

# Texas A&M Veterinary Medical Diagnostic Lab

Advocacy Presentation

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Texas A&M AgriLife Advanced Leadership Program  
January 5, 2015



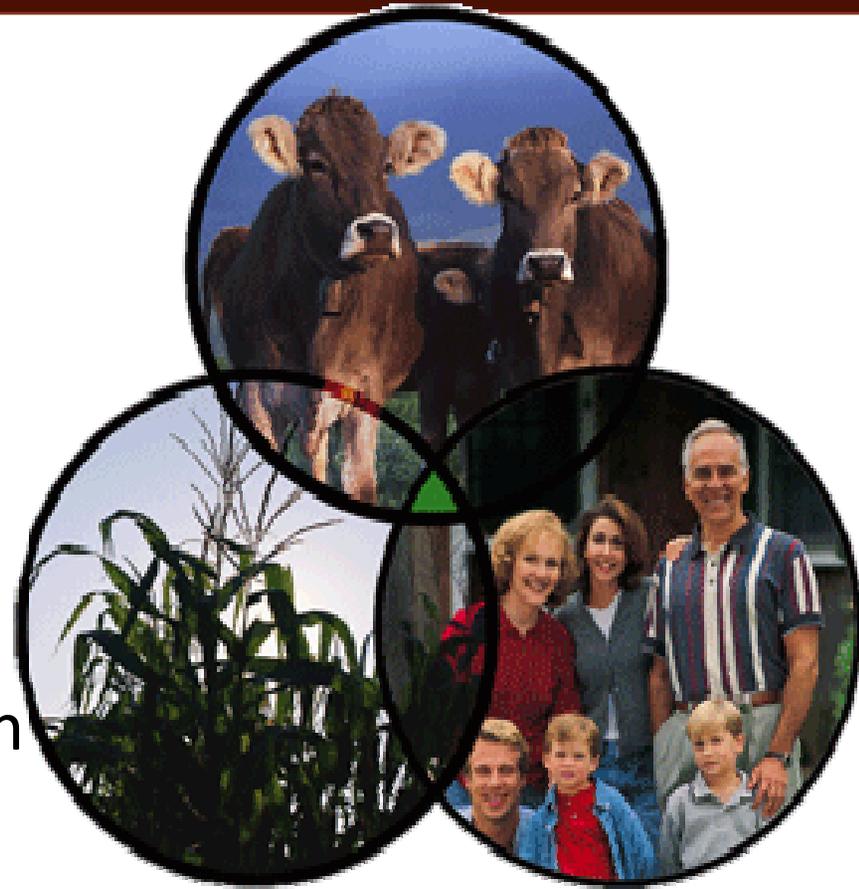
# Texas A&M Veterinary Medical Diagnostic Laboratory

## **Vision**

To be the global leader in providing innovative and state-of-the-art veterinary diagnostic services

## **Mission**

To promote animal health and protect agricultural, companion animal, and public health interests in Texas and beyond by providing excellence in veterinary diagnostic service



# TVMDL Agency Impacts

- One of four state agencies under the oversight of the Vice Chancellor for Agriculture within The Texas A&M University System
- Only state agency dedicated to providing veterinary diagnostic services to the citizens of Texas
- Only state lab with ability and response capacity for high consequence animal diseases



# TVMDL Agency Impacts

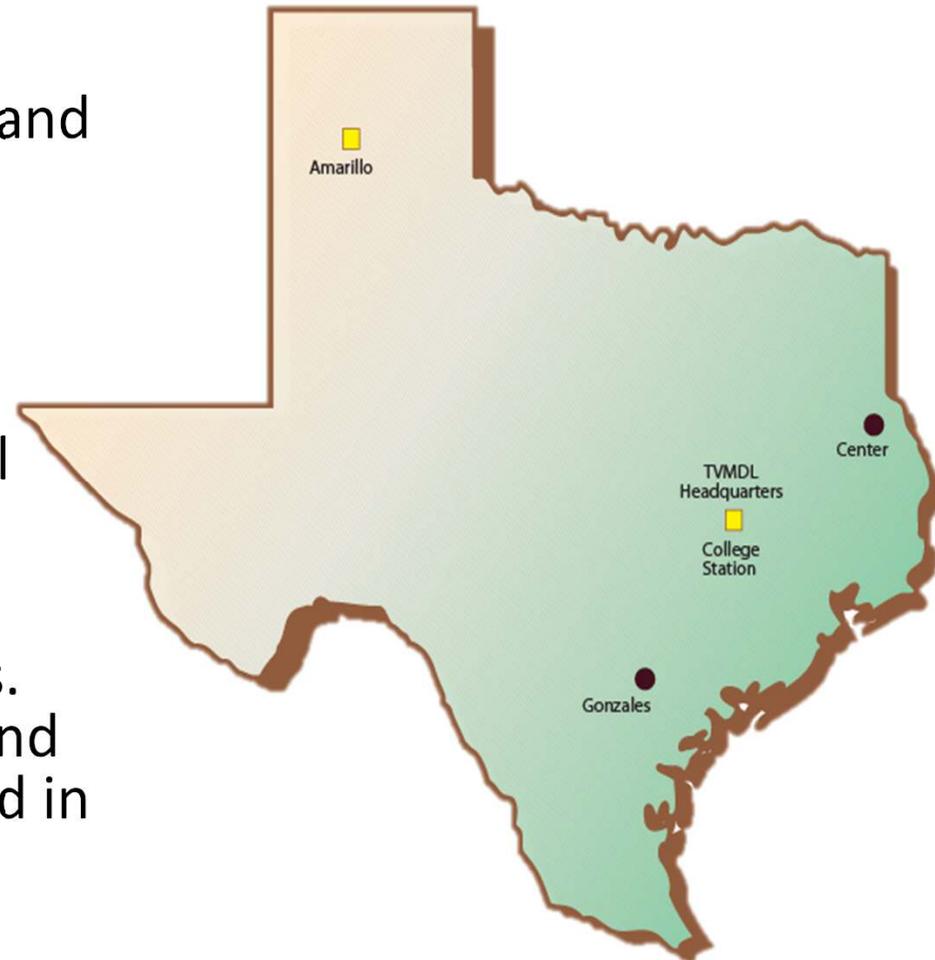
- Backbone of an animal and public health disease surveillance program
- Protects the State's \$12 billion livestock and poultry industry
- Facilitates movement and export of live animals and commodities
  - Testing supports agricultural sector business continuity planning efforts

# TVMDL Locations

TVMDL is composed of two full-service laboratories, located in College Station and Amarillo, and two poultry laboratories, located in Center and Gonzales.

With its strategic locations, TVMDL is uniquely positioned to serve the animal industries of Texas.

The agency is staffed by 165 employees. With over 30 hold a DVM and/or PhD and over 20 professionals are board certified in their specific discipline.



# TVMDL Locations



# TVMDL College Station - 2016



# TVMDL History

## 1967

- Texas Legislature establishes TVMDL to perform diagnostic testing for livestock and poultry. Two years later, the 18,000 sqft College Station facility opens.

## 1975

- TVMDL opens a 12,000 sq.ft laboratory in Amarillo to serve the important feedlot and large animal industries of the Texas Panhandle

## 1978

- TVMDL becomes the world's first laboratory to isolate canine parvovirus.

## 1989

- Texas Racing Act gives TVMDL primary responsibility for drug testing services for pari-mutuel racing



# TVMDL History

## 1991

- Texas Legislature transfers Pullorum-Typhoid program and poultry laboratories in Center and Gonzales from the Texas Agricultural Experiment Station to TVMDL



## 1998

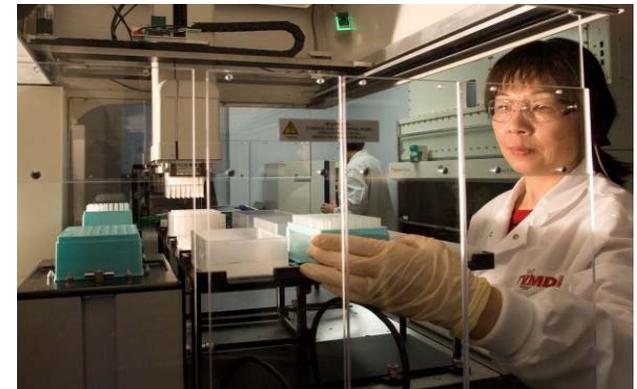
- TVMDL is the first to recognize liver lesions in dogs are caused by aflatoxin contamination of corn-based dog food

## 2002

- USDA selects TVMDL as one of 12 core diagnostic laboratories to be part of the National Animal Health Laboratory Network

## 2004

- TVMDL plays a critical role in containing and eradicating a highly pathogenic avian influenza outbreak in poultry in Gonzales County, Texas



# TVMDL History

## 2004

- College Station facility adds two new 800 sqft BSL-3 laboratories

## 2008

- TVMDL is one of the nation's first laboratories to alert vets and federal agencies to the presence of melamine in companion animal food

## 2009

- TVMDL diagnoses an outbreak of equine piroplasmiasis

## 2011

- TVMDL opens a new 2,950 sqft Poultry Diagnostic Laboratory in Gonzales

## 2011

- The Amarillo laboratory is expanded to include a BSL-3 laboratory and improved specimen receiving

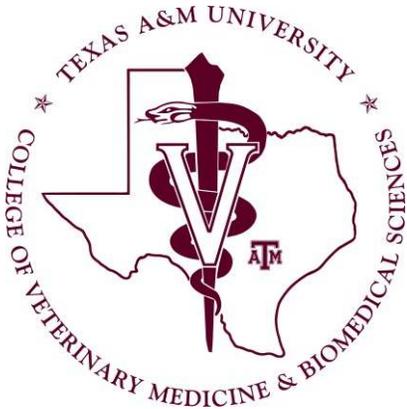


# TVMDL Clientele

- Texas veterinarians and animal owners
- Veterinarians and animal owners from other states
- Local, state and national agencies
- International clientele
- Commercial and state diagnostic laboratories

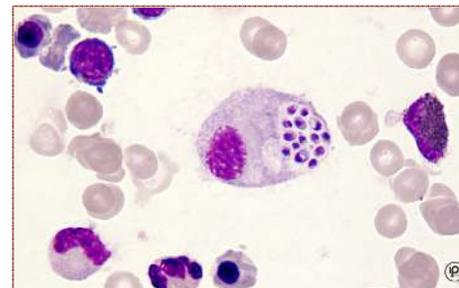
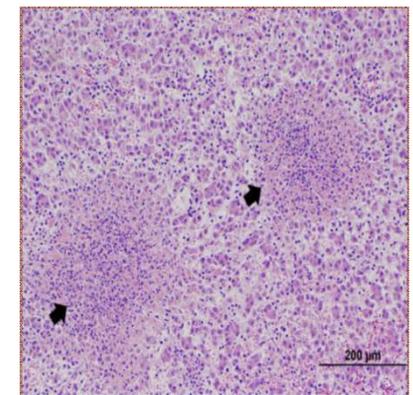


# TVMDL Strategic Partnerships



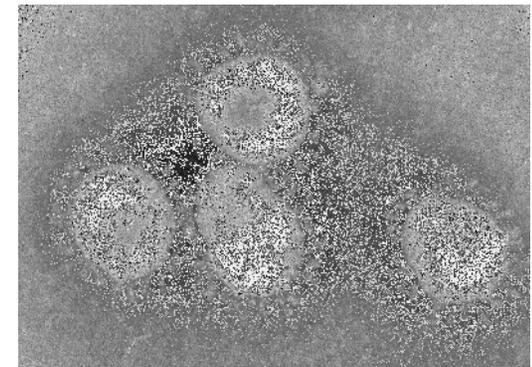
# Pathology Branch

- **Necropsy** examines animal remains to evaluate physical signs of injury or disease, or to sample tissue for testing.
- **Histopathology** conducts microscopic exams of tissue specimens taken during biopsy or necropsy.
- **Clinical Pathology** analyzes blood, body fluids, tissue fluids and secretions.



# Microbiology Branch

- **Bacteriology** identifies bacteria, fungi and other microorganisms cultured from animal specimens.
- **Virology** looks for viruses or immune responses to viruses in specimens from clinically ill animals.
- **Molecular Diagnostics** tests for minute amounts of genetic material of infectious microbes in specimens.
- **Serology** examines serum and other bodily fluids for antibodies that may indicate disease or exposure.



# Other Testing Sections

- **Poultry diagnostics** works with producers to protect flocks from infectious diseases of high significance.
- **Endocrinology** determines hormone levels to confirm certain diseases or to evaluate fertility.
- **Toxicology** studies and tests specimens for indications of accidental or intentional poisoning.
- **Drug Testing** analyzes samples from race track and livestock shows to help enforce competitive rules.



# Diagnostic Cases

- Small animal
- Large animal → tour of relevant lab sections

# Small Animal Case Presentation

Specimens were submitted from an adult male castrated domestic feline weighing 15 pounds. The clinical history stated:

*“This cat has a bone problem in RF and RR. The RR is more advanced – on radiographs looks like osteomyelitis but could be neoplasm as well? On RR, it affects the bones below the hock, on RF the radius and ulna. There are no major changes in thorax on radiographs. CBC, chemistries are in normal range. This cat is not acting normal and is not eating well.”*



# Case Presentation

- Submitting vet performed blood work – results normal
- Radiographs taken in clinic



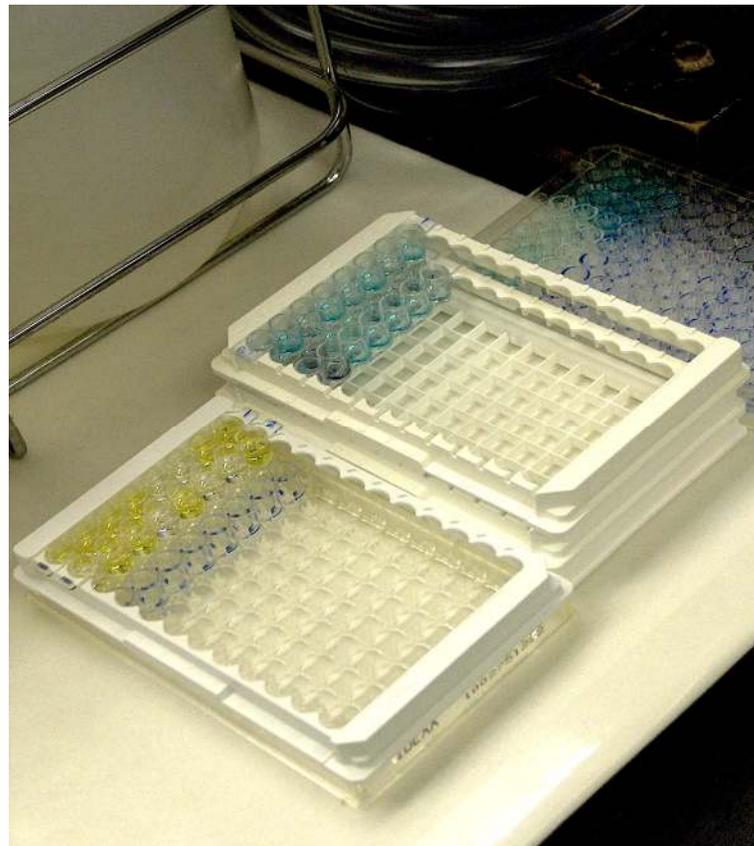
# Samples Submitted to TVMDL

- Serum → Virology
- Bone → Histopathology
- Bone swab → Bacteriology → Molecular Dx



# Virology Results

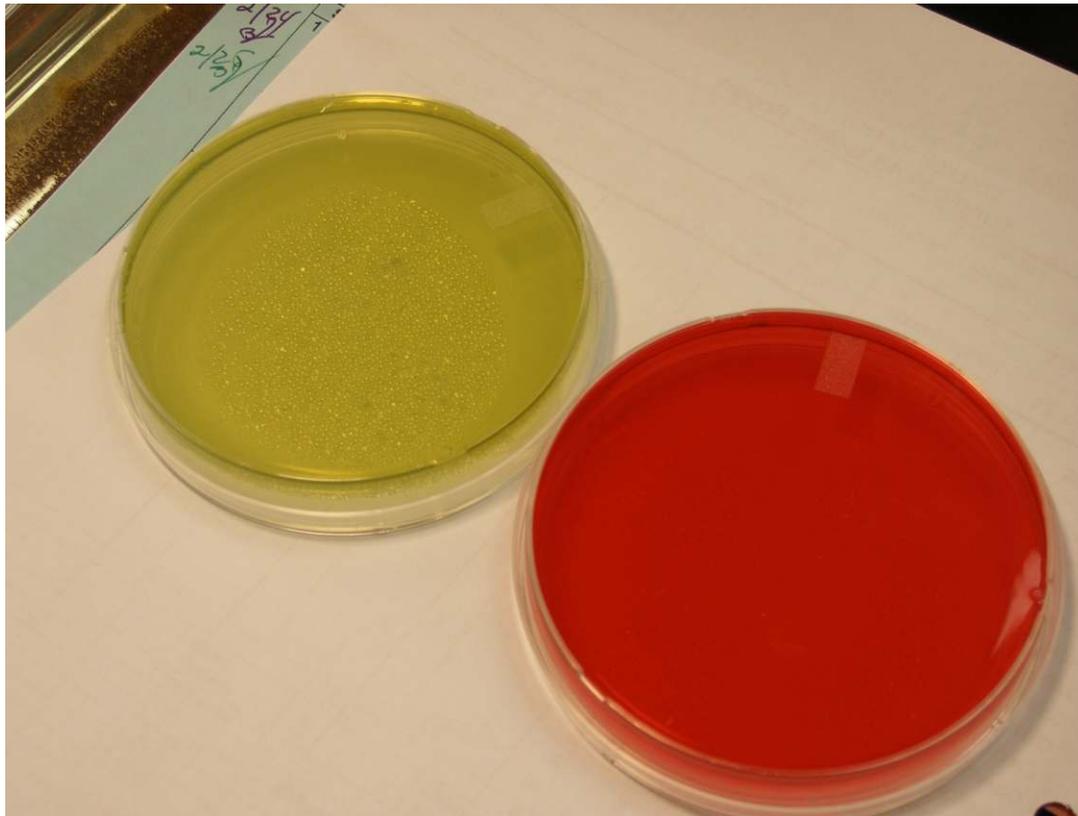
- Feline leukemia virus ELISA - negative
- Feline immunodeficiency virus ELISA - negative



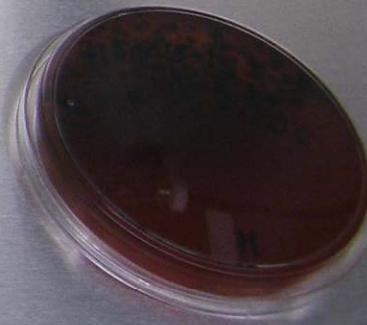
# Bacterial Culture Results

No bacterial growth on any plates after 6 days

Tiny slow-growing fungal colonies after 3 days on blood agar







5/21/08  
5/21/08

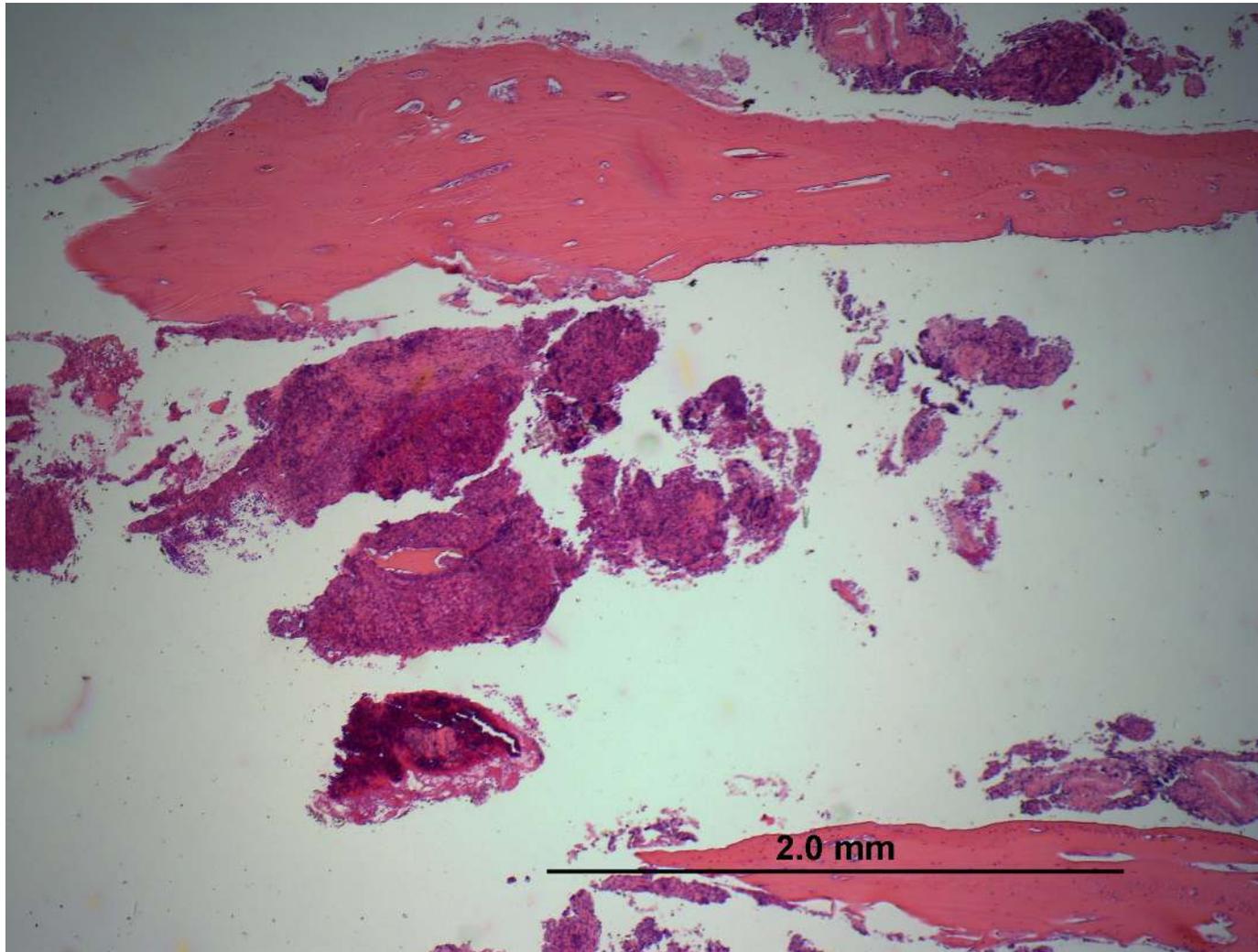


# Histopathology Results

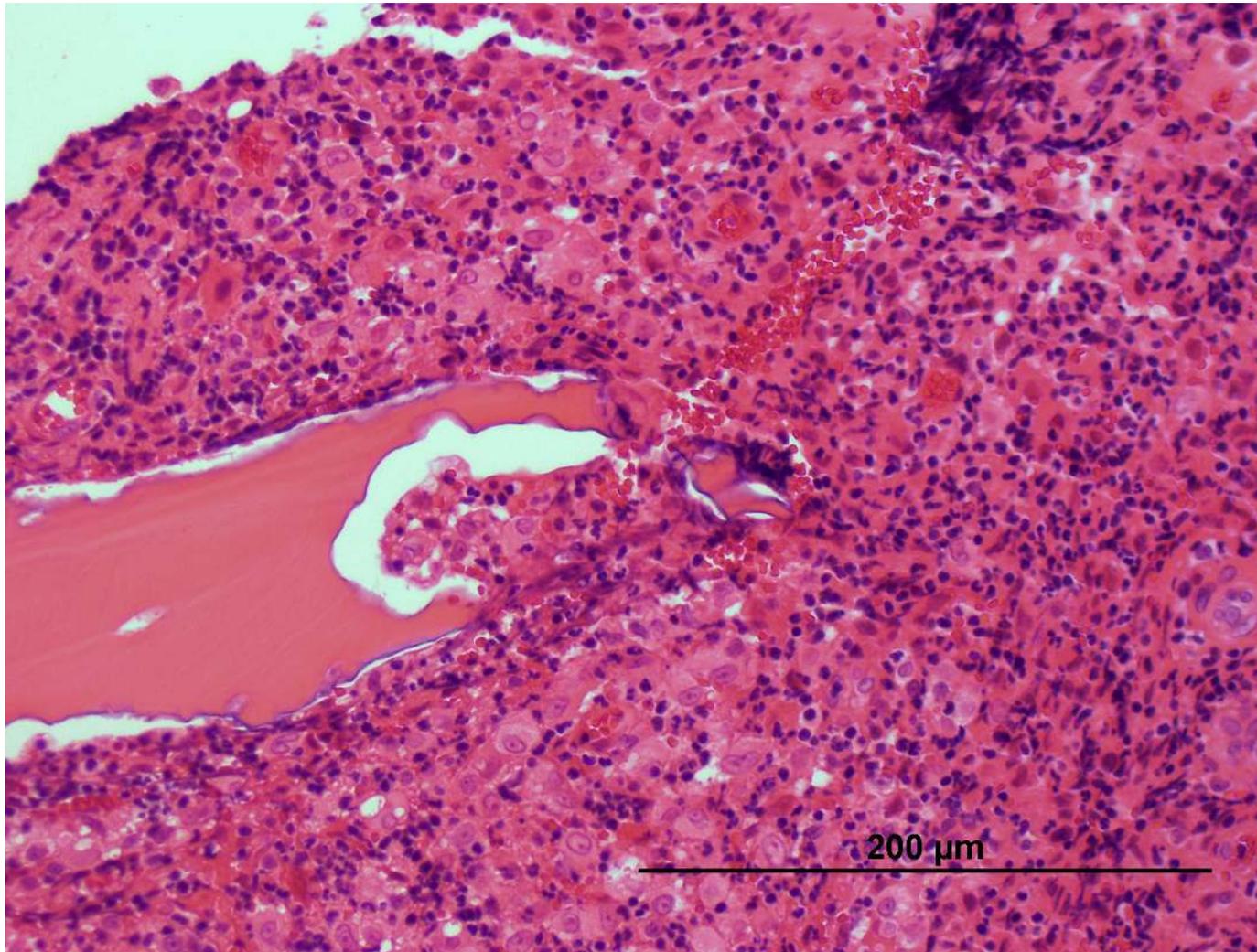
- Two sections of bone examined
- Areas of bone resorption and remodeling
- Histopathologic dx: pyogranulomatous osteomyelitis
- Comment: “...appearance of lesion is inflammatory rather than neoplastic in nature. Based on the clinical history, I am suspicious that this lesion might represent a systemic fungal disease...”



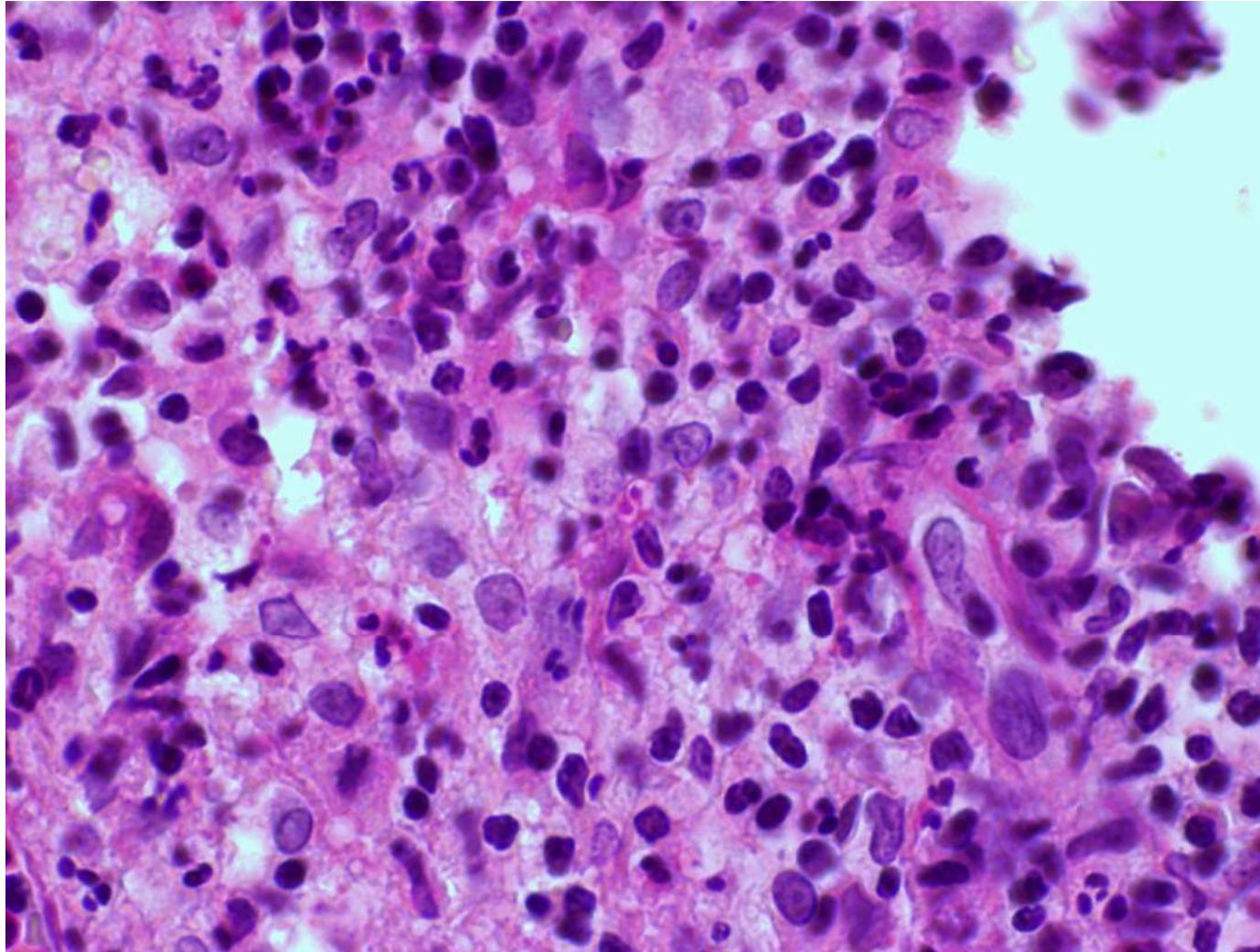
# Bone section, H&E



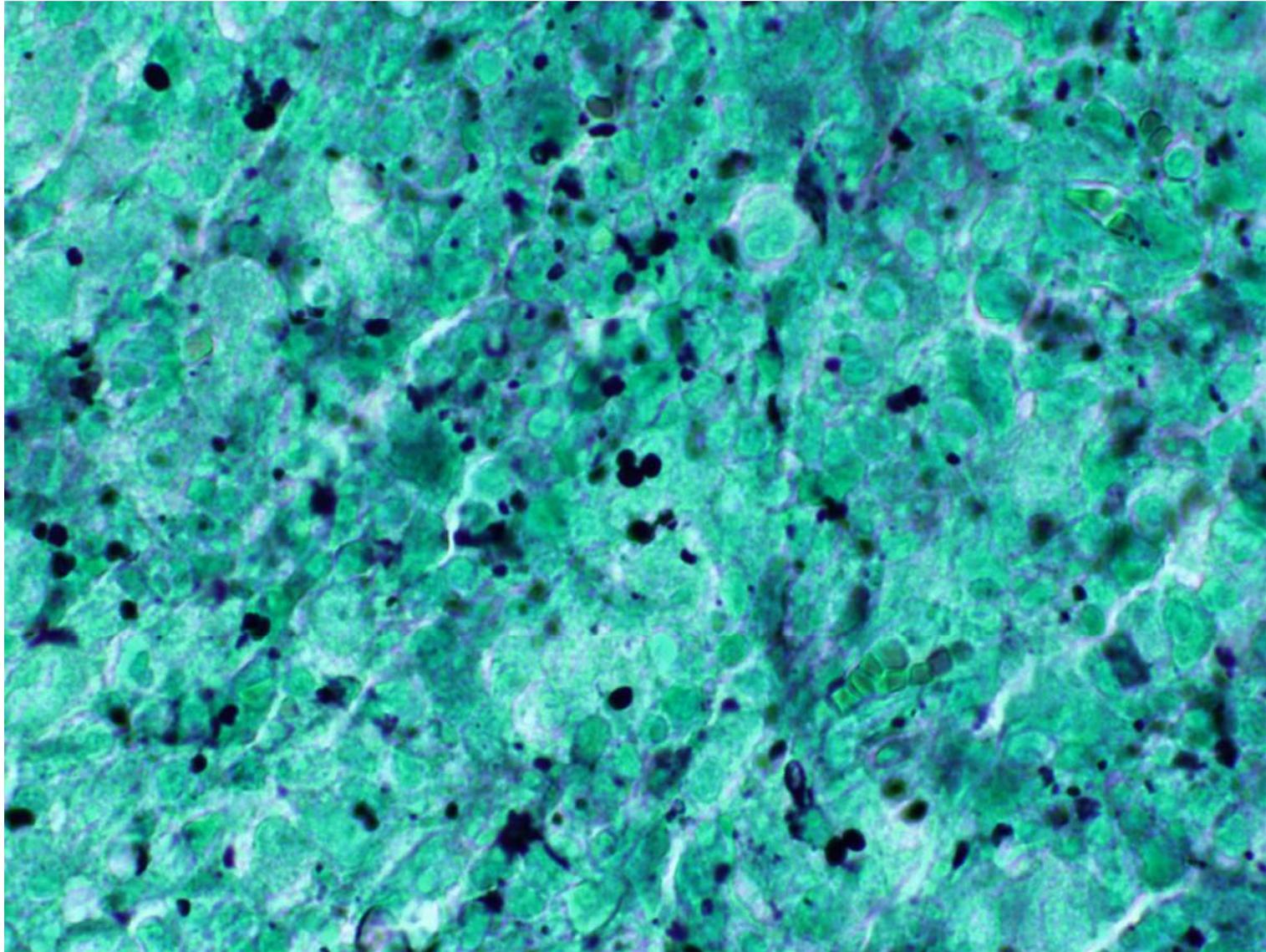
# Bone section, H&E



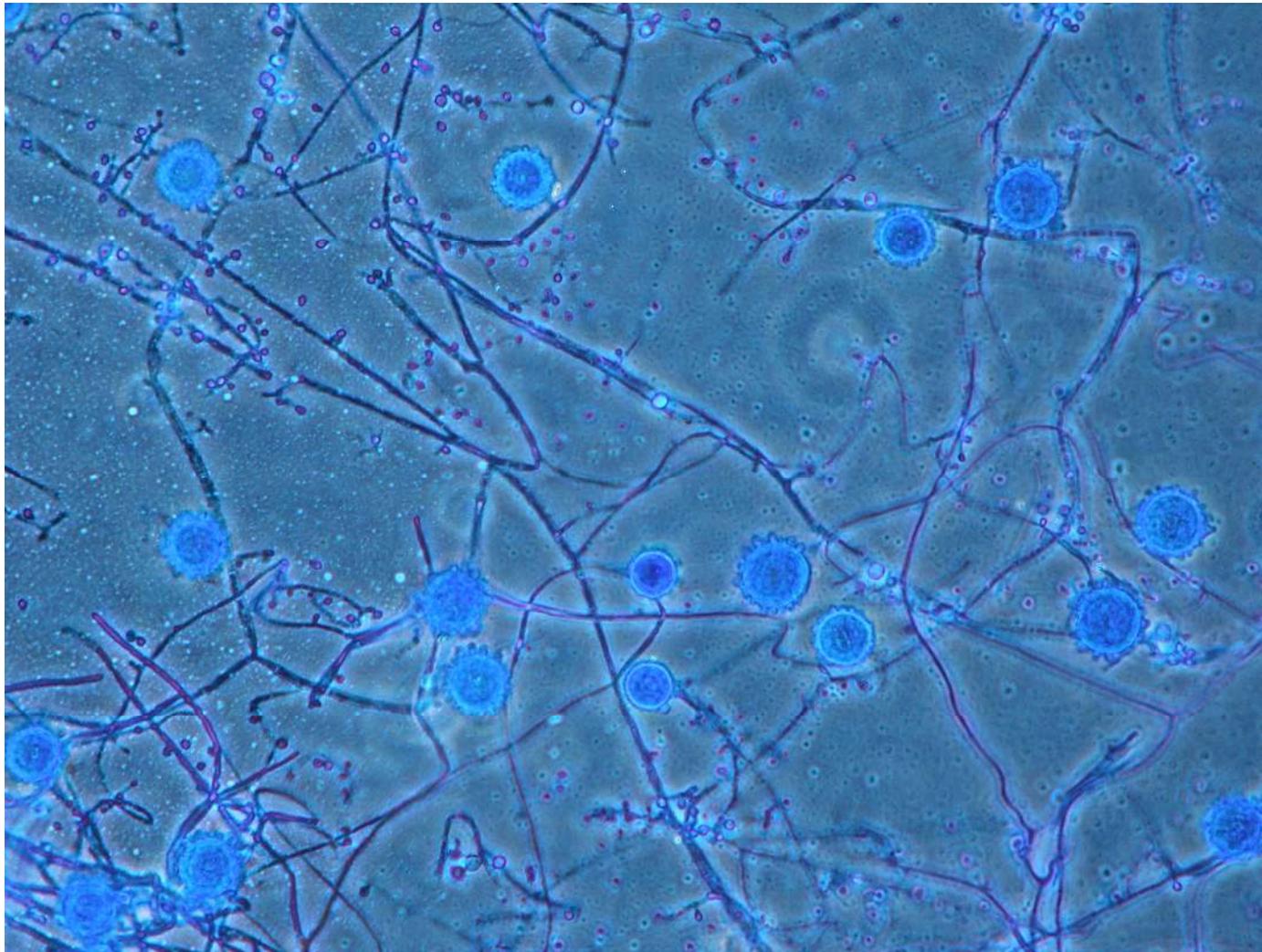
# Bone section, PAS



# Bone section, GMS



# *Histoplasma capsulatum*



# Molecular Sequencing Confirmation

C12 3180015-1	
% Identical Sites	Description
99.80%	Ajellomyces capsulatus isolate H9 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence
99.80%	Ajellomyces capsulatus genes for ITS1, 5.8S rRNA, ITS2, complete sequence, isolate:H79
99.80%	Ajellomyces capsulatus genes for ITS1, 5.8S rRNA, ITS2, complete sequence, isolate:IFM41329
99.30%	Ajellomyces capsulatus 5.8S rRNA gene, complete sequence, and ITS1 and ITS2
99.20%	Ajellomyces capsulatus isolate type F 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence
99.00%	Ajellomyces capsulatus isolate type E 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence
98.10%	Ajellomyces capsulatus genes for ITS1, 5.8S rRNA, ITS2, partial and complete sequence, isolate: blood sample No.1
97.90%	Ajellomyces capsulatus isolate B3-6-2R8 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence
97.70%	Ajellomyces capsulatus isolate E1-13-2R8 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence

# Histoplasmosis

- Canine histoplasmosis
  - Most susceptible domestic species
  - Young outdoor sporting breeds
- Feline histoplasmosis
  - Rare, progressive, debilitating (wt loss, lethargy, fever)
  - 44% of cats in endemic areas may harbor yeast in tissues
- Other animals
  - Horses, cattle, pigs, zoo birds, poultry, exotics

# Histoplasmosis

- **Public Health Significance**
  - Most common human pulmonary mycosis in U.S.
  - Disseminated disease
    - Impairment of host immunity
    - Elderly, immunocompromised
    - Dormancy in macrophages and reactivation
  - Disease in healthy individuals
    - Overwhelming inoculum of organisms
  - Interspecies transmission unlikely

# Case Coordination

- Histopathology findings supported by Bacterial culture results
- Virological etiologies were ruled out
- Molecular Dx confirmed identity of fungal isolate

# Impacts

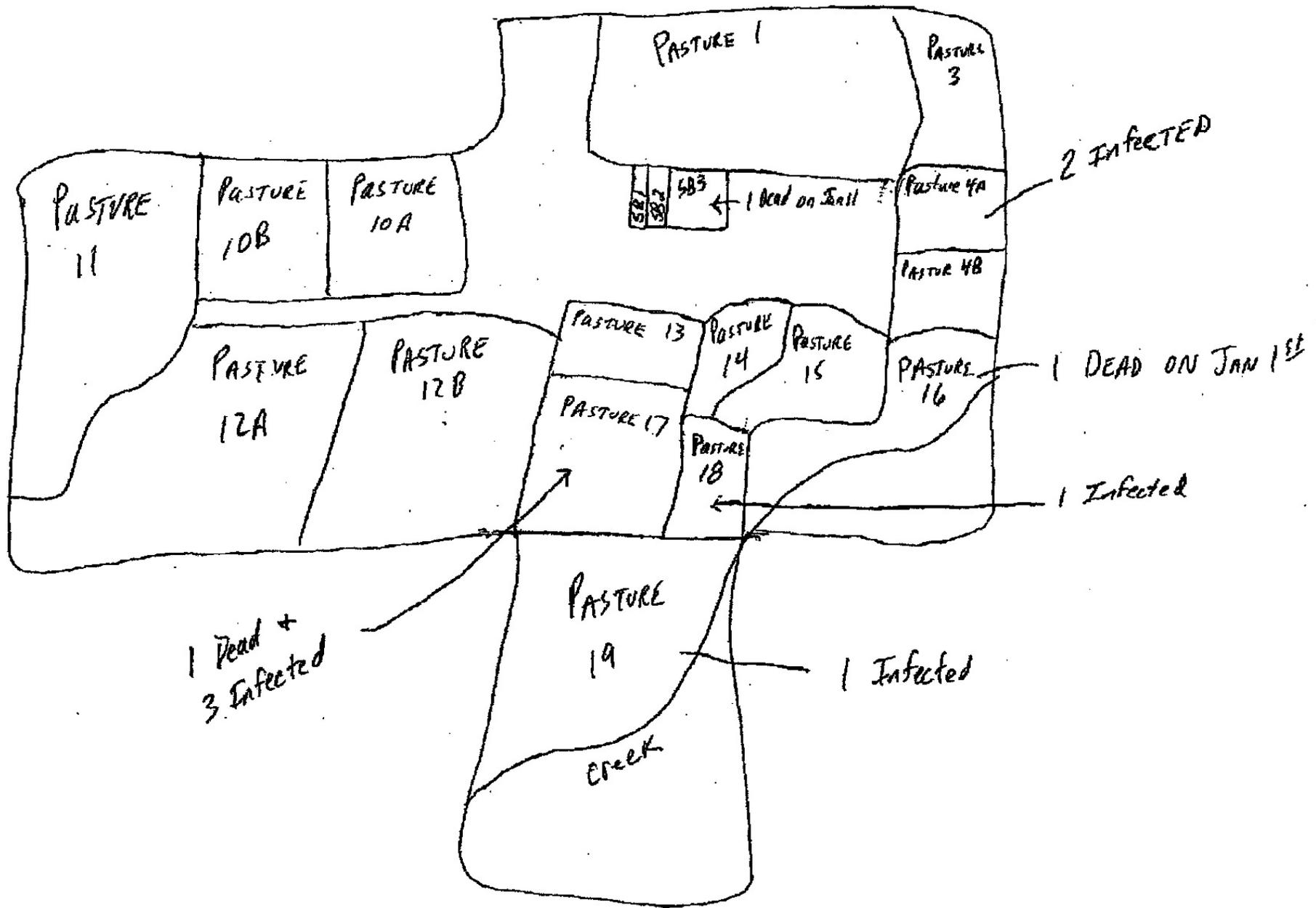
- Identification of etiology results in appropriate therapy
- Zoonotic agent identified – look for potential sources in order to protect human health

# Disease Outbreak in an Angus Cattle Herd



# Case Presentation

- 10 Angus cows down, weak, lethargic, watery diarrhea
- One cow died, submitted for necropsy
- Cow's calf died 4 days later. Tissues submitted for testing
- Morbidity/mortality affected multiple pastures



# Samples Submitted to TVMDL

- Cow → Necropsy, Histopath, Bacti, Virology, Tox
- Calf tissues → Histopath, Bacti, Tox
- 80 fecal samples → Bacti, Virology, Molecular Dx
- Hay, feed samples → Bacti, Tox

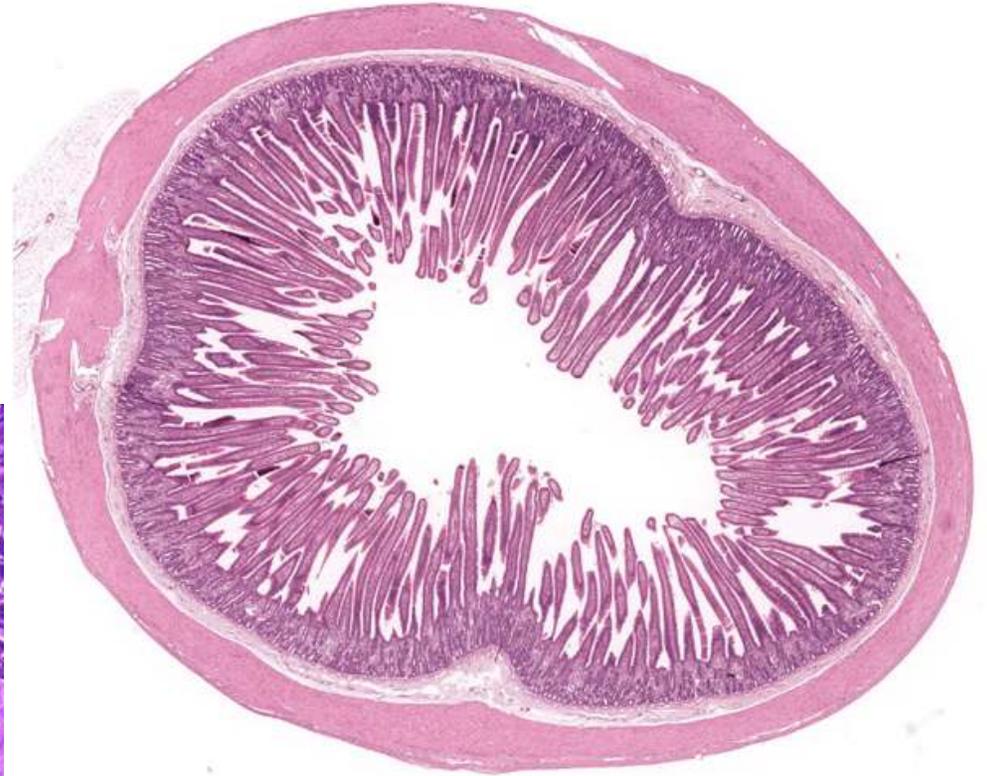
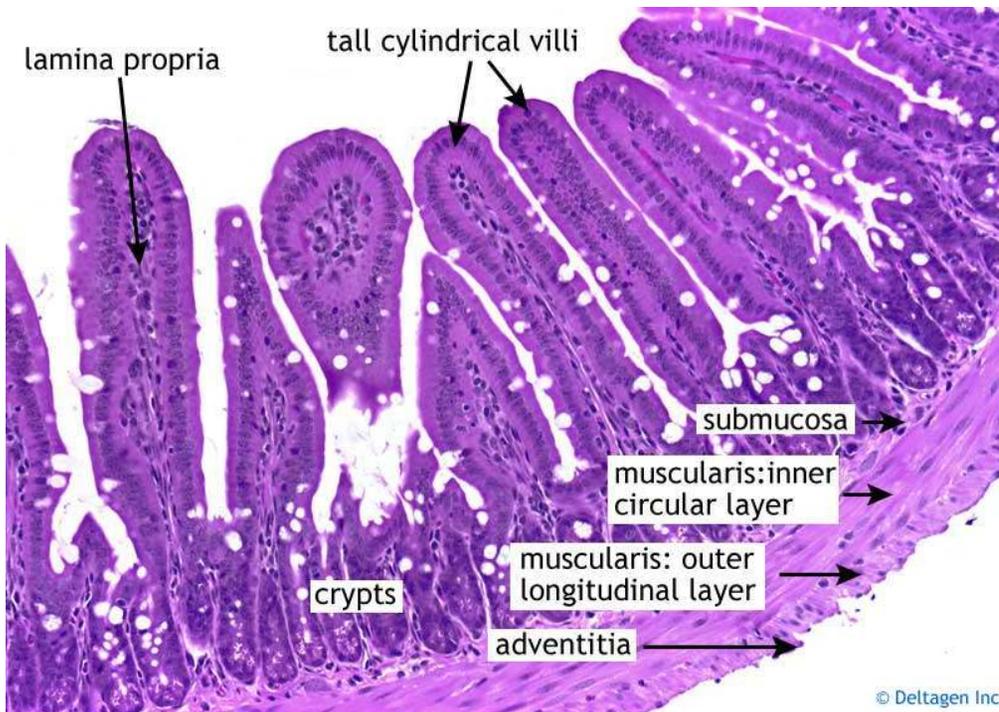
# Cow Necropsy Findings

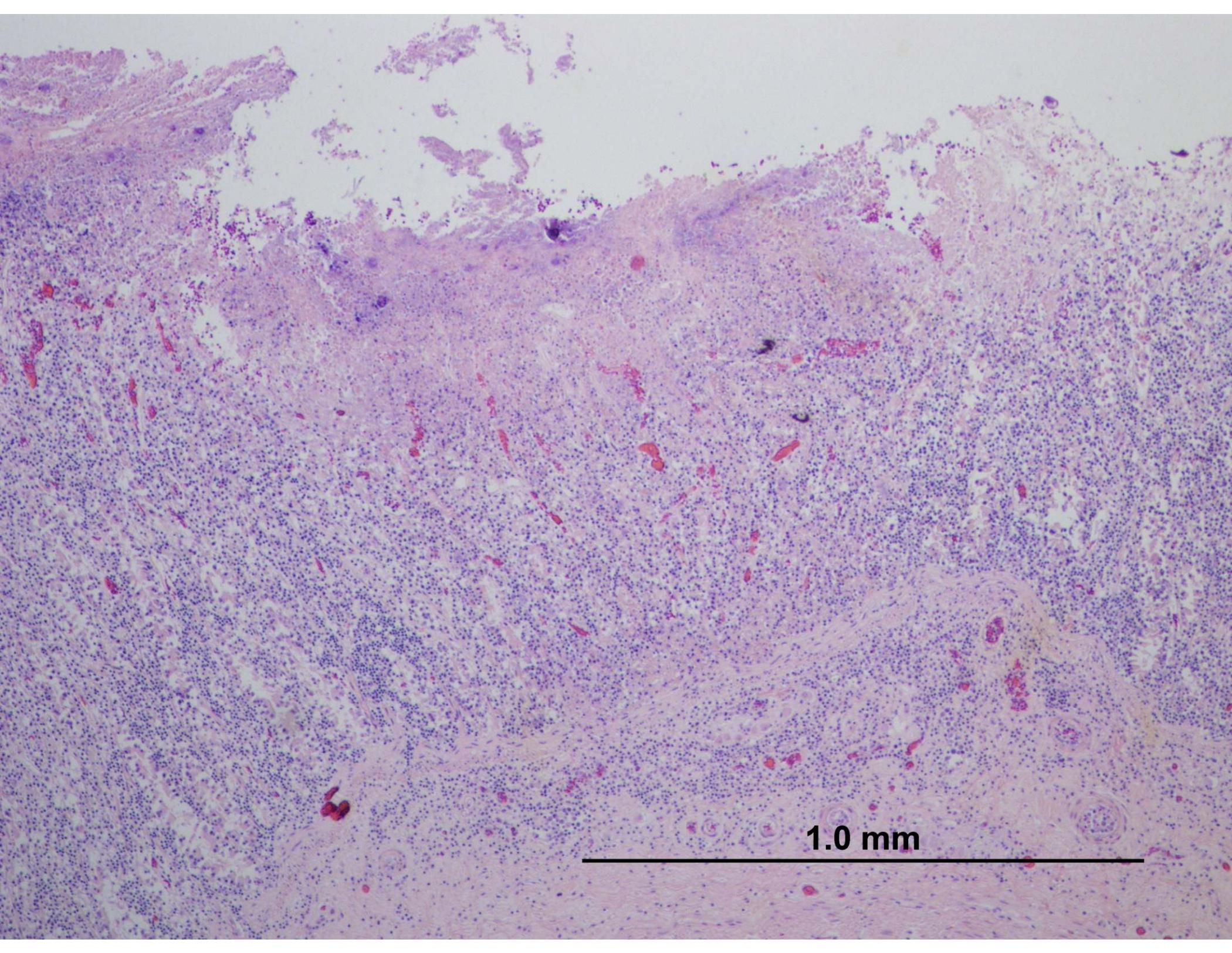
- Bloody abdominal fluid
- Enlarged colon with blood clots
- Large intestine with dead tissue

# Histopathologic Findings

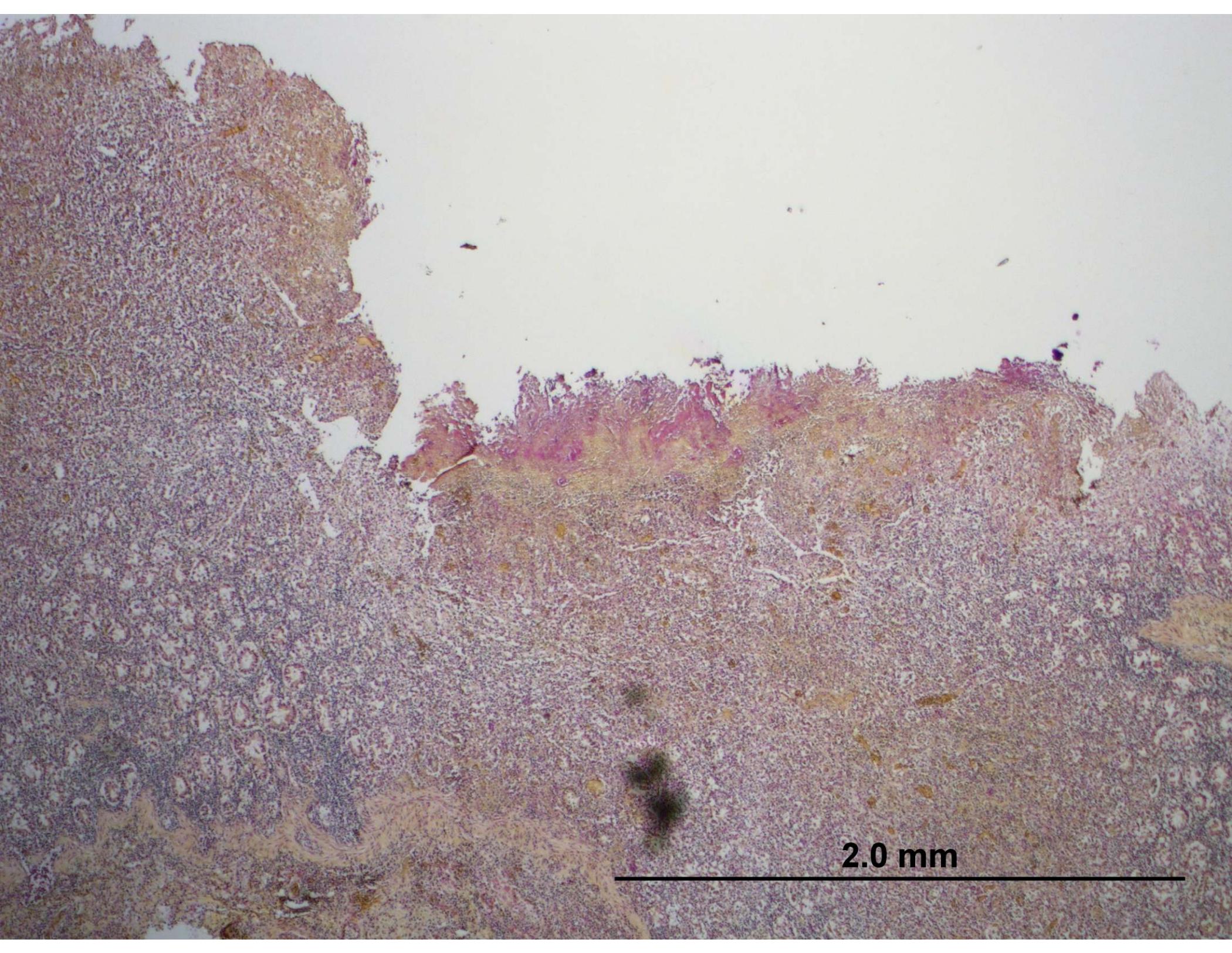
- Marked, multifocal , acute necrotizing enterocolitis
- Intralesional mixed bacteria:
  - Gram positive rods
  - Gram negative rods and coccobacilli

# Normal Intestine

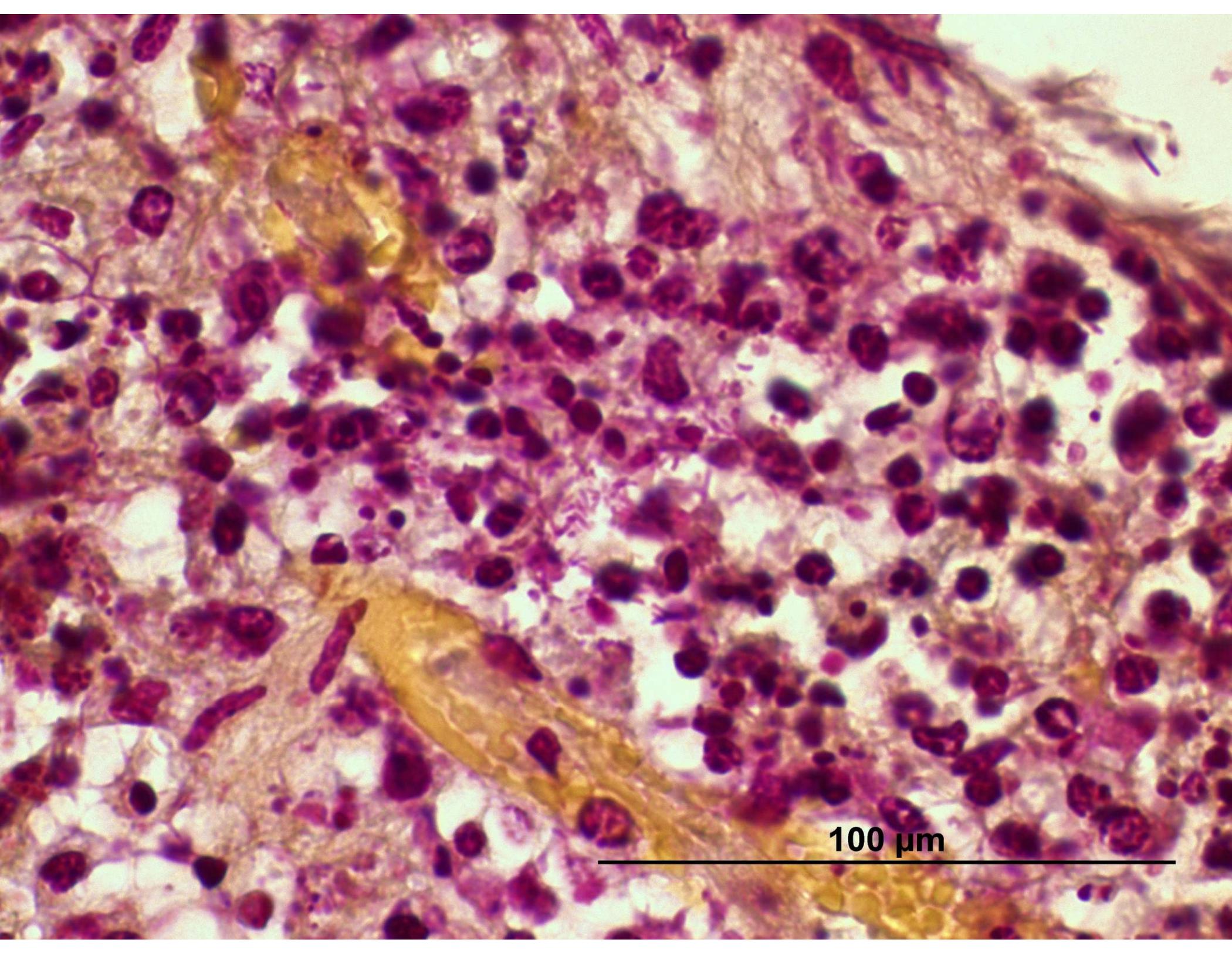




1.0 mm



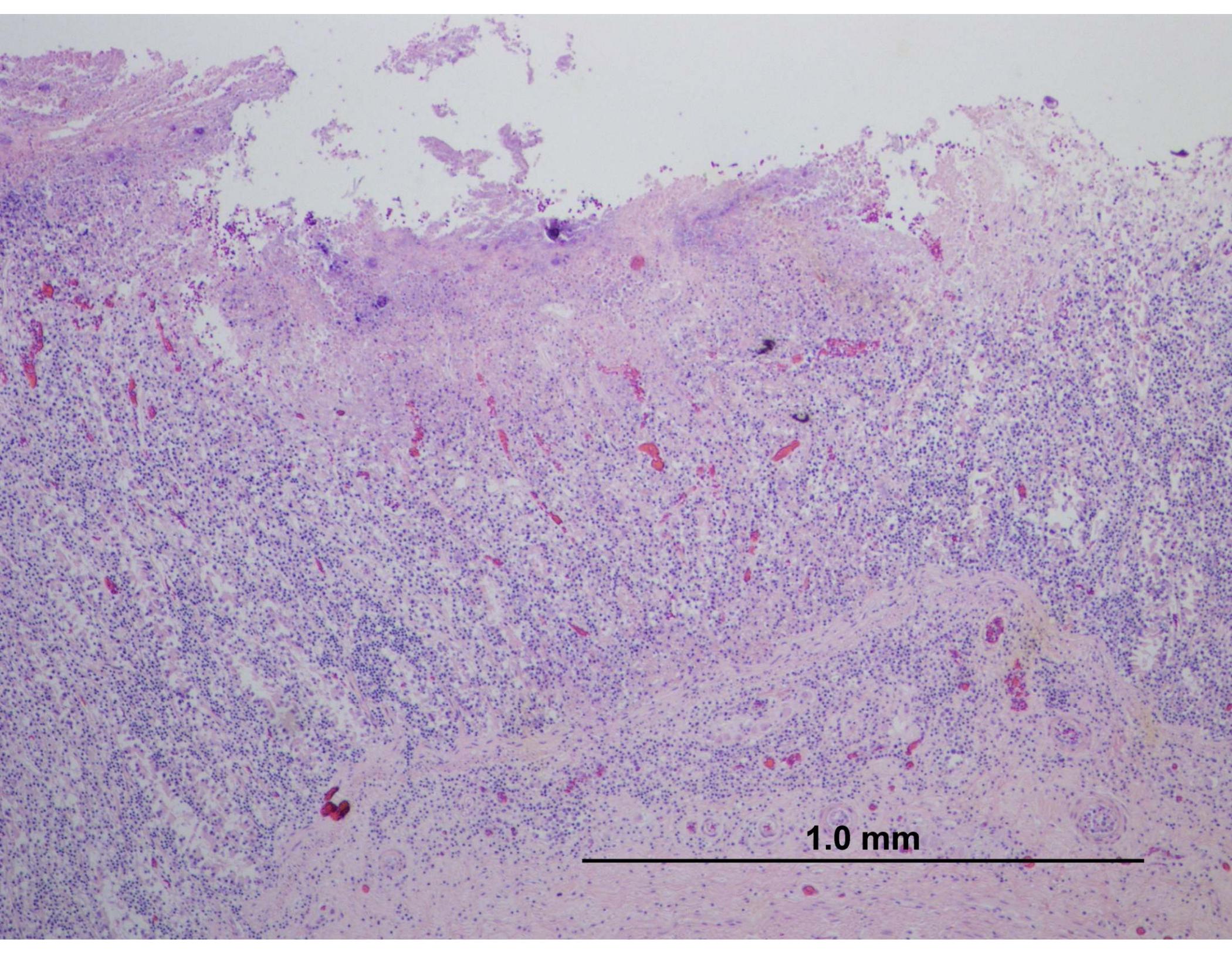
2.0 mm



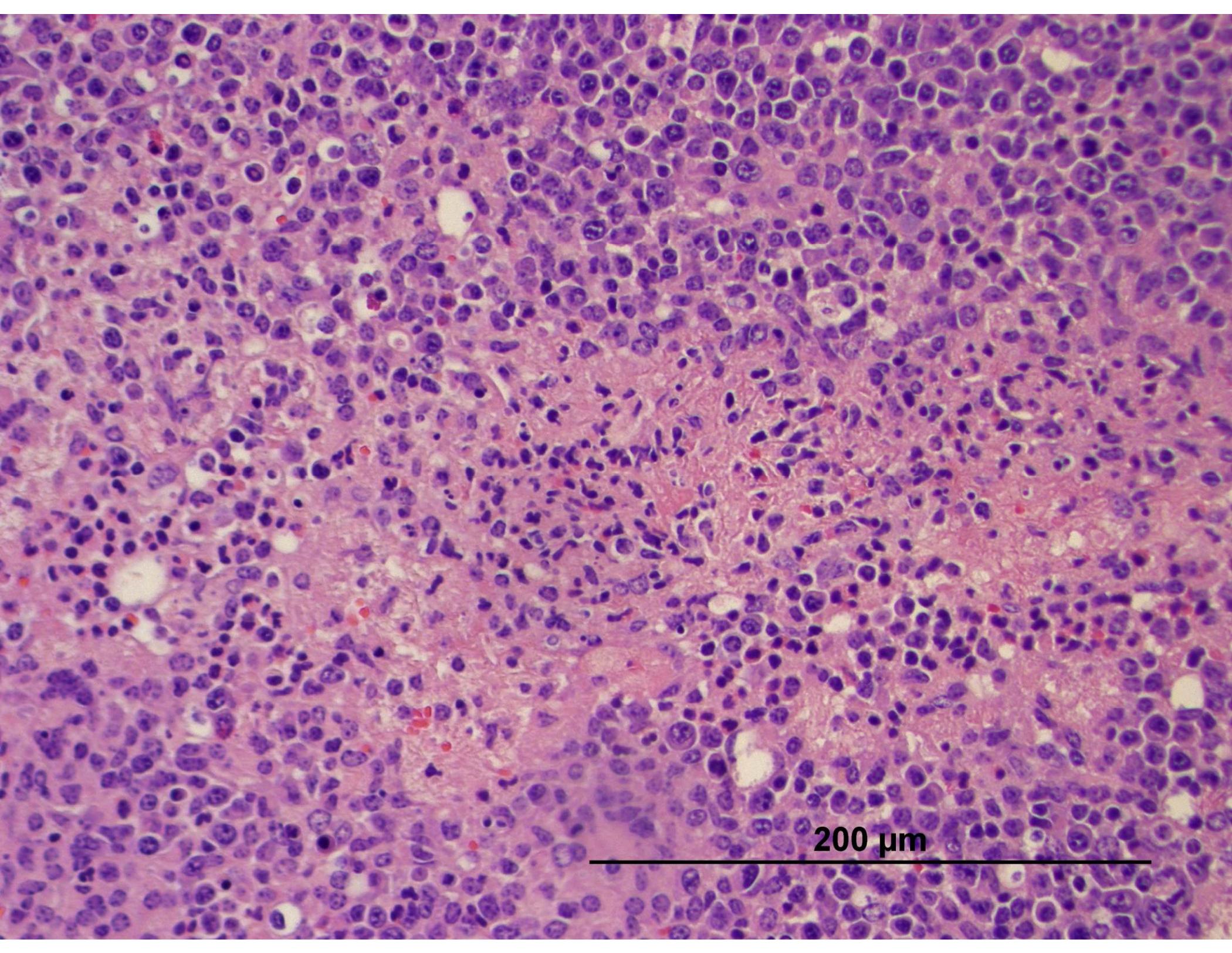
100  $\mu\text{m}$

# Testing of Calf Tissues

- Mild, acute enteritis
- Acute fibrinonecrotizing lymphadenitis



1.0 mm



200  $\mu\text{m}$

# *Salmonella enterica*



# Follow-up Testing Results

- PCR Salmonella testing
  - 1 week after index case submitted
  - 2/24 positive fecal samples
- Bacteriology Follow up
  - 3 weeks after index case submitted
  - 5/37 *Salmonella* positive fecal samples
  - NVSL Salmonella Serotyping
    - Salmonella 4,5,12:i:- all samples submitted

# Salmonella 4,5,12:i:-

- Very closely related to *S. enterica* Typhimurium serotype
- Lacks 2 flagella genes
- Isolated from cattle, swine, poultry, foods, and human cases
- Previously rare, but in recent years has become 6<sup>th</sup> most isolated serovar in US (2006)

# Salmonella 4,5,12:i:-

APPLIED AND ENVIRONMENTAL MICROBIOLOGY, Sept. 2010, p. 5947–5959 Vol. 76, No. 17

0099-2240/10/\$12.00 doi:10.1128/AEM.00377-10

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## **The Prevalence of Multidrug Resistance Is Higher among Bovine than Human *Salmonella enterica* Serotype Newport, Typhimurium, and 4,5,12:i: Isolates in the United States but Differs by Serotype and Geographic Region†**

K. Hoelzer,<sup>1\*</sup> Y. Soyer,<sup>1,6</sup> L. D. Rodriguez-Rivera,<sup>1</sup> K. J. Cummings,<sup>2</sup> P. L. McDonough,<sup>2</sup>  
D. J. Schoonmaker-Bopp,<sup>3</sup> T. P. Root,<sup>3</sup> N. B. Dumas,<sup>3</sup> L. D. Warnick,<sup>2</sup> Y. T. Grohn,<sup>2</sup>  
M. Wiedmann,<sup>1</sup> K. N. K. Baker,<sup>4</sup> T. E. Besser,<sup>4</sup> D. D. Hancock,<sup>5</sup> and M. A. Davis<sup>4</sup>

Received 11 February 2010/Accepted 6 July 2010

# Salmonella 4,5,12:i:-

K. Hoelzer, et al Conclusions:

“Our study provides support for the hypothesis that cattle may represent a reservoir for multidrug-resistant *Salmonella* and may serve as a source for emerging MDR strains...”

# Case Coordination

- Necropsy and Histopathology findings supported by Bacterial culture results
- Toxicological and Virus etiologies were ruled out
- Follow-up testing by culture and Molecular Dx (PCR) showed multiple animals affected across operation
- Source of infection not identified

# Impacts

- Rapid results reduced number of animals infected
- Financial losses were minimized
- Zoonosis identified, thereby protecting human health

# Tour of Testing Sections

- Histopathology
- Virology
- Toxicology
- Bacteriology