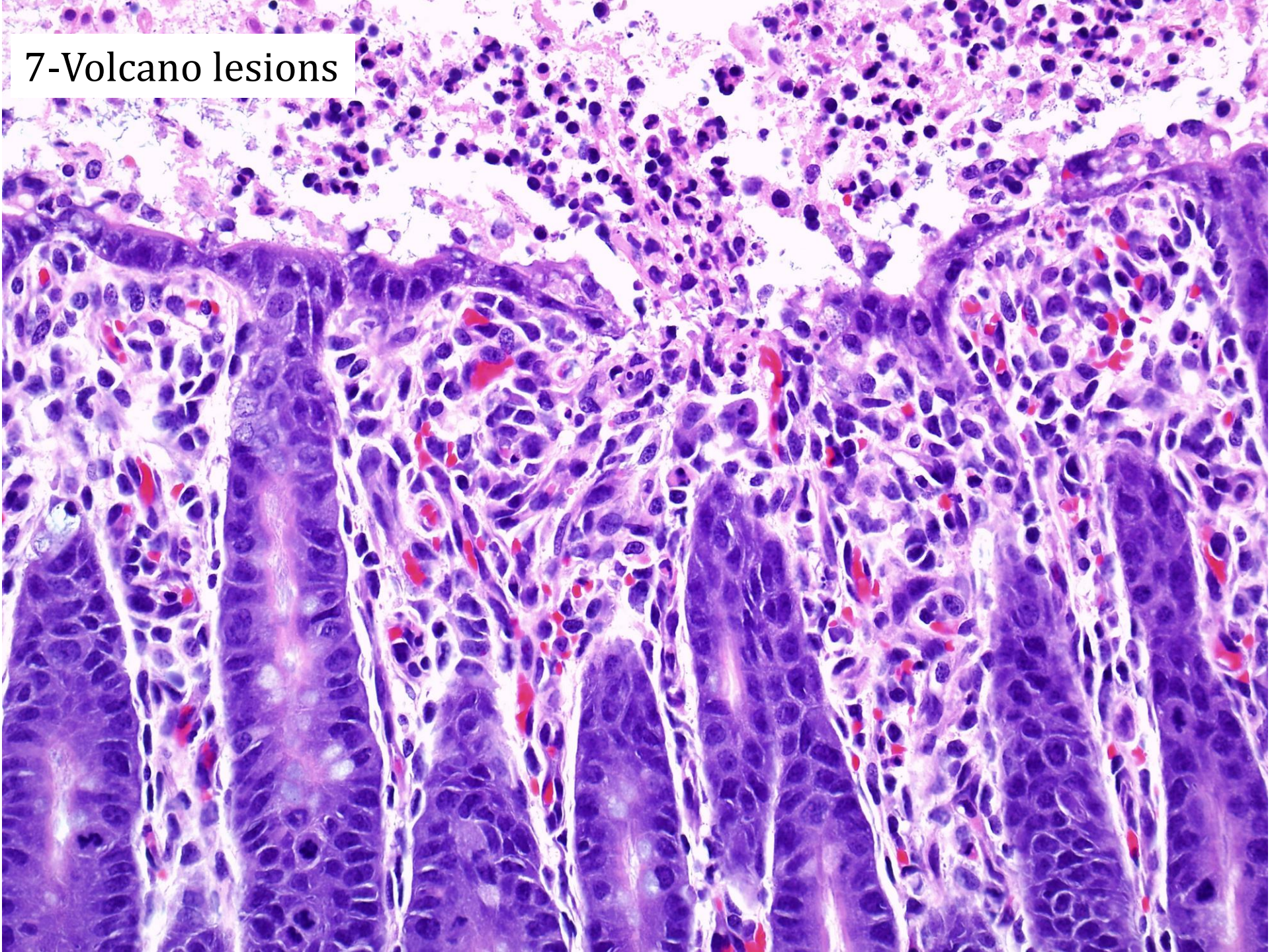


# 6-Pseudomembranes



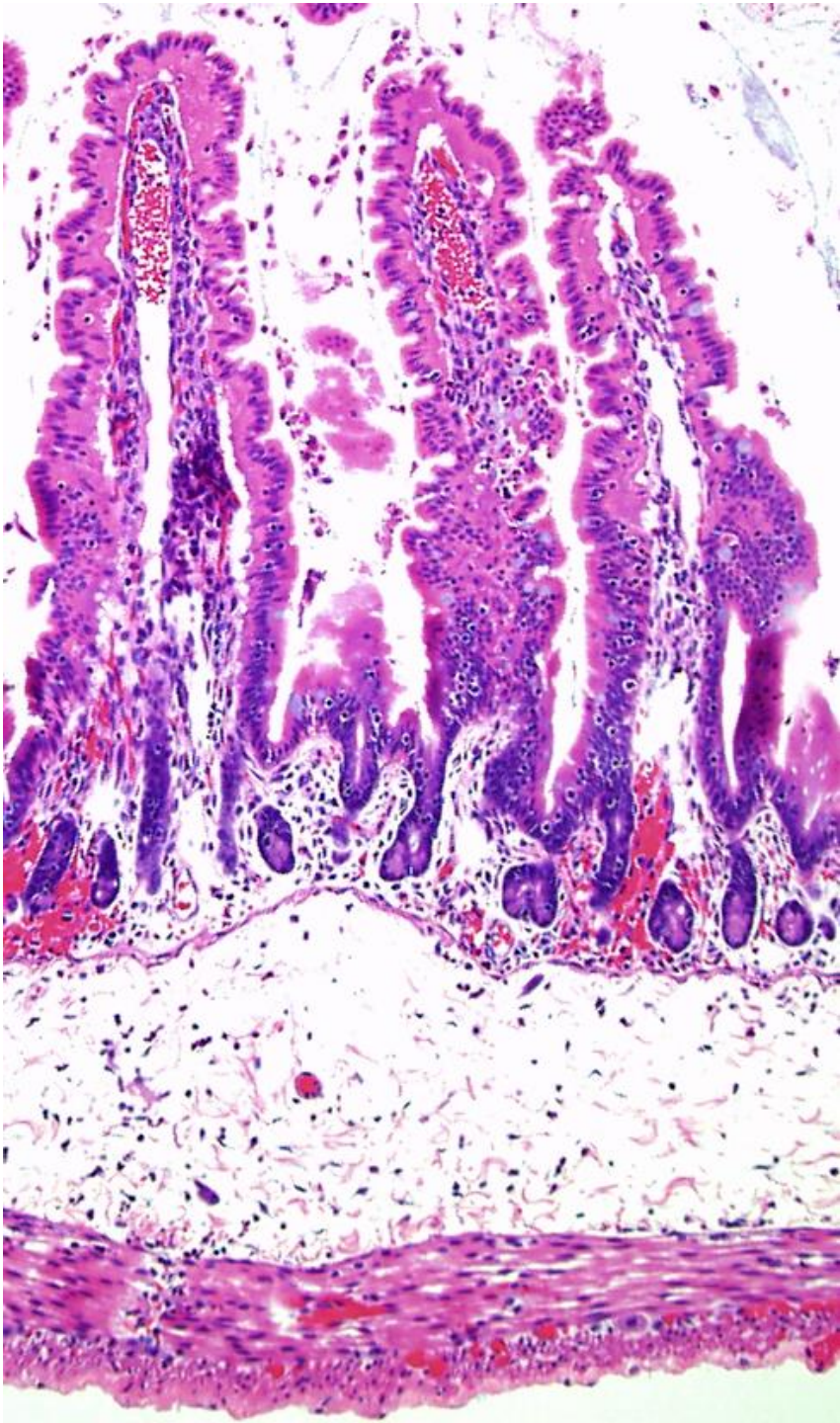


7-Volcano lesions



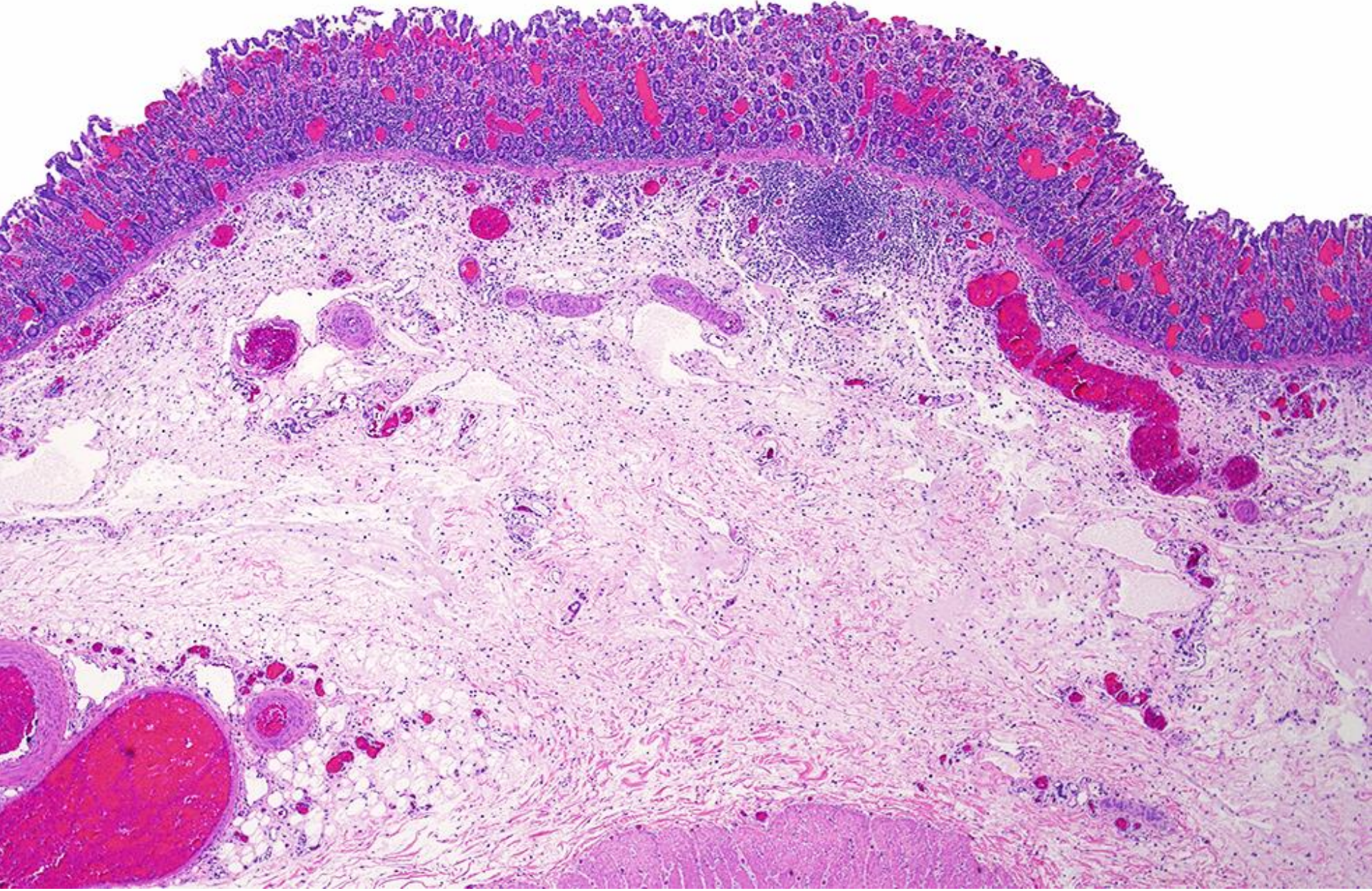


8-Submucosal edema



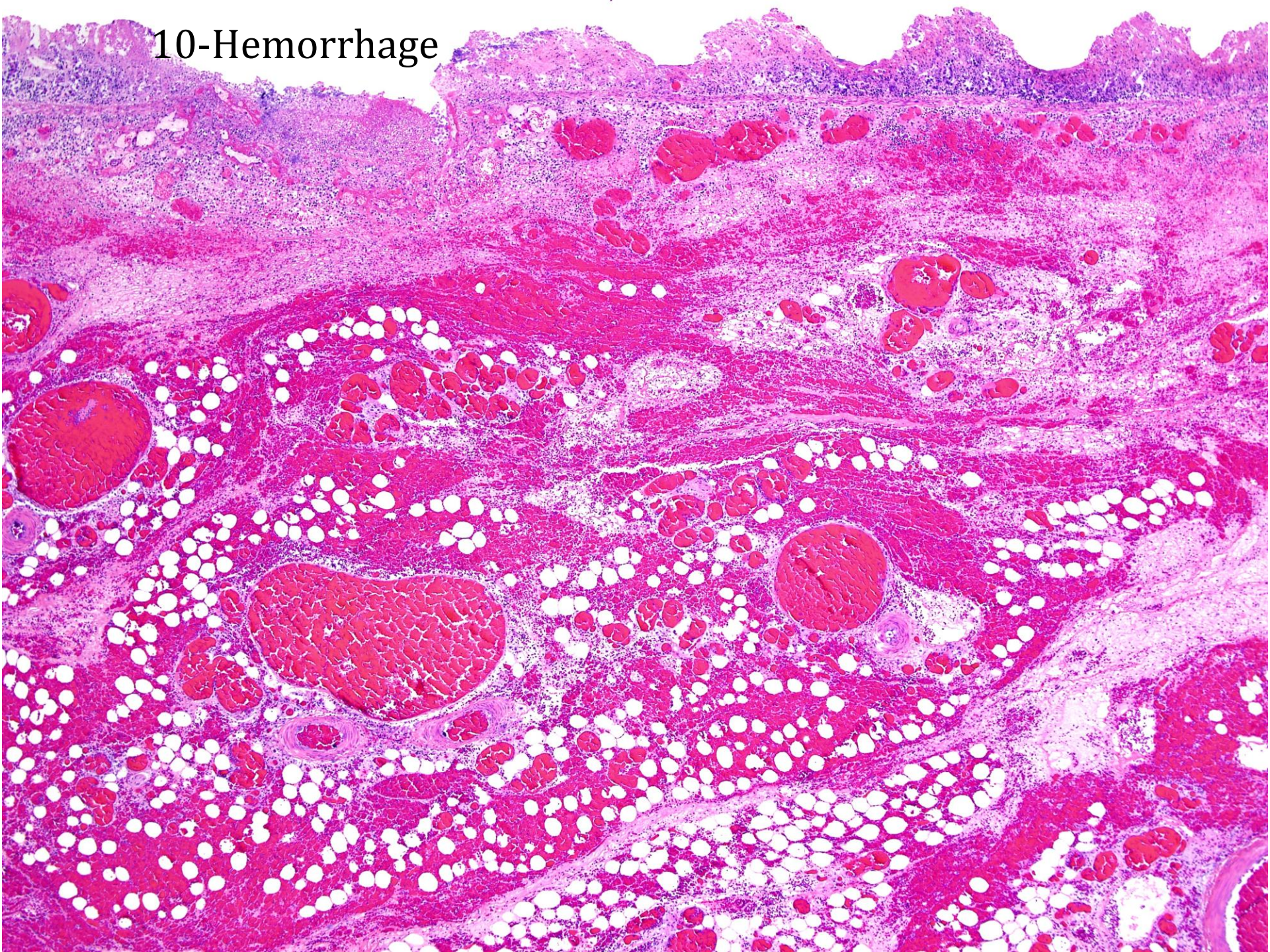


9-Dilated lymphatics



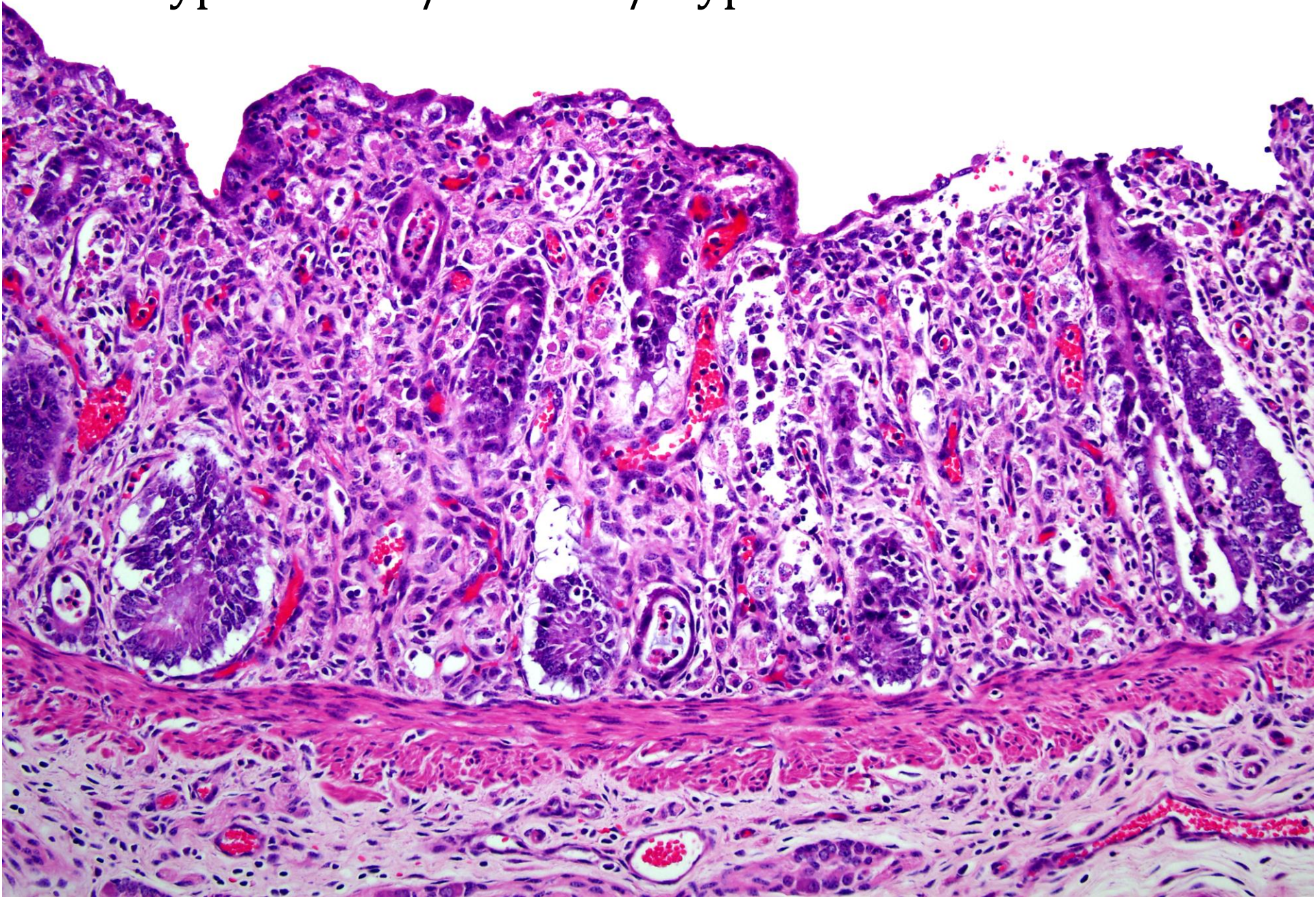


# 10-Hemorrhage



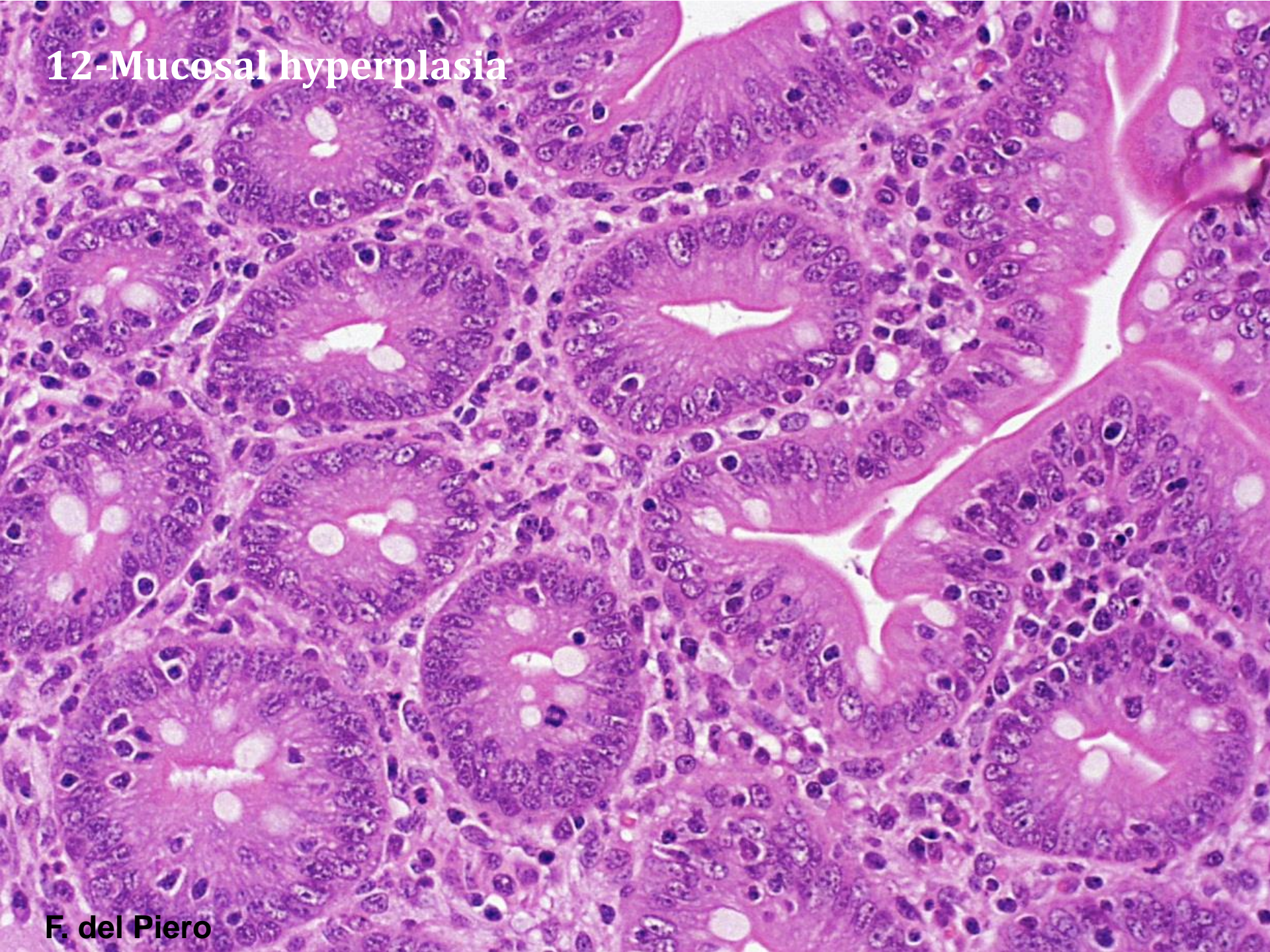


# 11-Crypt dilation/necrosis/cryptitis



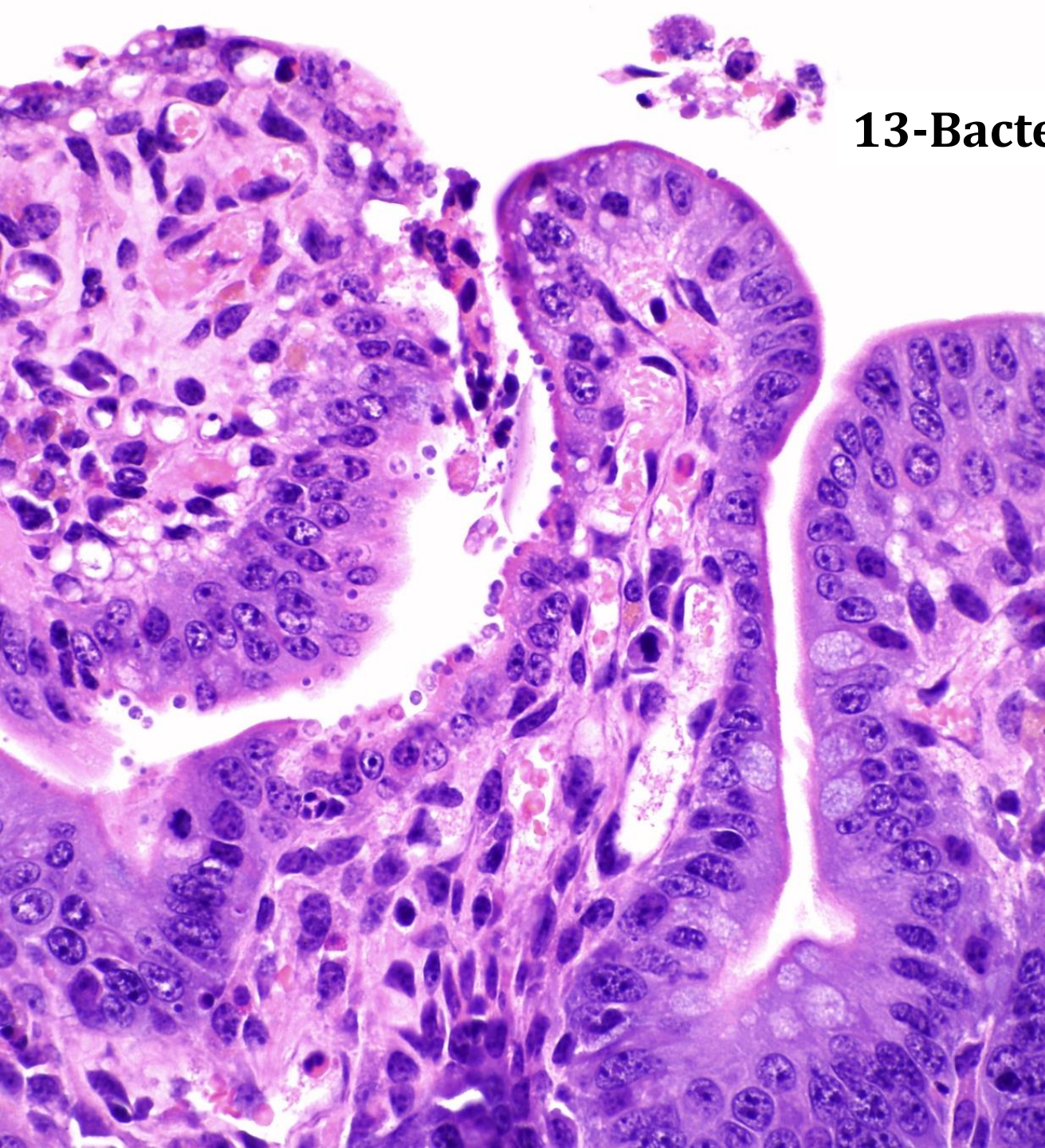


## 12-Mucosal hyperplasia



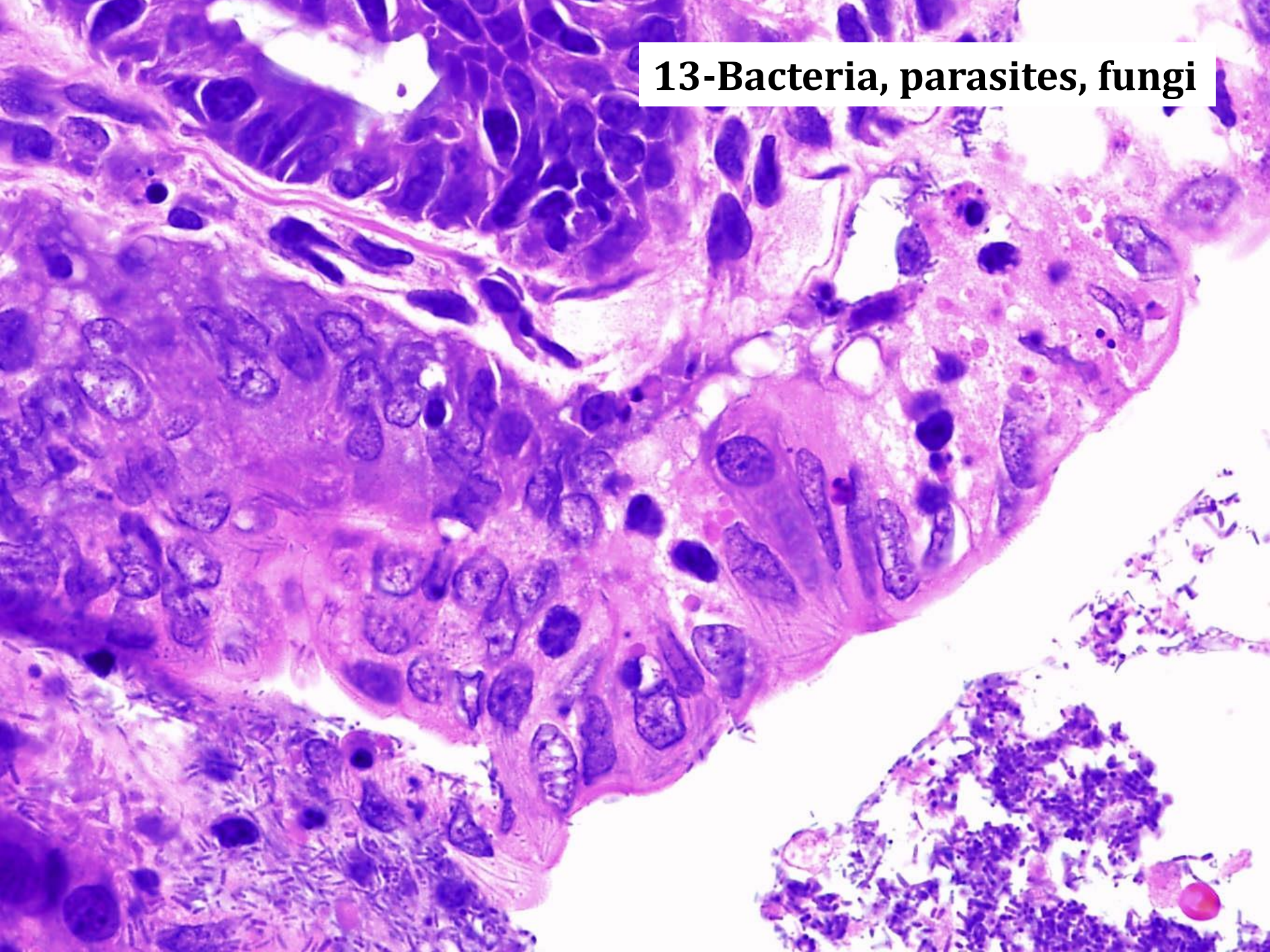


# 13-Bacteria, parasites, fungi



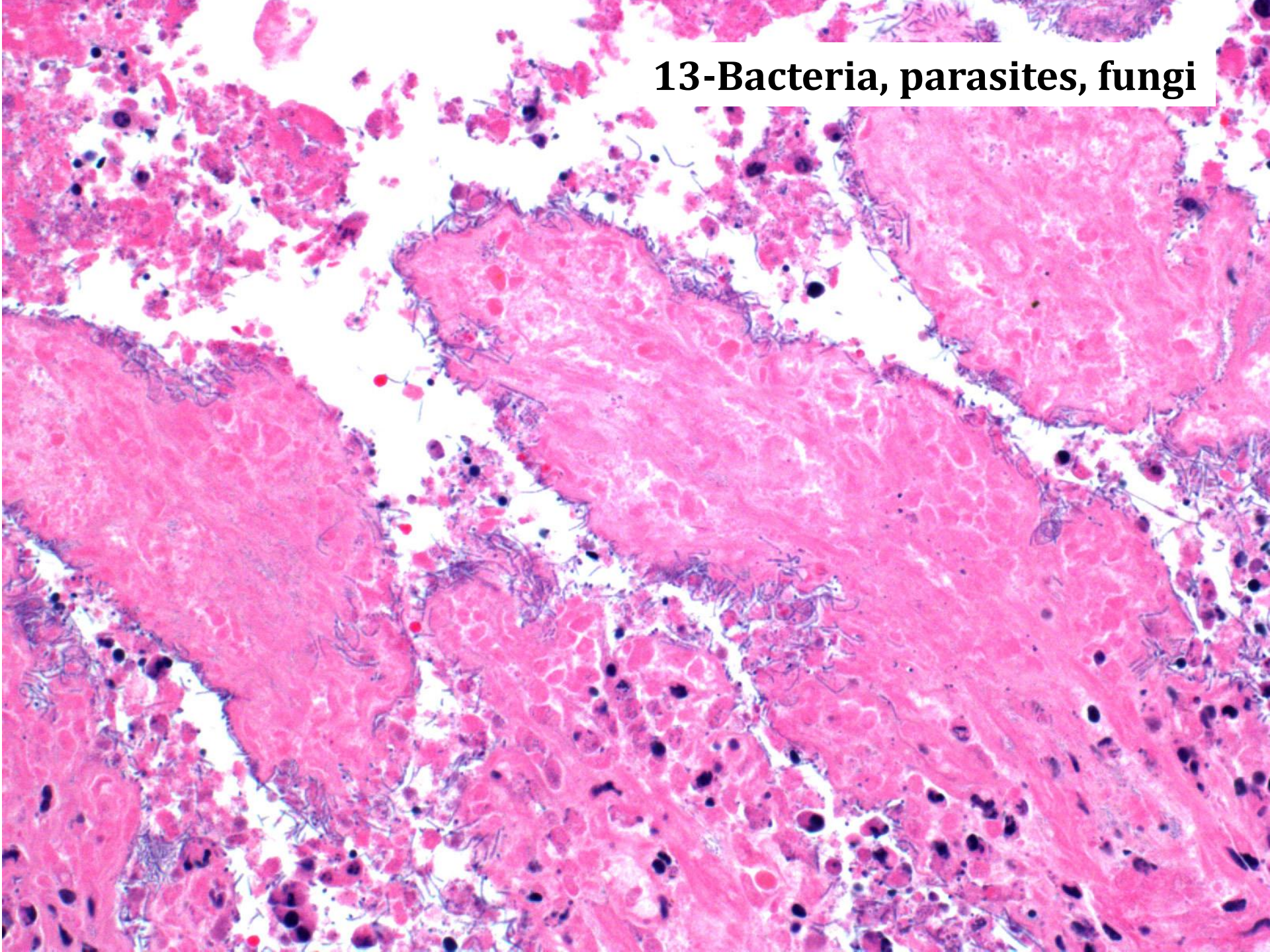


# 13-Bacteria, parasites, fungi





# 13-Bacteria, parasites, fungi





# 14-Neoplasia

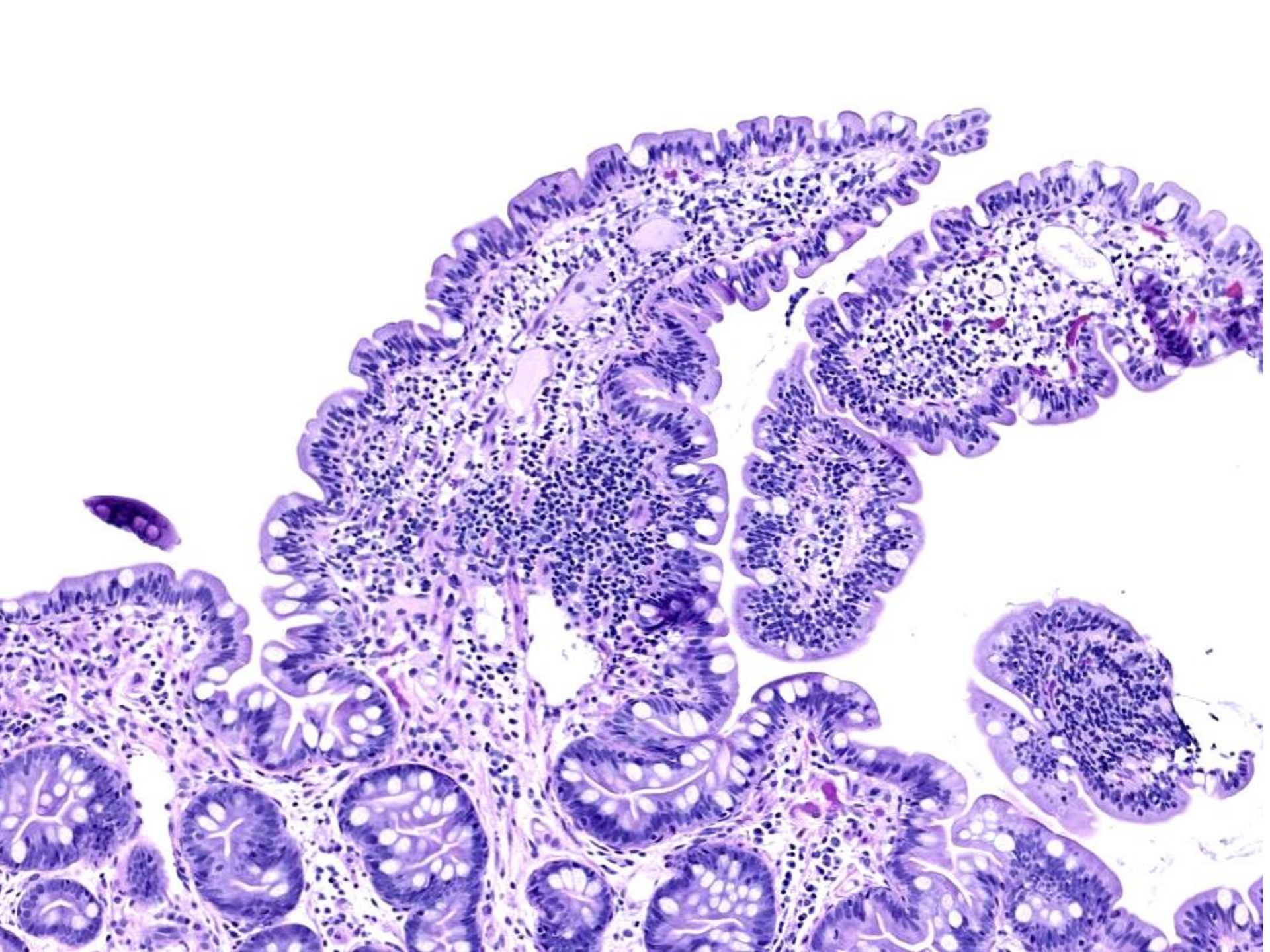




# Challenges with GI biopsies

- Inflammatory infiltrates vs normal
- Inflammatory vs neoplasms
- Quality of the biopsy samples
- Biopsies may not be representative of whole GI tract



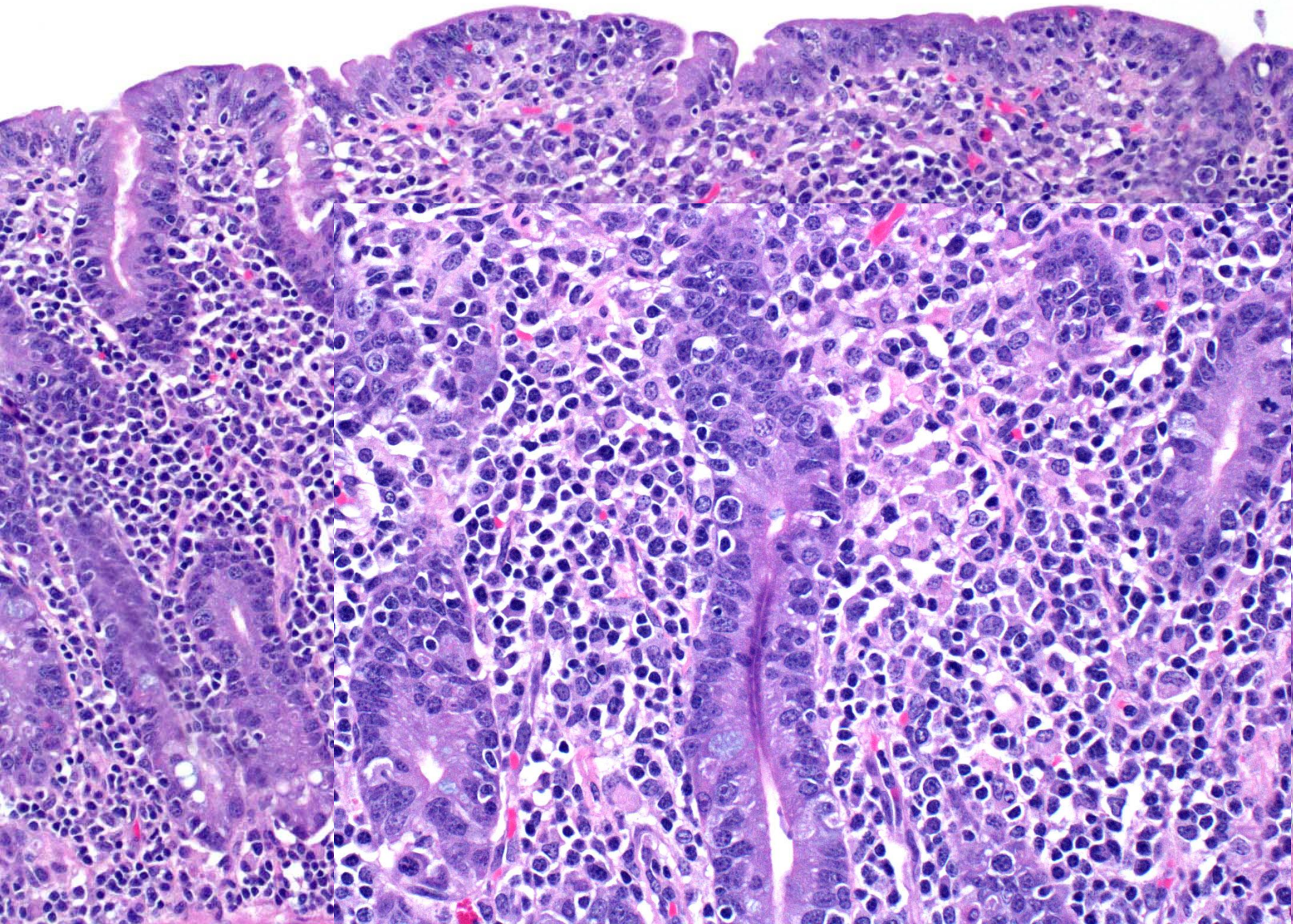




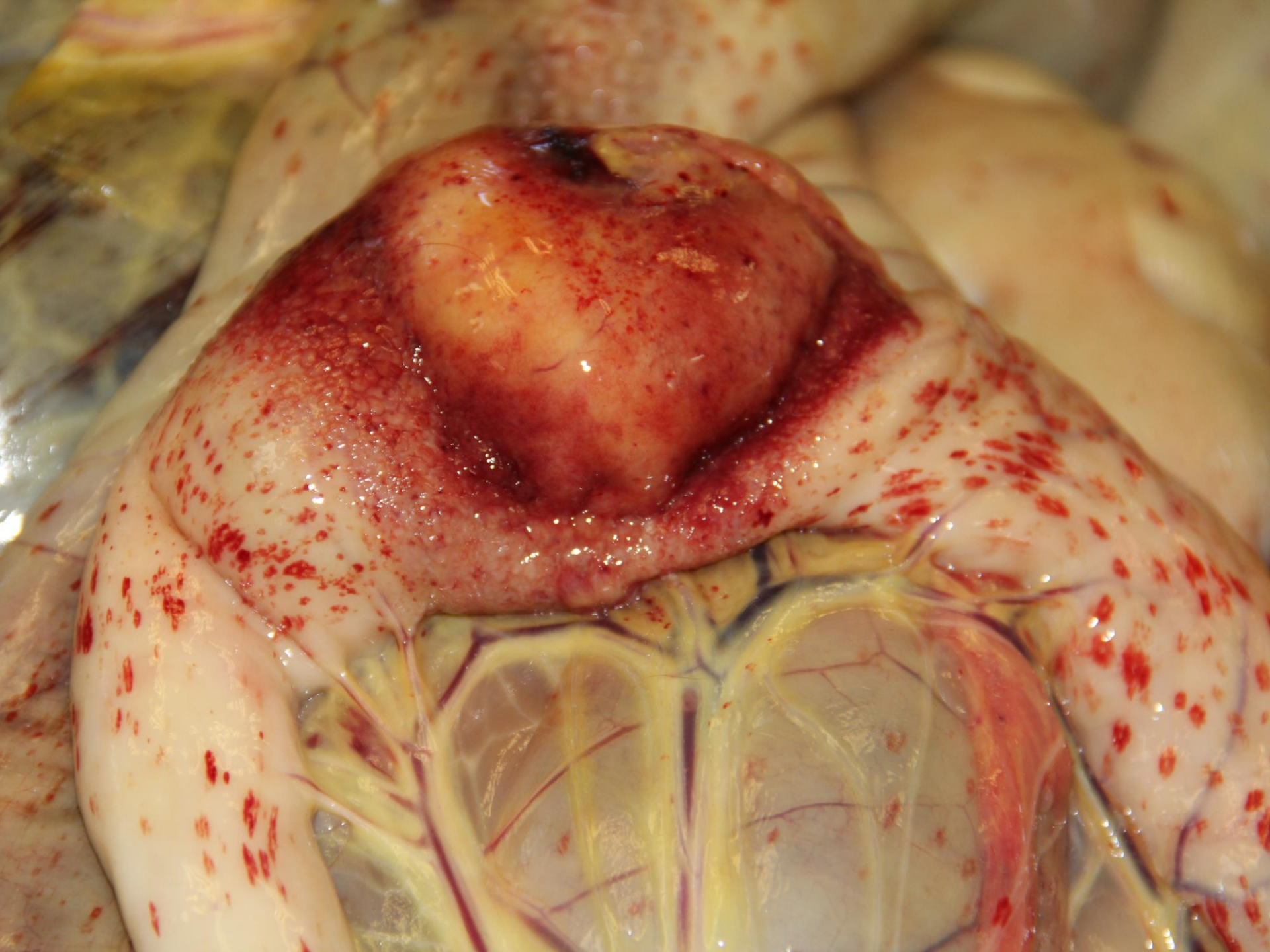
# Challenges with GI biopsies

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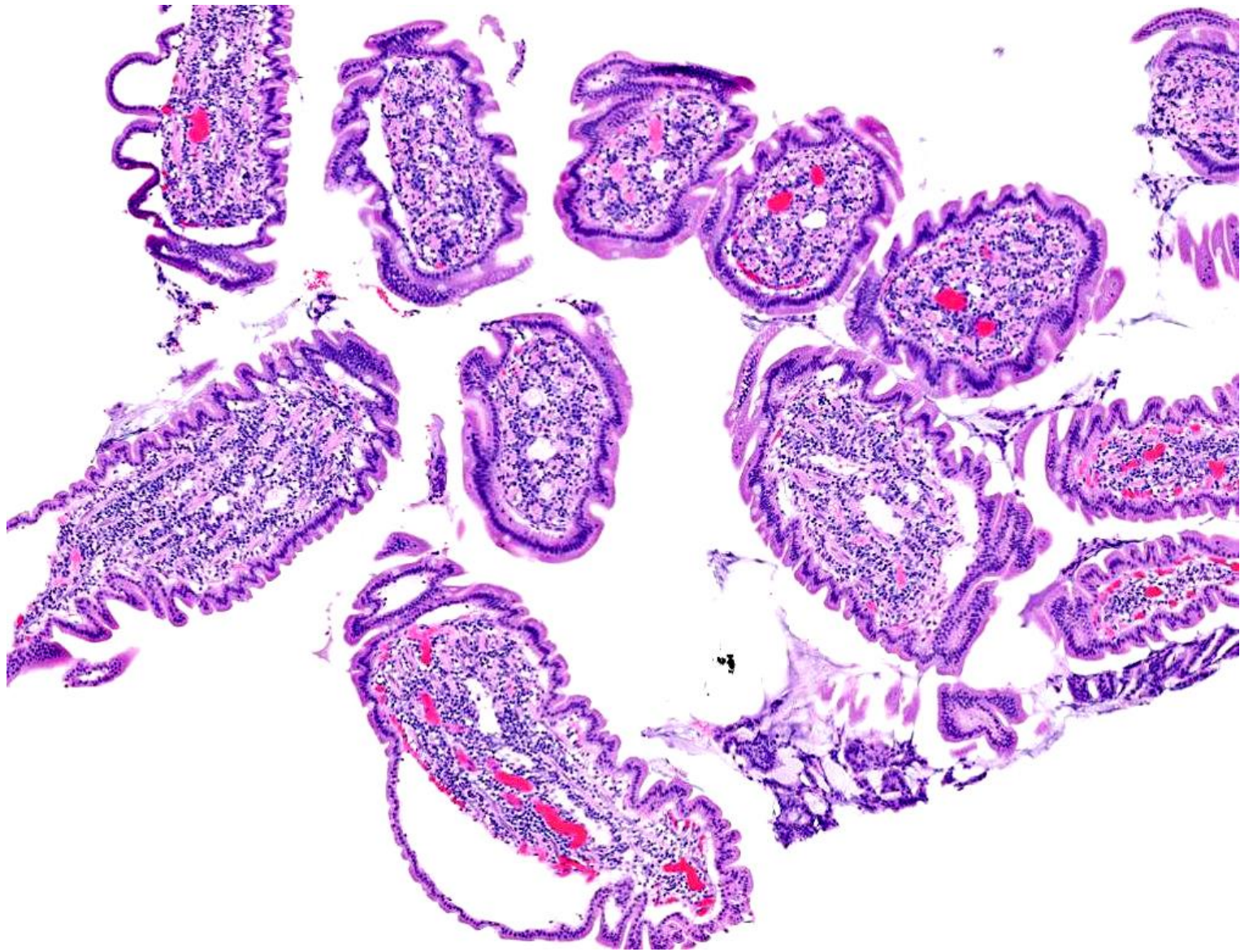




# Challenges with GI biopsies

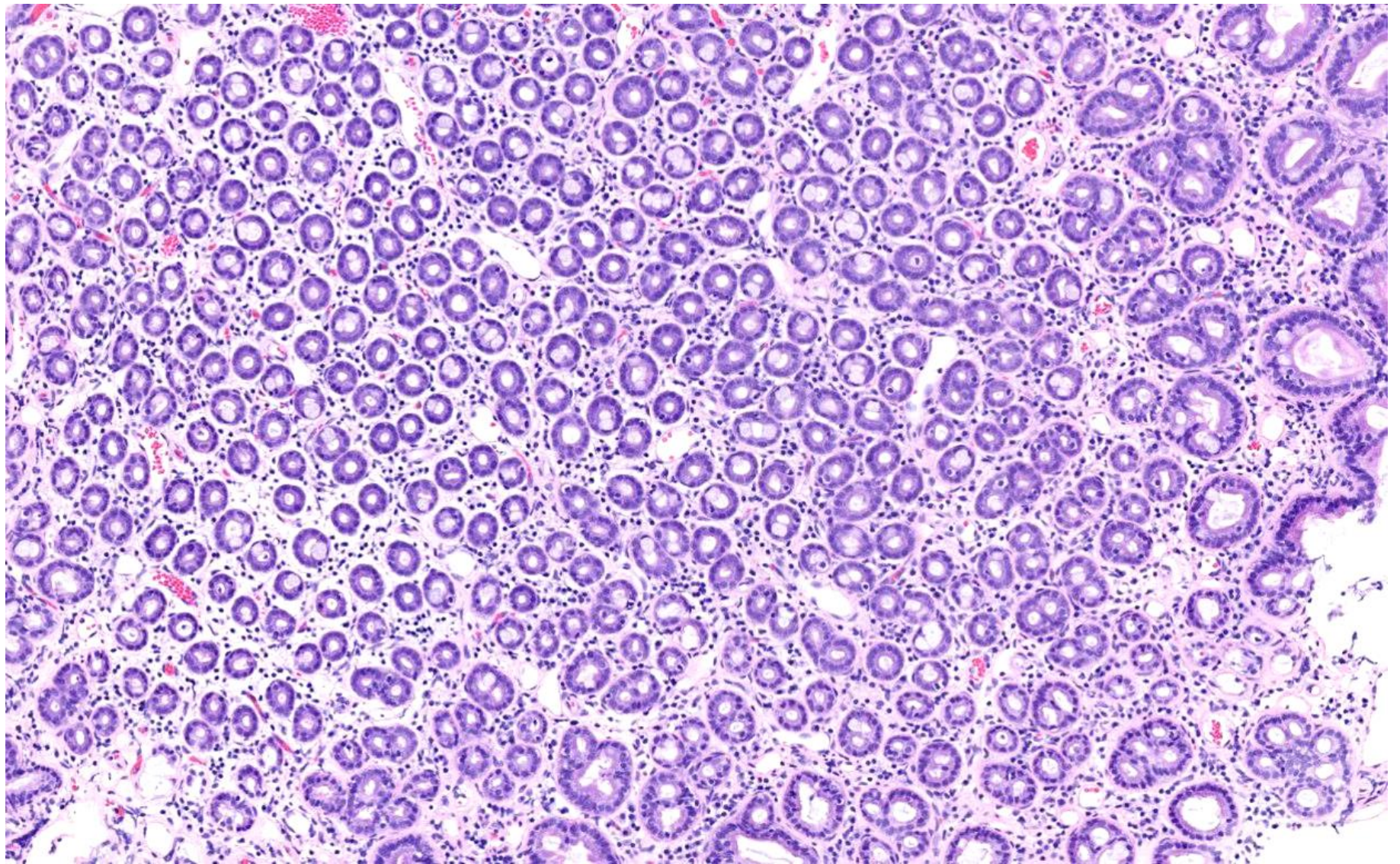
- Inflammatory infiltrates vs normal
- Inflammatory vs neoplasms
- **Quality of the biopsy samples**
- Biopsies may not be representative of whole GI tract





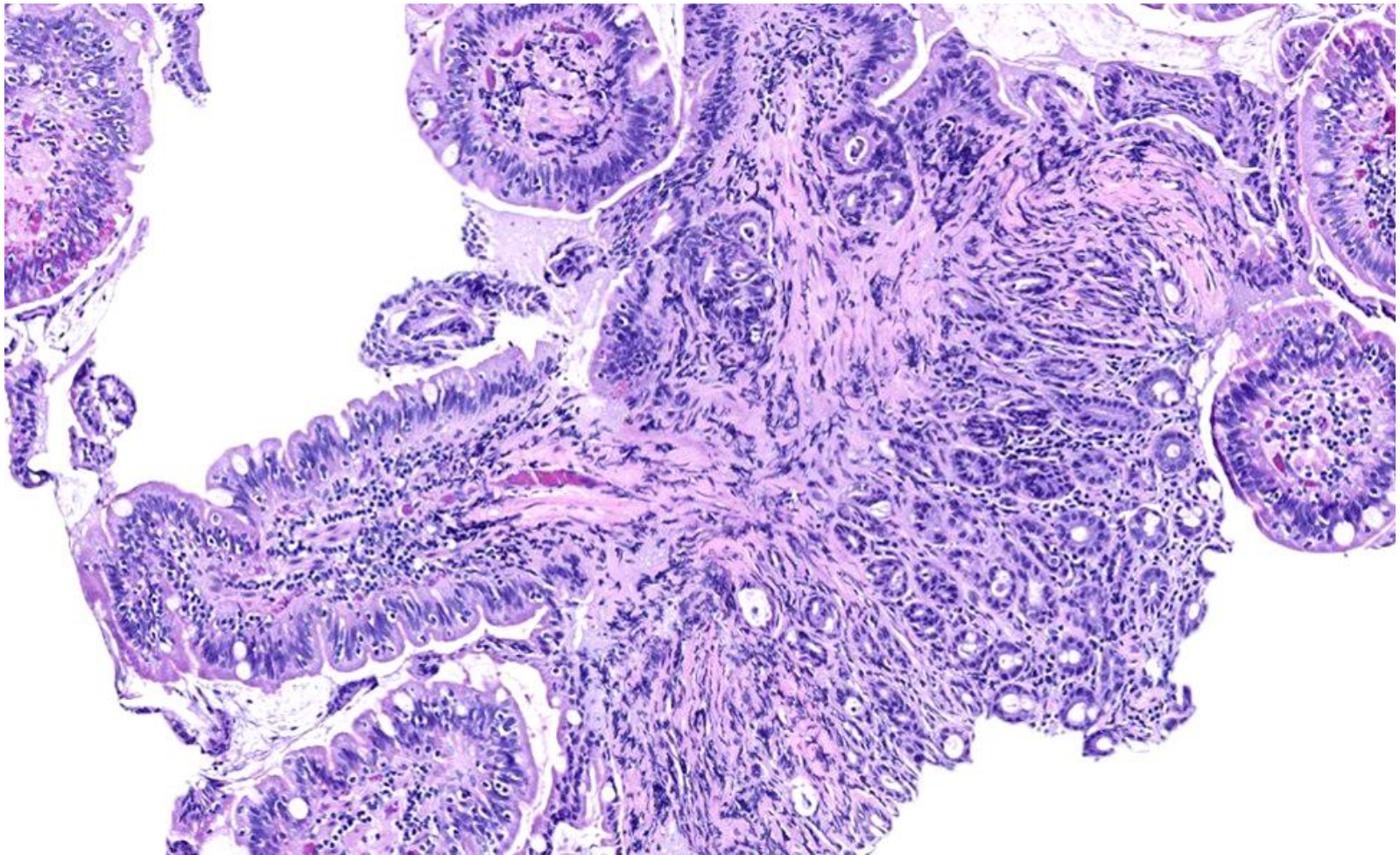
Duodenum: villi – no crypts





Colon: transverse section





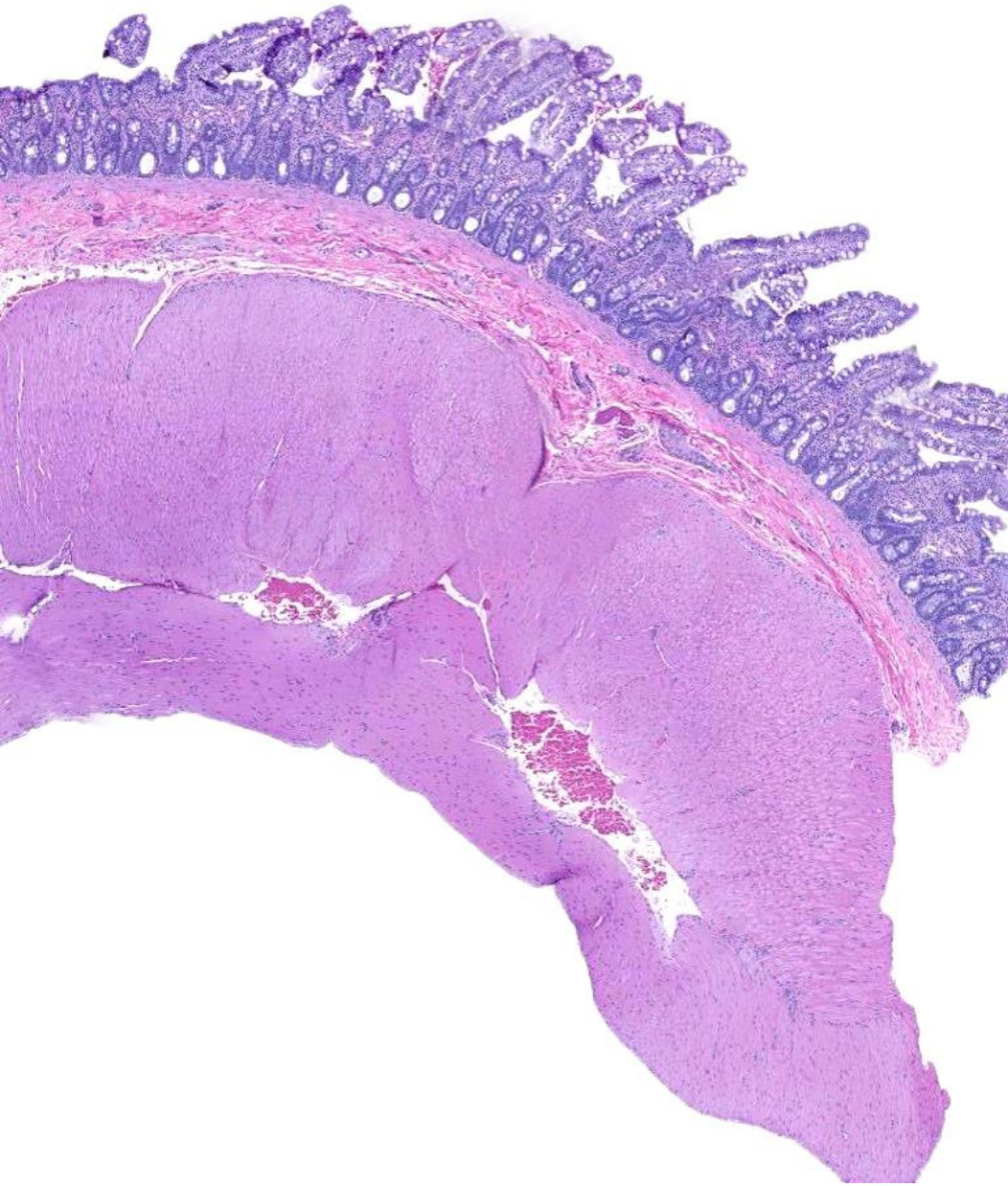
Duodenum - distorted with crush artifact



# Challenges with GI biopsies

- Inflammatory infiltrates vs normal
- Inflammatory vs neoplasms
- Quality of the biopsy samples
- Biopsies may not be representative of whole GI tract

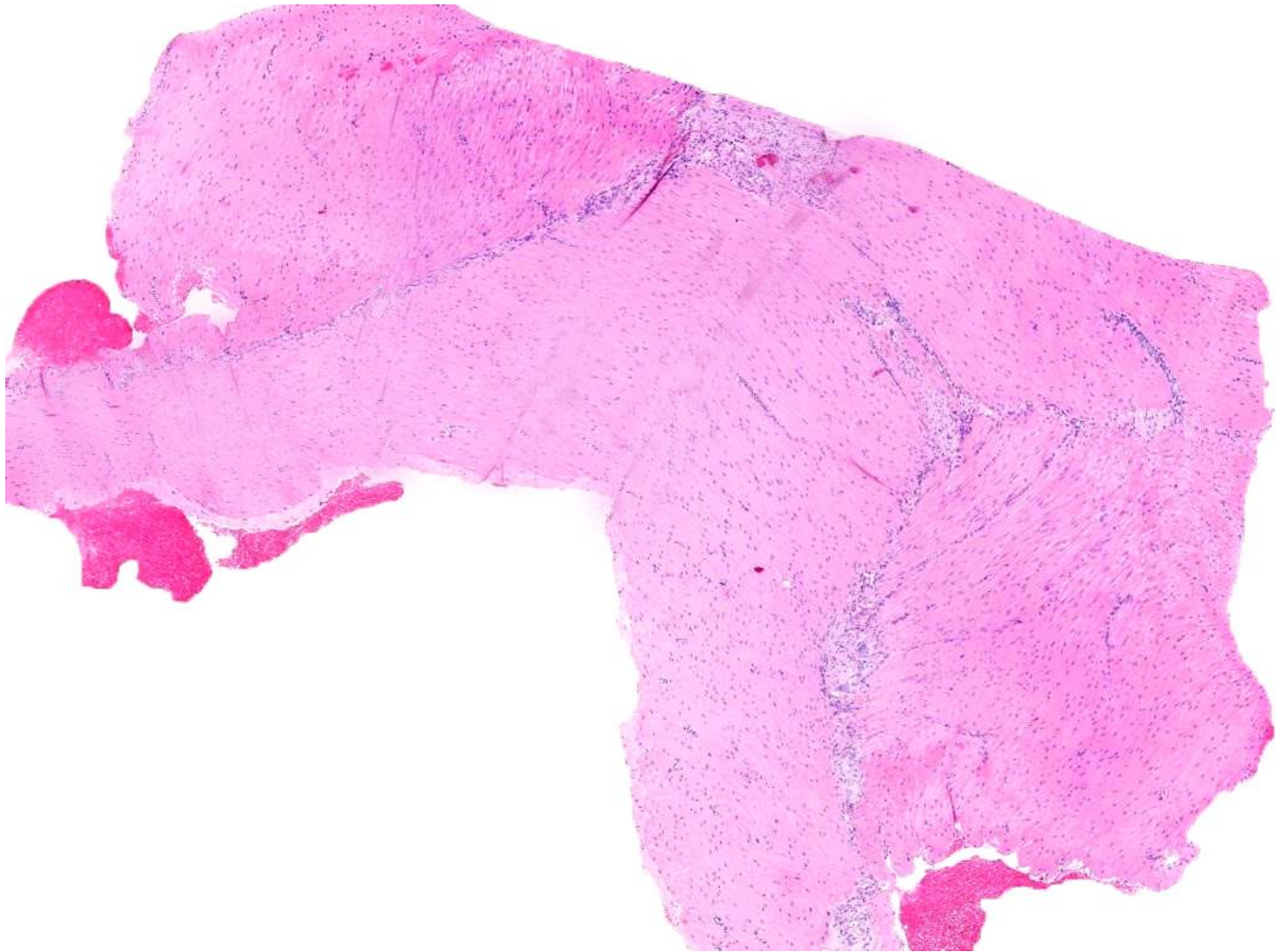




**Surgical biopsy**

**Quality: ???**





Surgical biopsy  
Quality: ????



# **Selected Lesions**

- \* Inflammatory/infectious lesions
- \* Neoplasms



# **Selected Lesions**

- \* Inflammatory/infectious lesions
- \* Neoplasms



# **Main causes of enterocolitis in horses (California)**

*Salmonella spp.*

*Clostridium difficile*

*Clostridium perfringens* type C

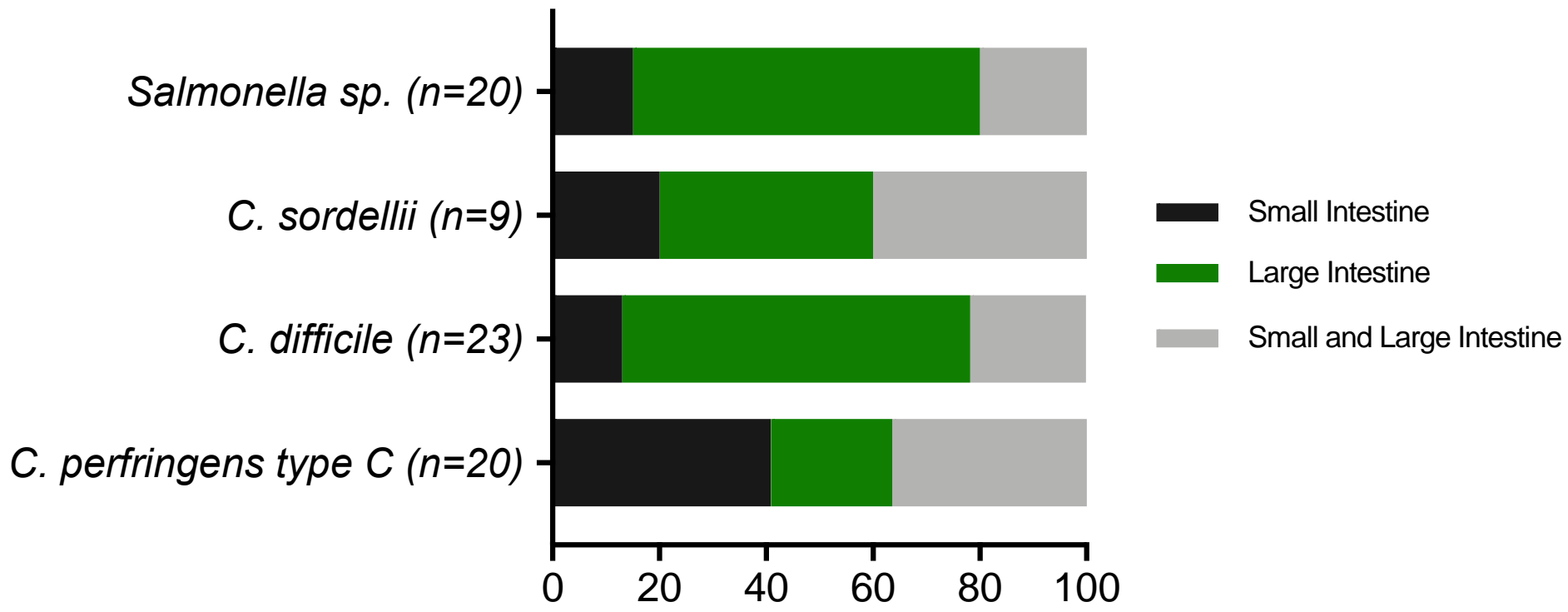
*Clostridium sordellii*

**NSAIDs**

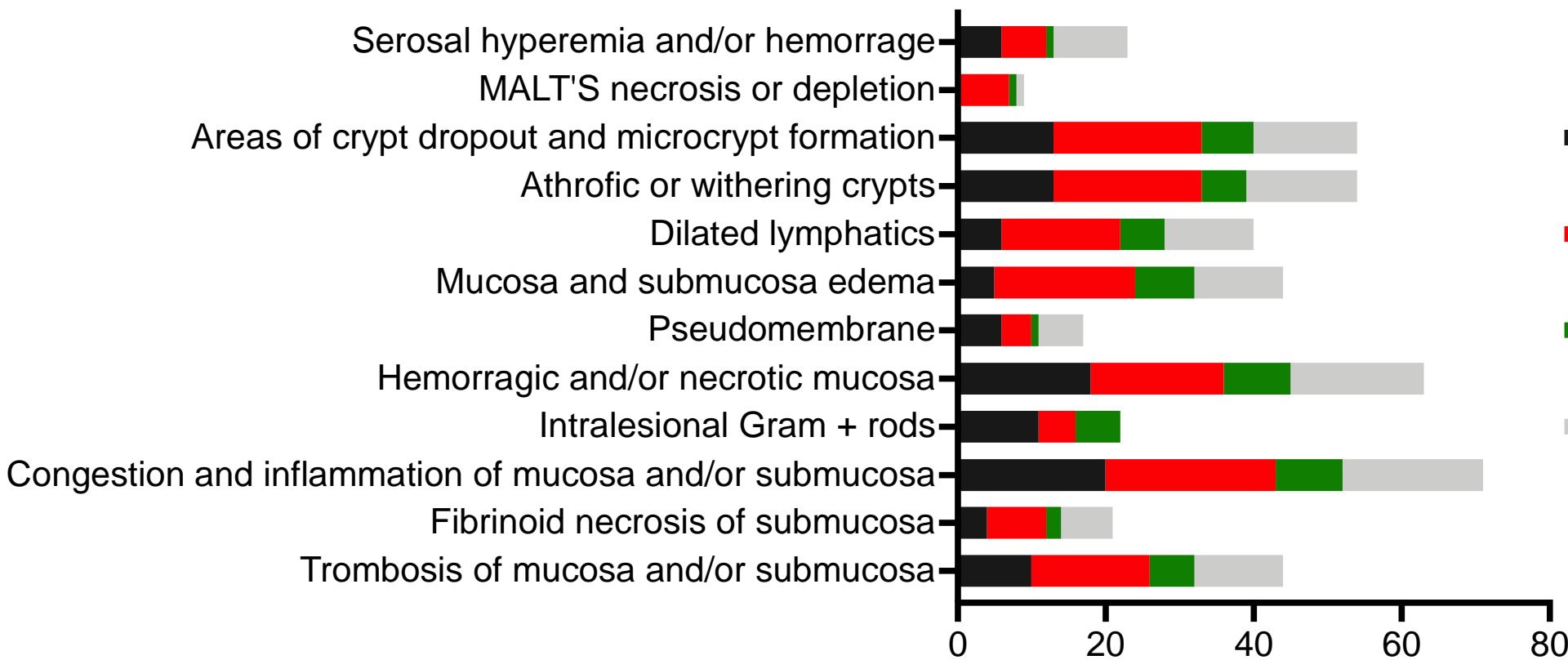


Can they be differentiated by histopathology?









■ *C. perfringens* type C

■ *C. difficile*

■ *C. sordellii*

■ *Salmonella* sp.



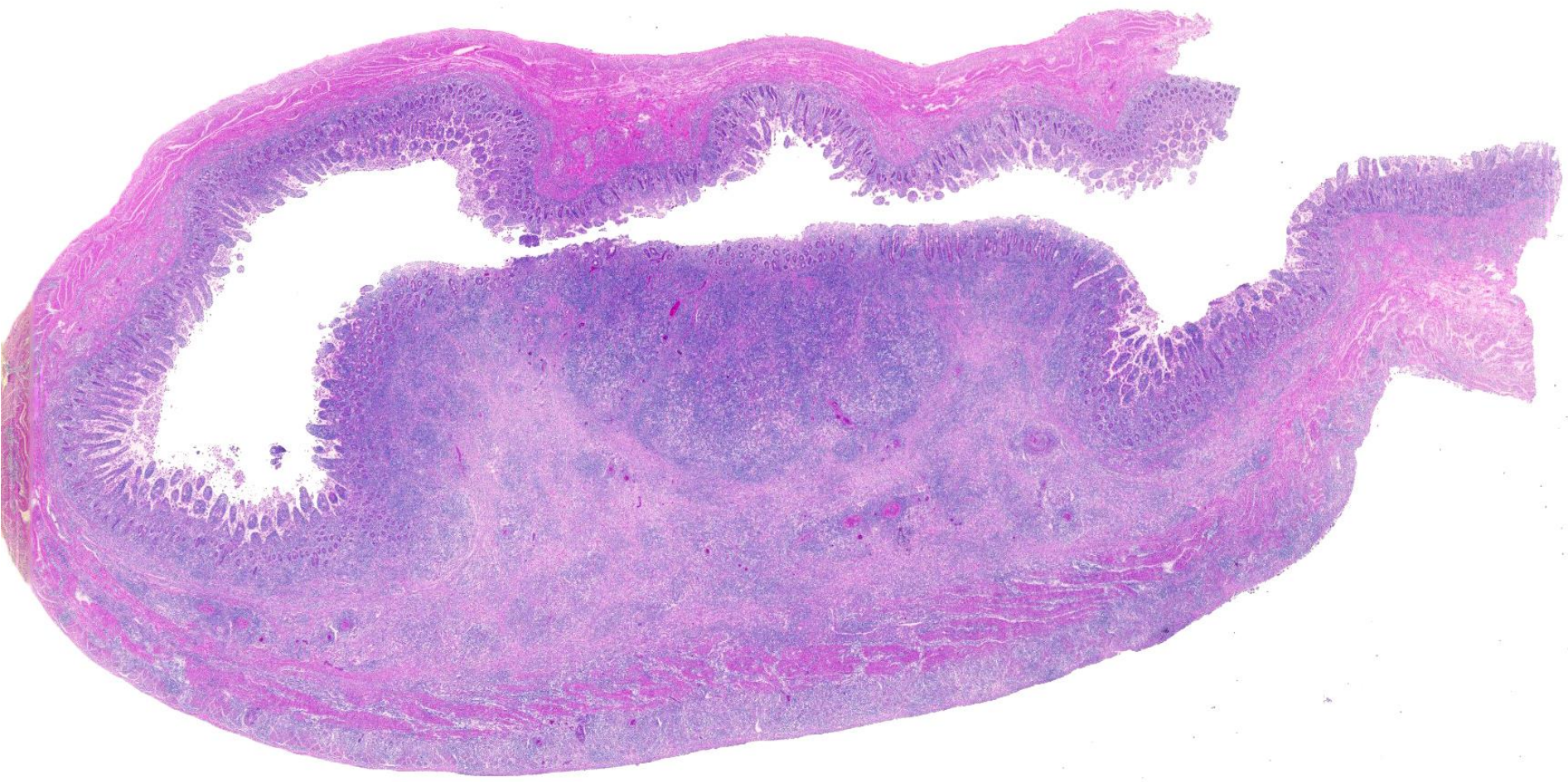
# **Selected Lesions**

- \* Inflammatory/infectious lesions
- \* Neoplasms

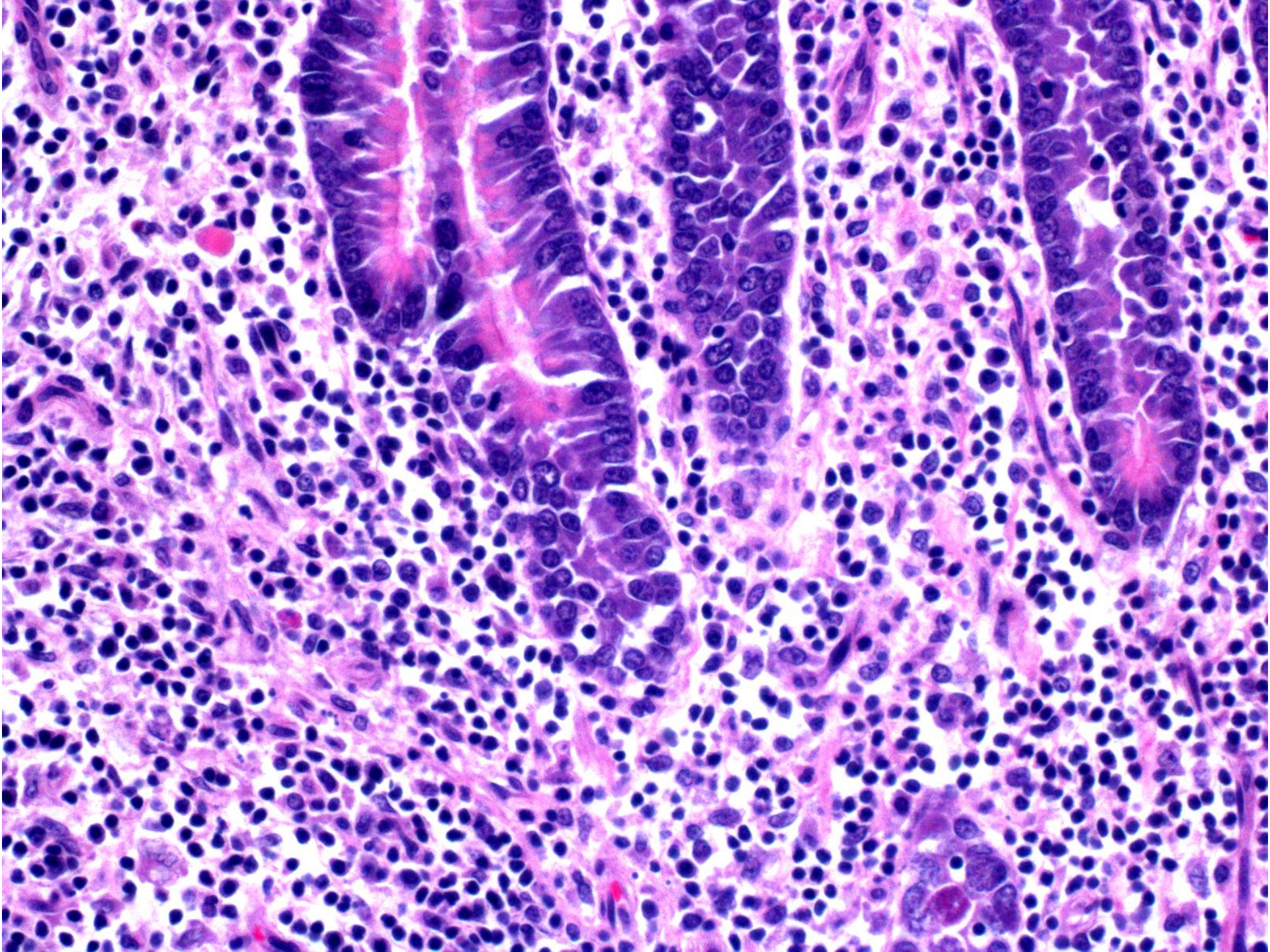


# Case 1

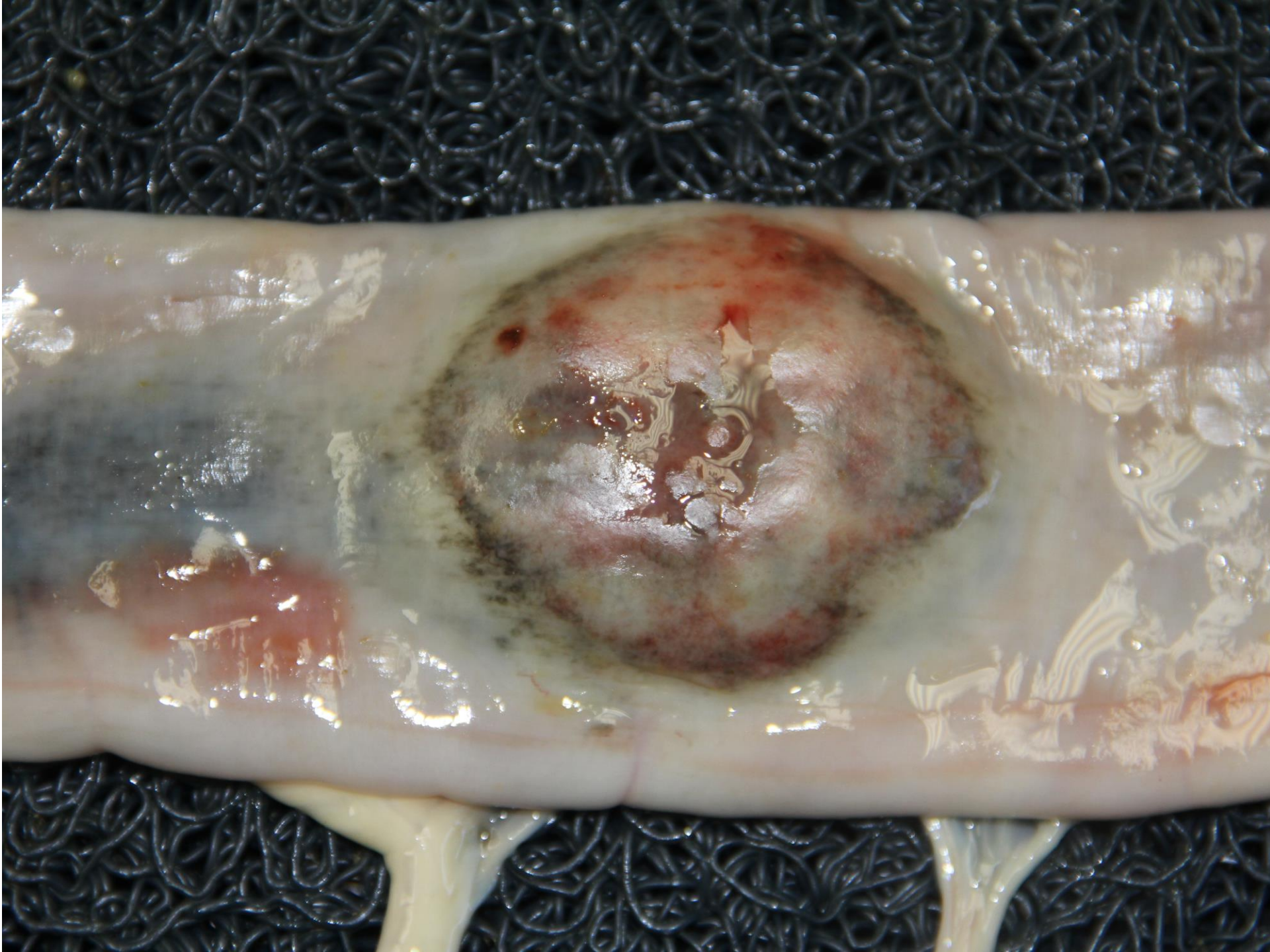








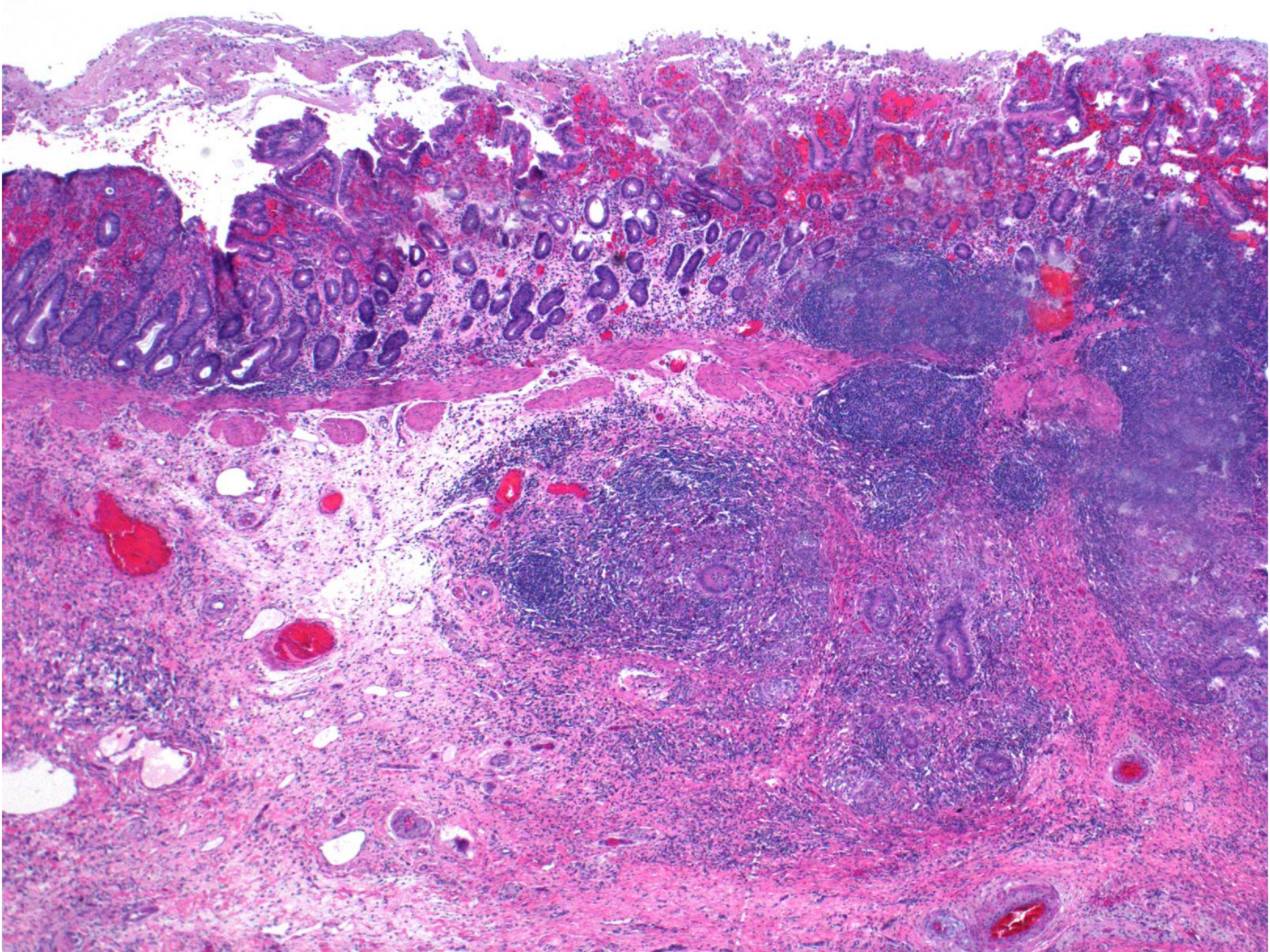




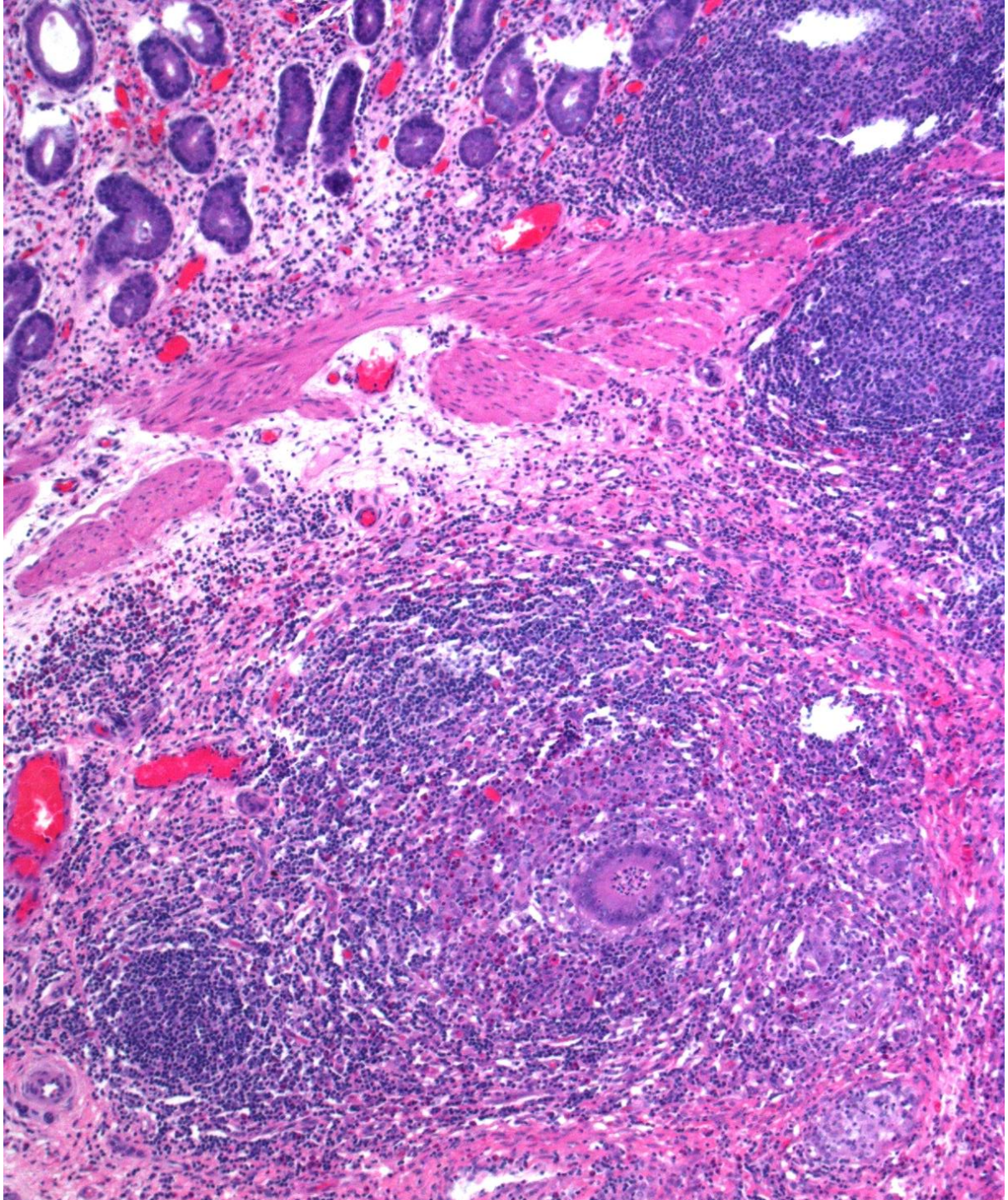


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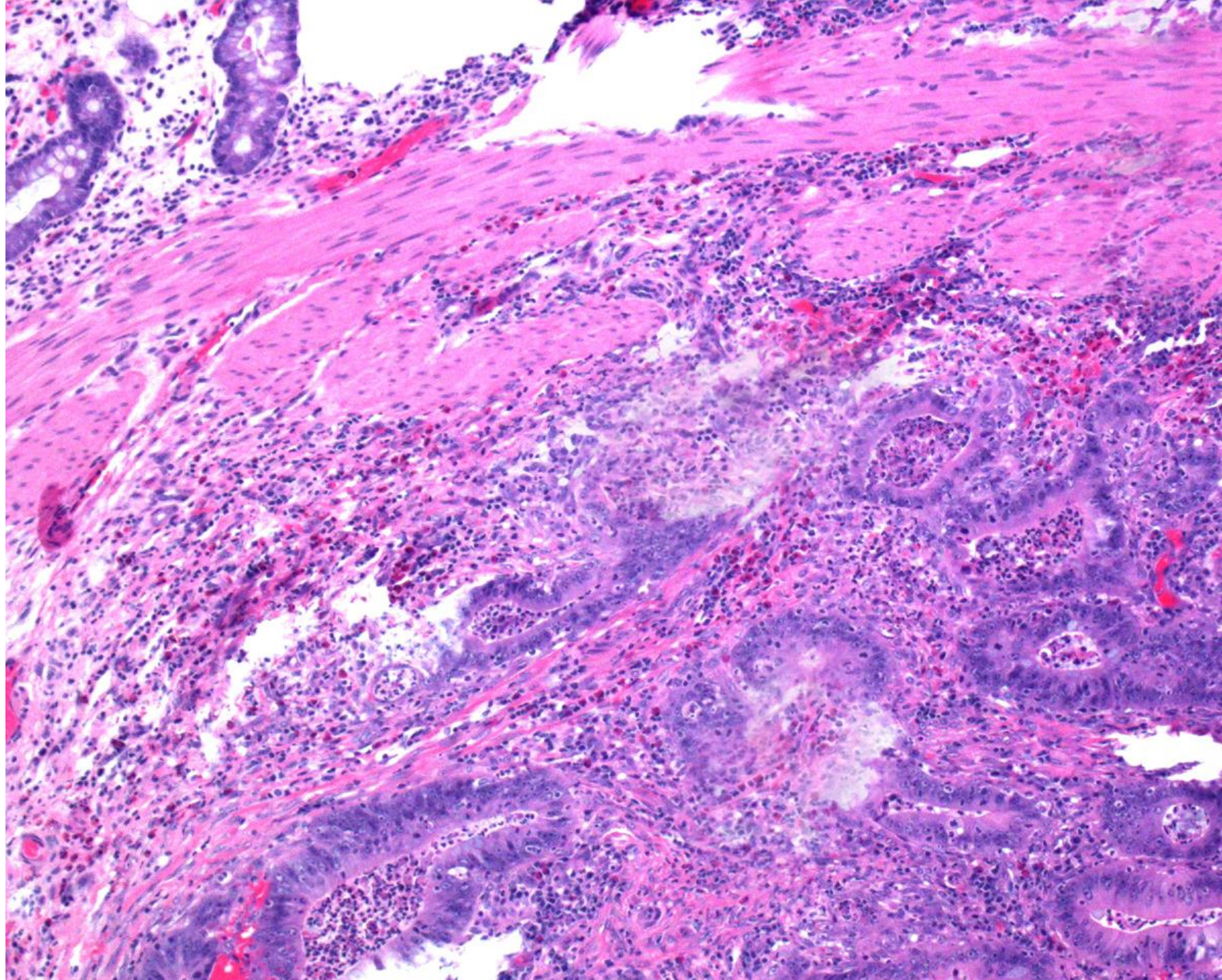






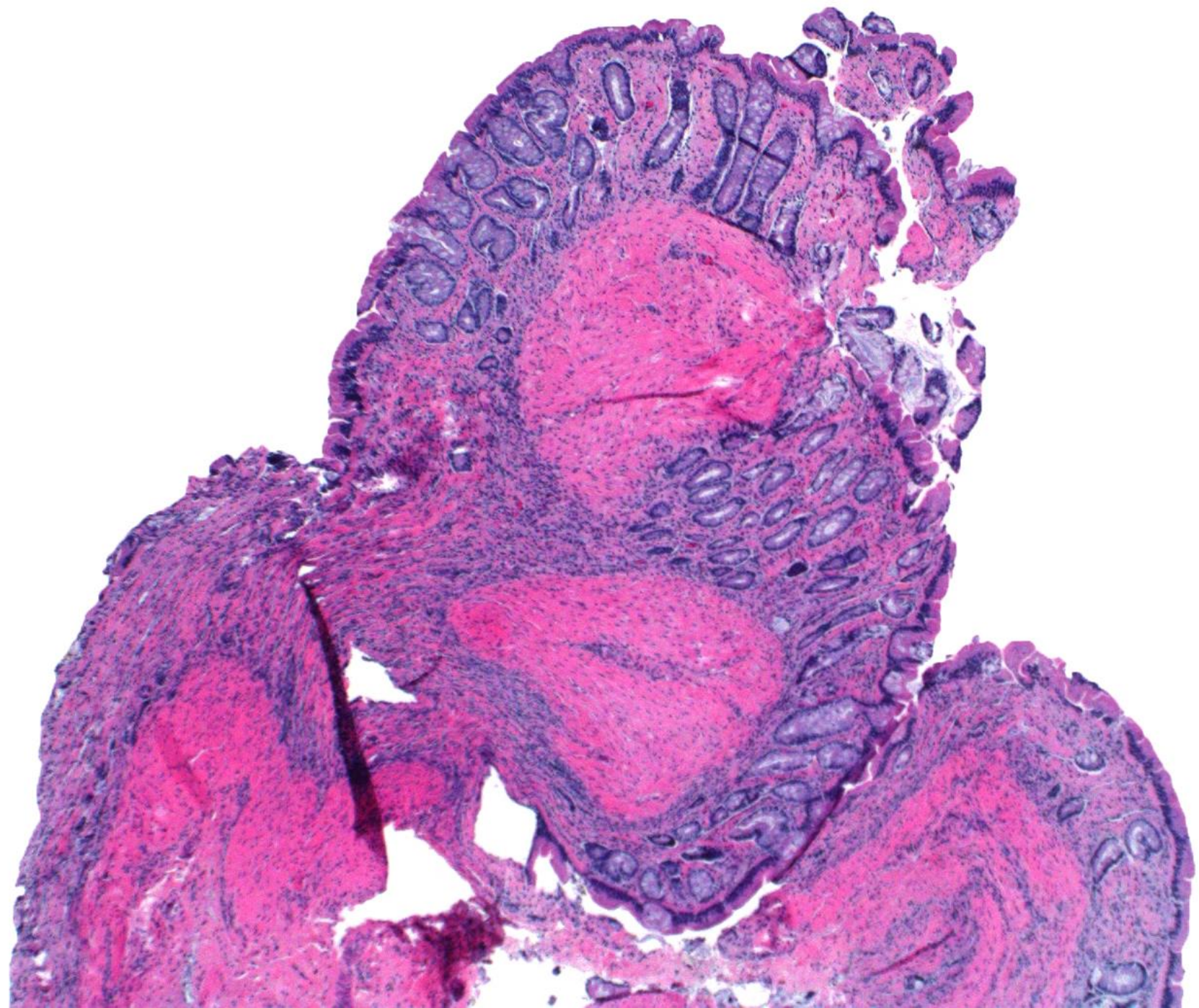




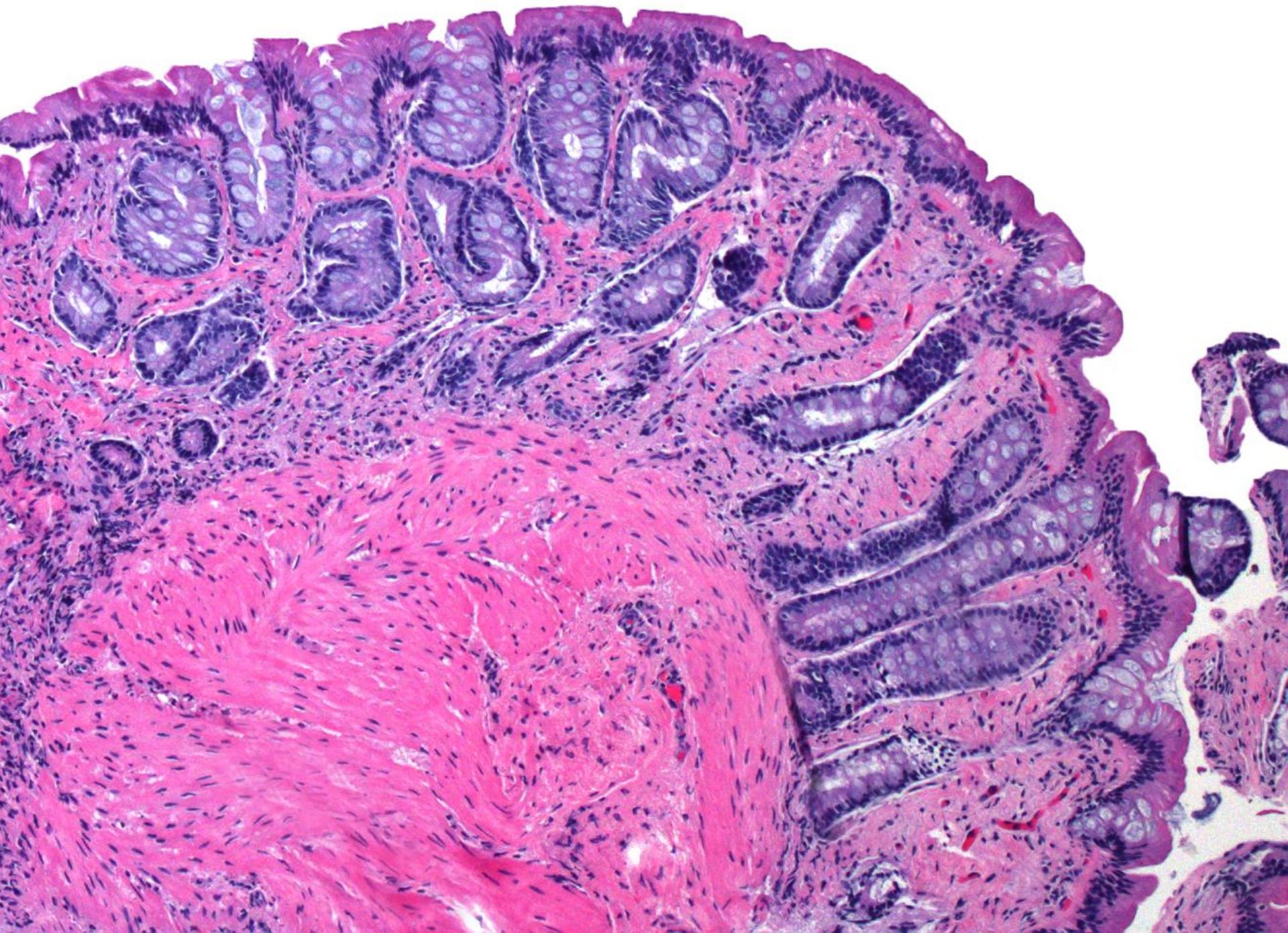




# Case 3



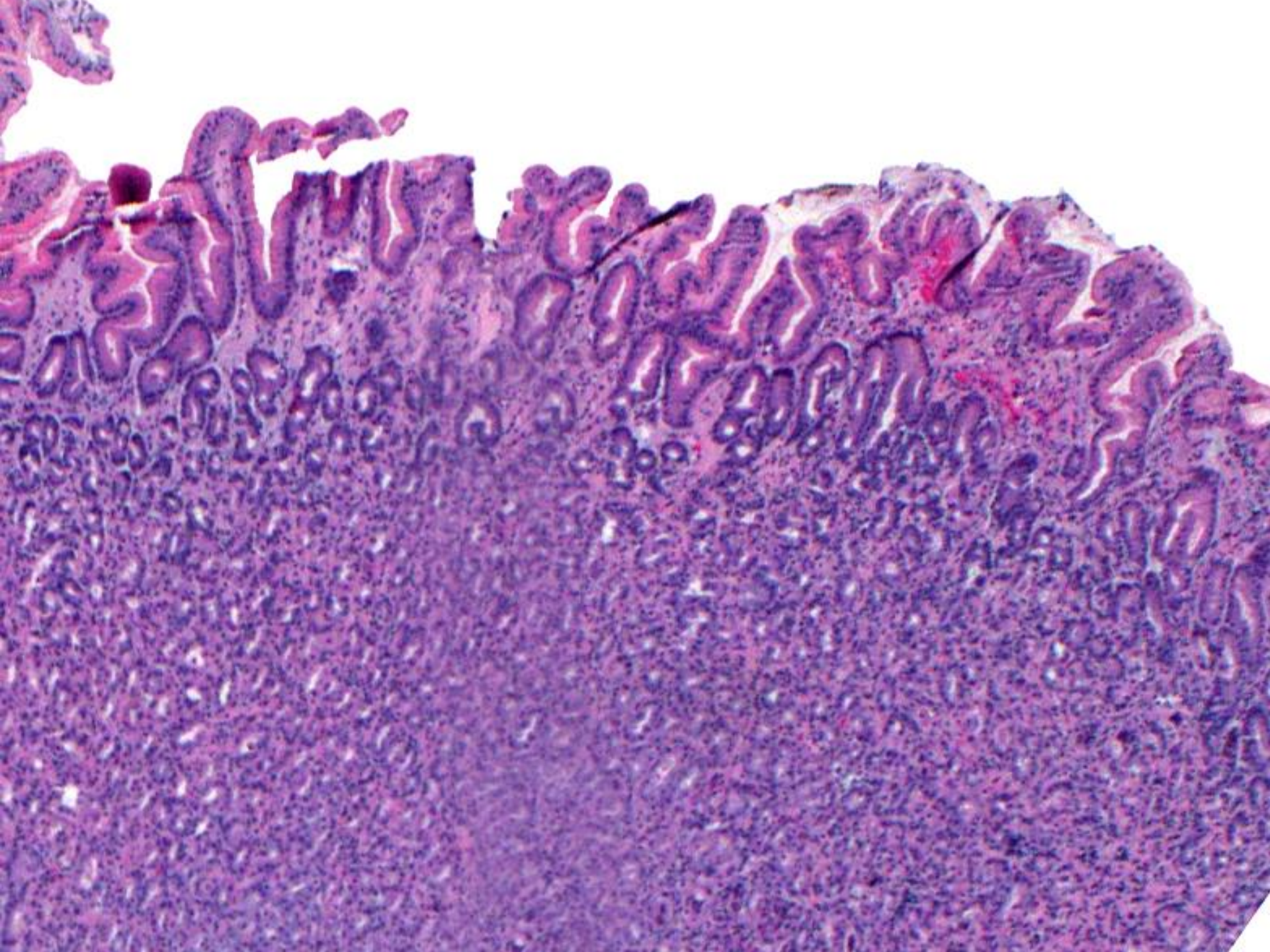




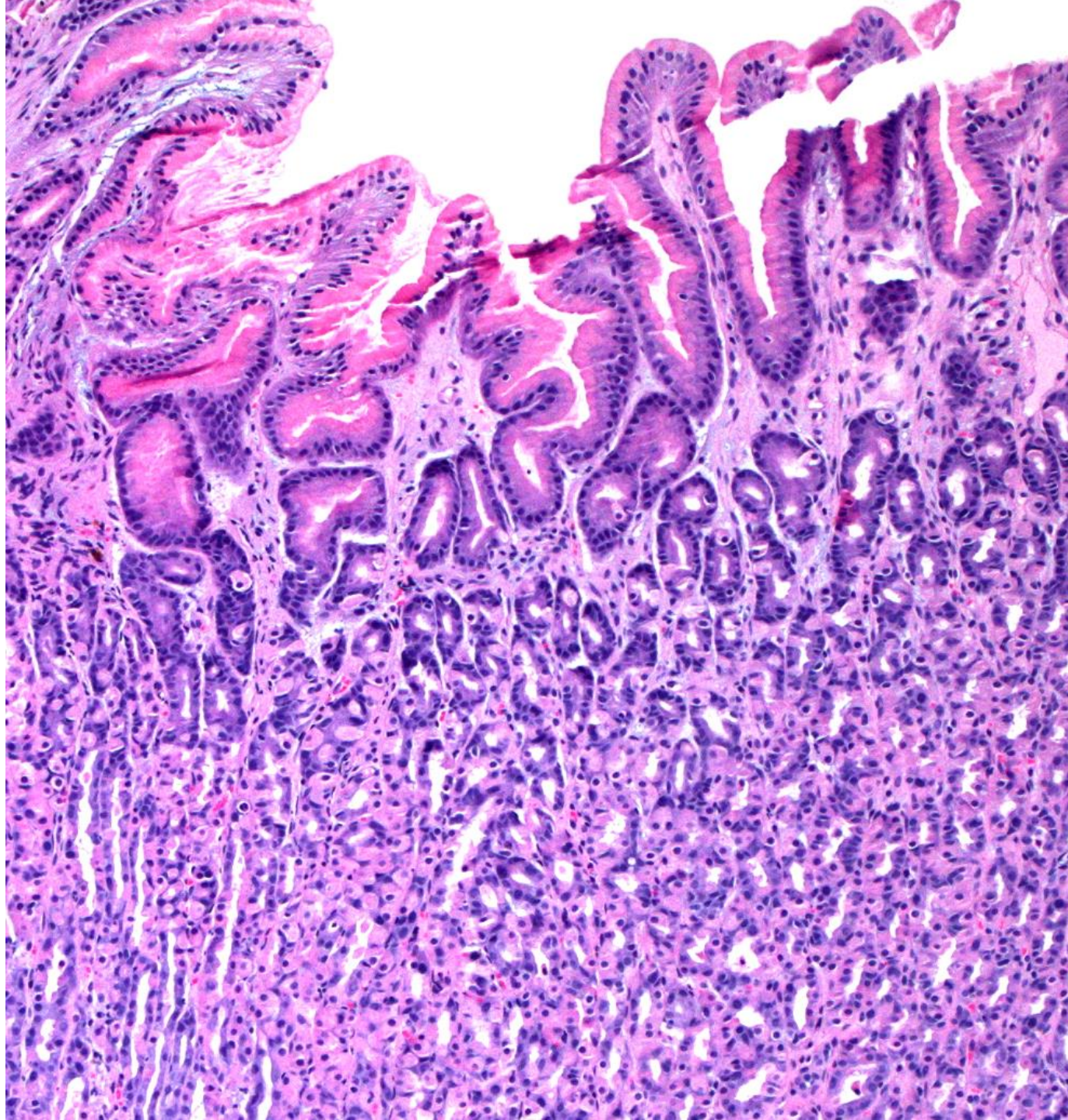


# Case 4





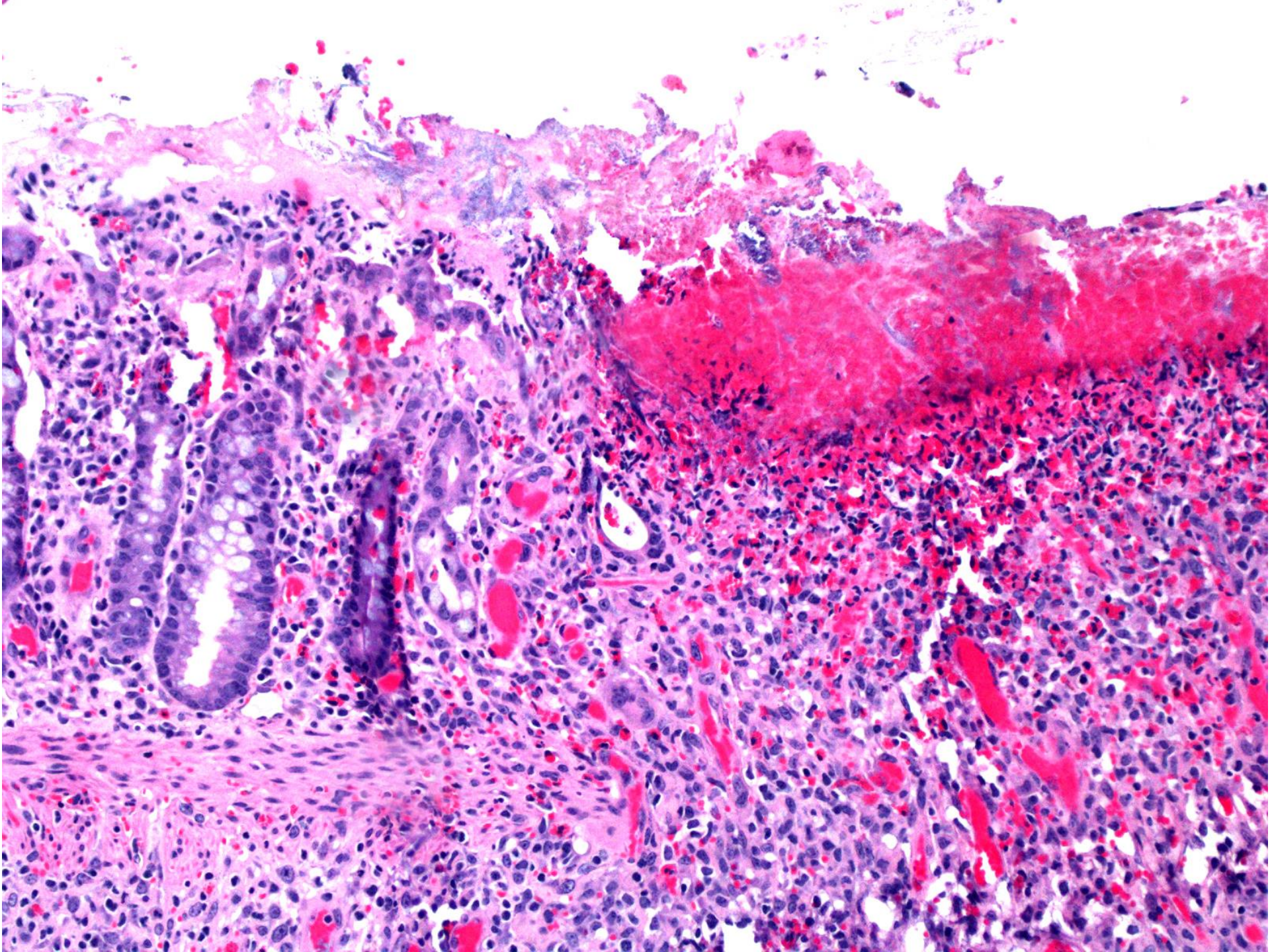




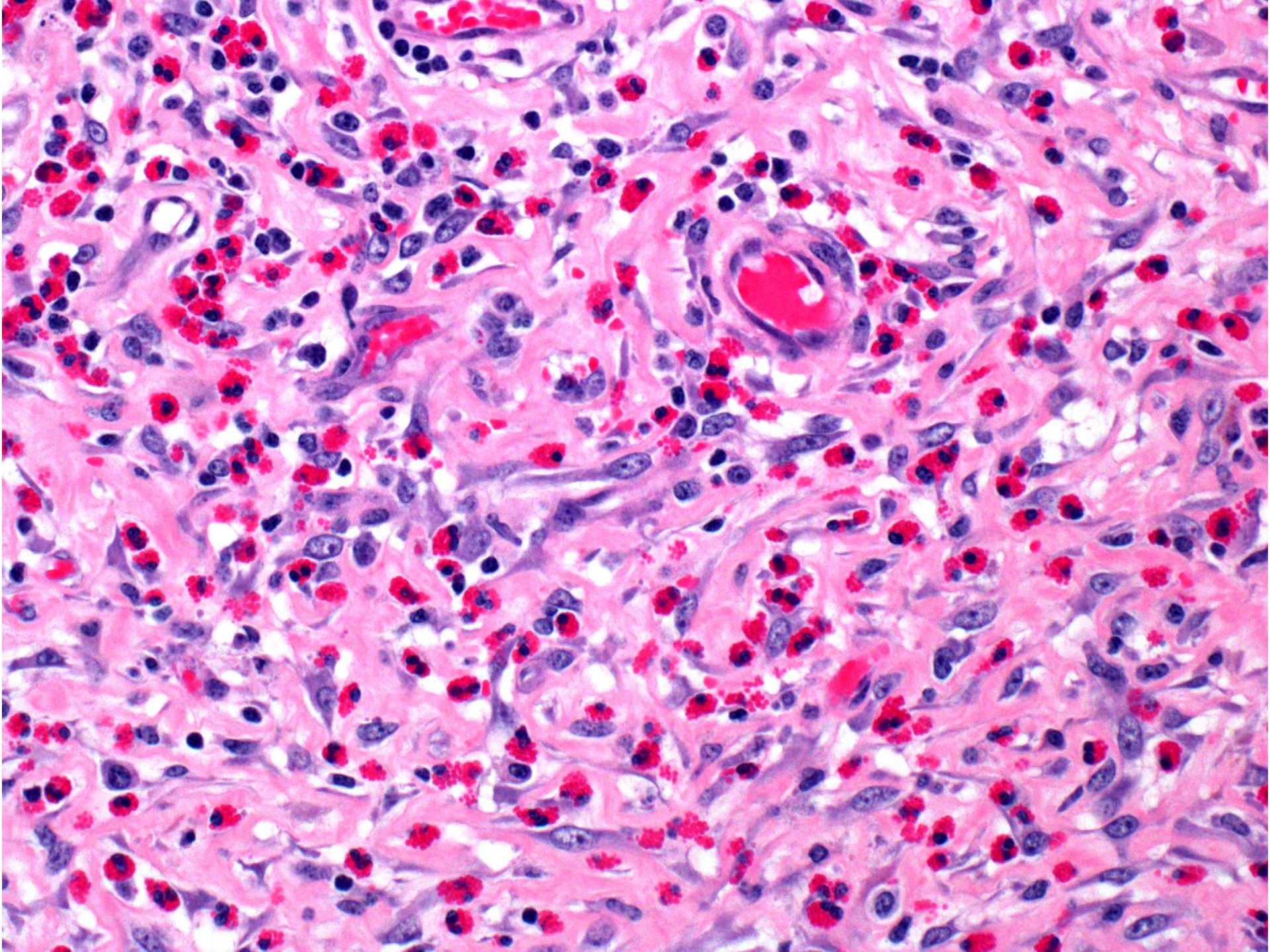


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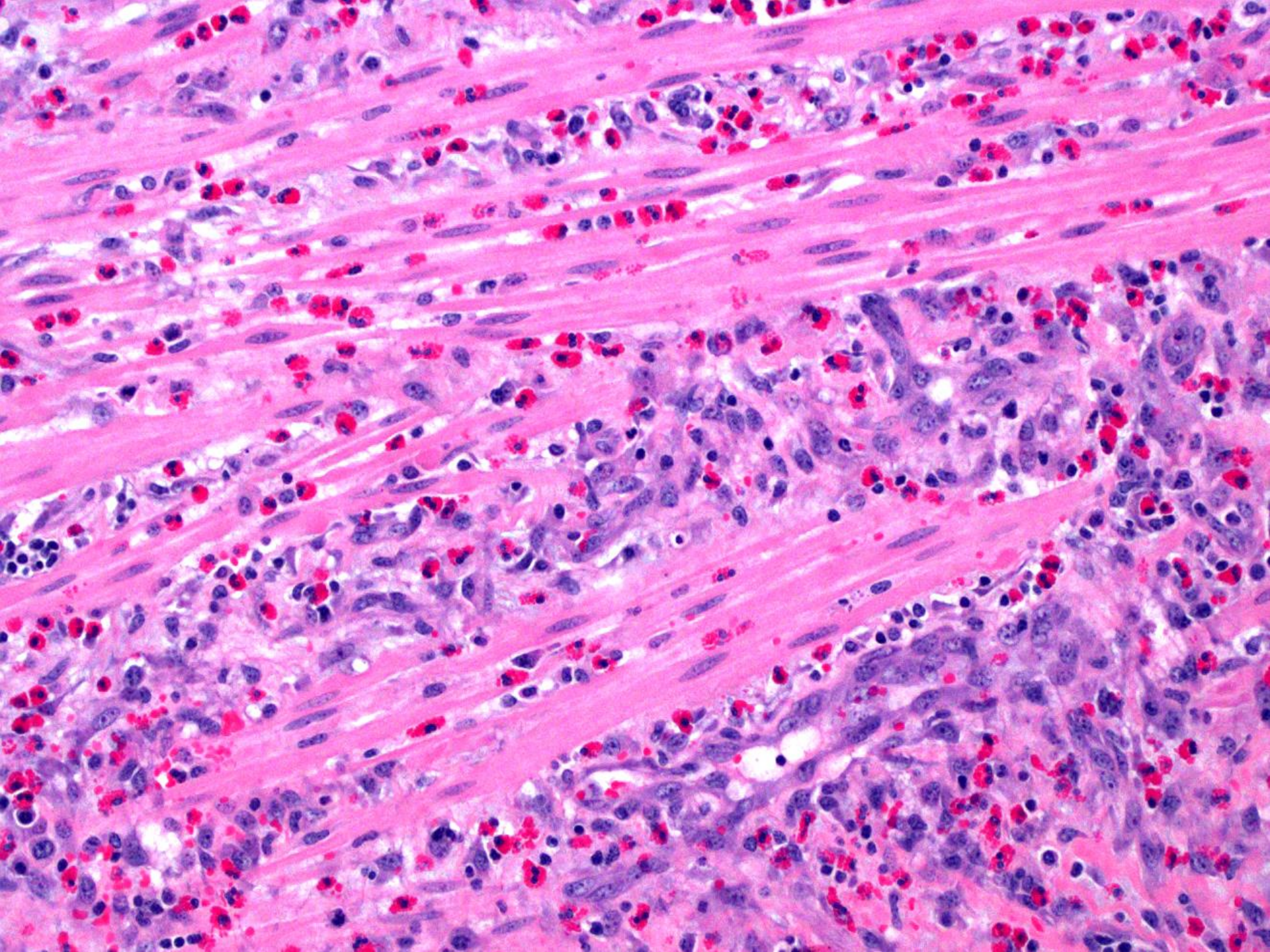




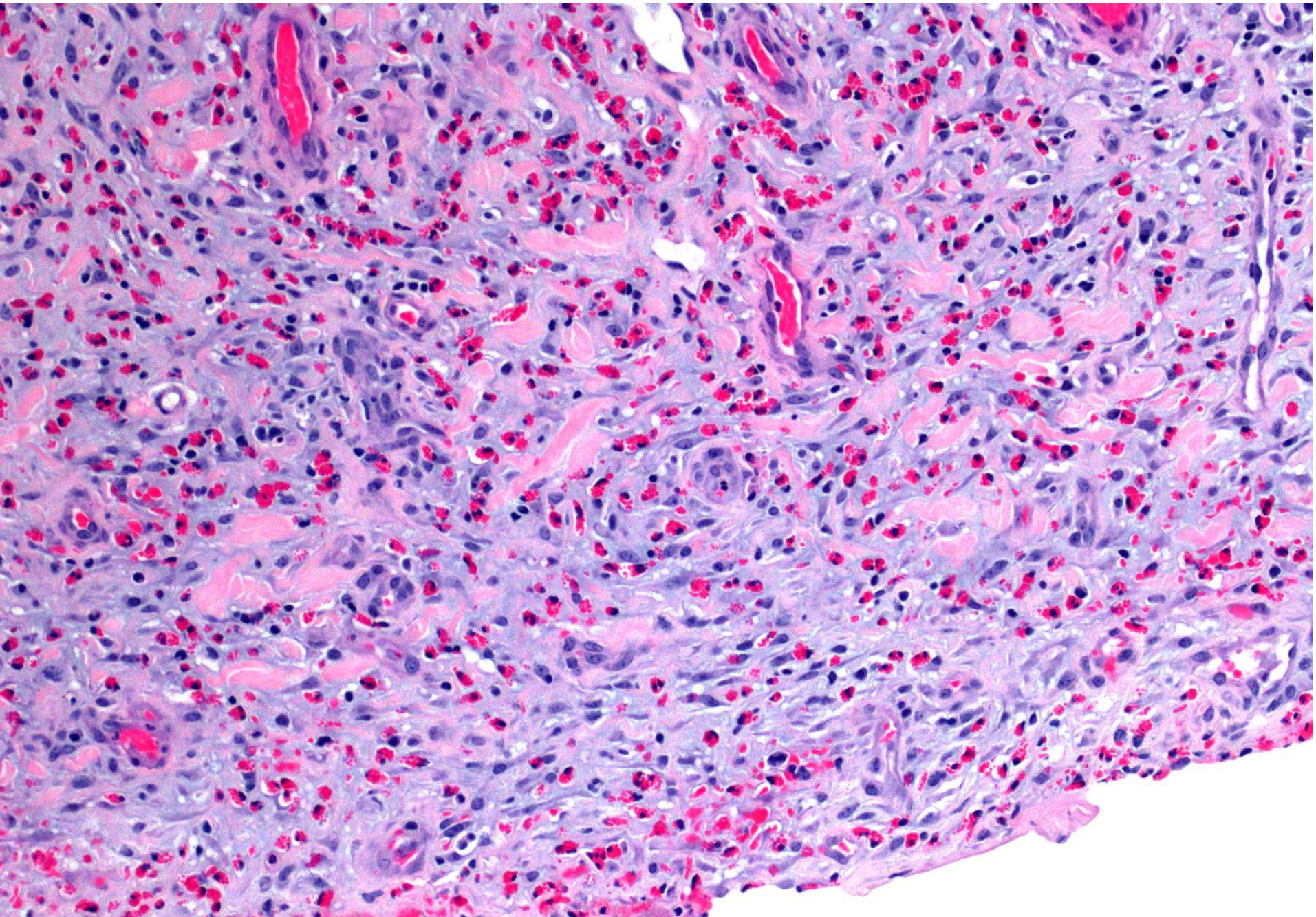














**THANK YOU!!!**

