

Lessons from  
“Mycobacterium-related”  
Elephant necropsy cases

Scott P. Terrell, DVM, DACVP







# My “files”

- 41 “adult” animals spanning 11 years
  - Fetal and neonatal deaths excluded
  - Herpes virus cases excluded
- 21 Asians
  - Musculoskeletal, repro neoplasia, cardiac disease, GI disease, Mycobacterial disease
- 20 Africans
  - Musculoskeletal disease, GI disease, Mycobacterial disease

# Mycobacterial-related disease

- 14 cases
  - 6 Africans
    - 1 confirmed *M. tuberculosis* by post mortem culture
      - Gross and histologic granulomatous disease
      - **Negative** acid-fast stains
    - 5 confirmed atypical Mycobacterial disease
      - Culture (4), PCR (1)
  - 8 Asians (skewed sample?)
    - 6 confirmed *M. tuberculosis* by post mortem culture
    - 2 gross and/or histologic granulomatous disease, acid-fast negative, and culture negative\*

African elephants

# African elephants with Mycobacterium-related disease

## 1 confirmed *M. tuberculosis* by post mortem culture

- Exposure and trunk wash history unknown
- Gross and histologic granulomatous disease
- Negative acid-fast stains\*\*\*

## 5 confirmed atypical Mycobacterial disease

- *M. szulgai* - 3 cases by culture
- *M. smegmatis* – 1 case by culture
- *M. aurupense* – 1 case by PCR

# African elephant with *Mycobacterium*-related disease

1 confirmed *M. tuberculosis* by post mortem culture

– No mention of TB in history

- Clinical evidence of musculoskeletal disease

– Gross findings

- Several pulmonary granulomas > 12cm diameter
- Caseous material in bronchioles
- Tracheobronchial lymph nodes enlarged
- Sublumbar lymph node enlarged and caseous



# African elephant with *Mycobacterium*-related disease

1 confirmed *M. tuberculosis* by post mortem culture

## – Histopathology

- Evaluated by highly qualified zoo pathologist
- “Numerous” granulomas evaluated
- Central caseous debris and mineralization
- Multiple acid-fast stains negative
- Diagnosed as highly suspicious for M tb.

## – Culture (NVSL)

- Positive from lung
- Negative from lymph node and bronchial

Asian elephants

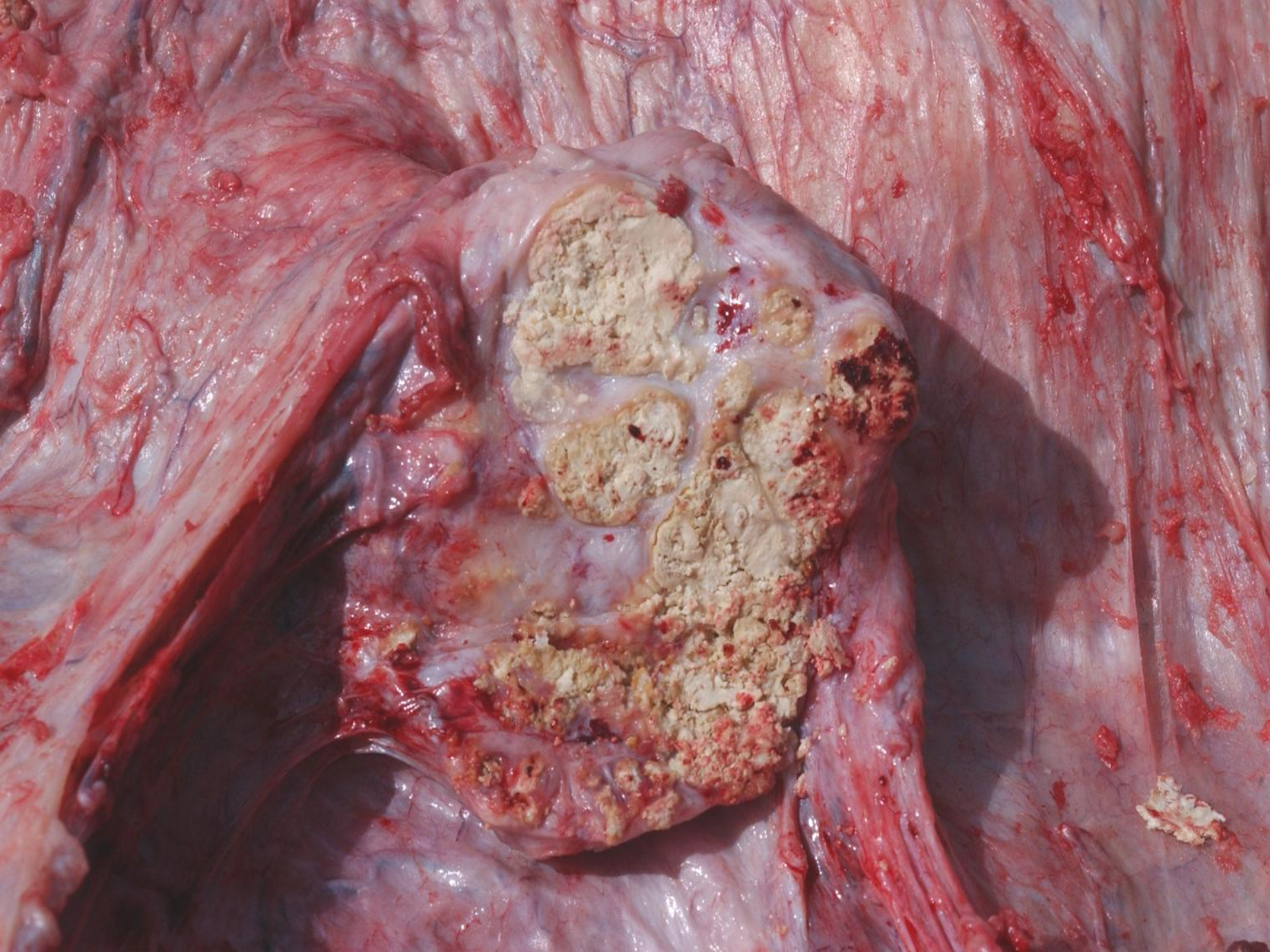
# *Mycobacterium*-related disease in Asian elephants

- 6 confirmed *M. tuberculosis* by post mortem culture
  - 2 historically trunk wash positive, tx hist unknown
  - 4 had at least an exposure history to TB+ animal
- 2 gross and/or histologic granulomatous disease, acid-fast negative, and culture negative
  - 1 historically trunk wash positive, treated
  - 1 pos STAT-pak, MAPIA, treated

# *M. tb* confirmed Asian elephants (n=6)

- Gross pathology
  - Lesions limited to lungs and lymph nodes – 3
  - Lesions present in lungs, lymph nodes, and other sites/organs – 3
    - Trachea, repro tract, mesenteric LN
  - Caseous and mineralized granulomas
  - Fibrotic areas of lung
  - Dorsal lung lobes common
  - Tracheobronchial LN most common

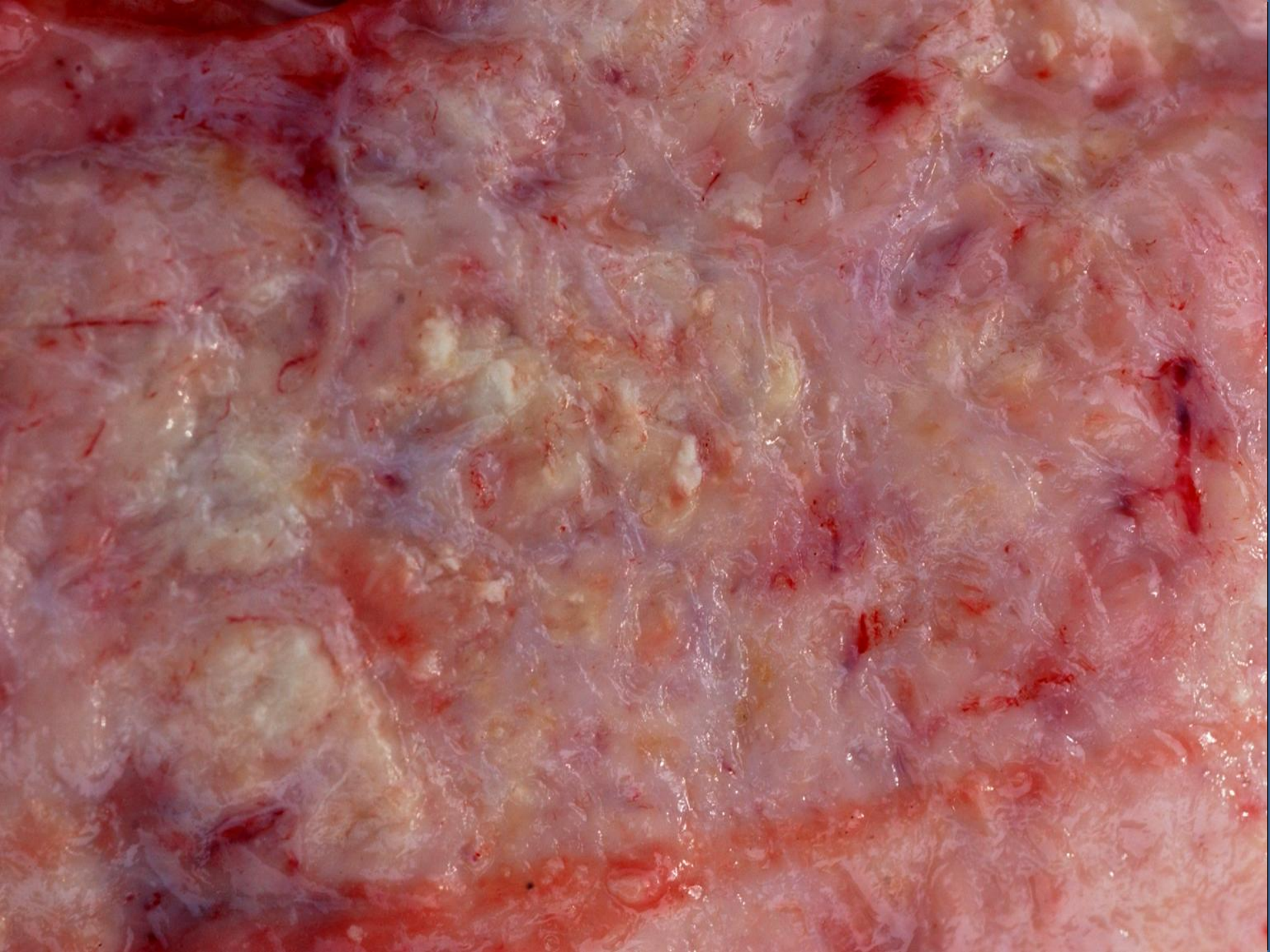














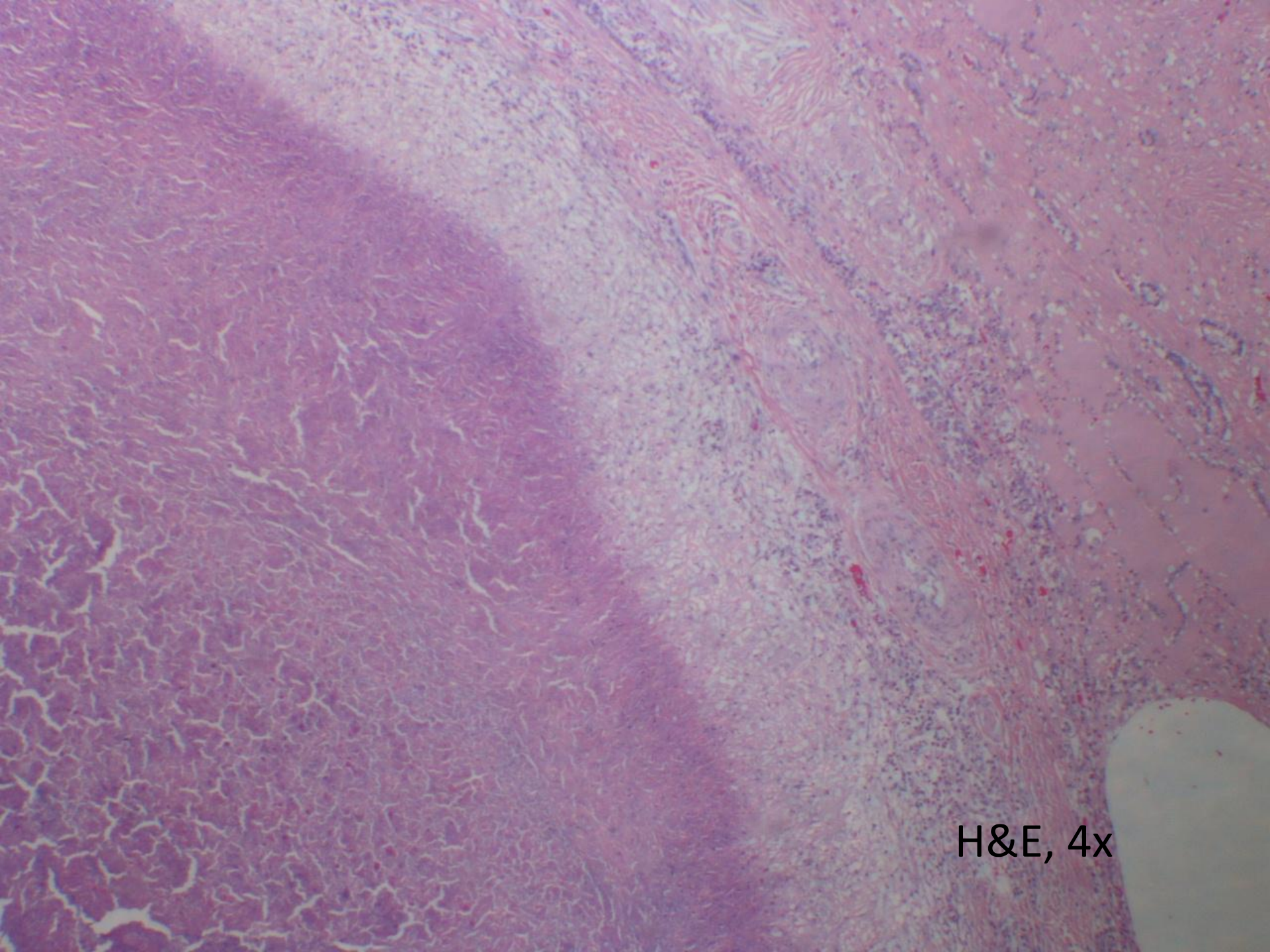




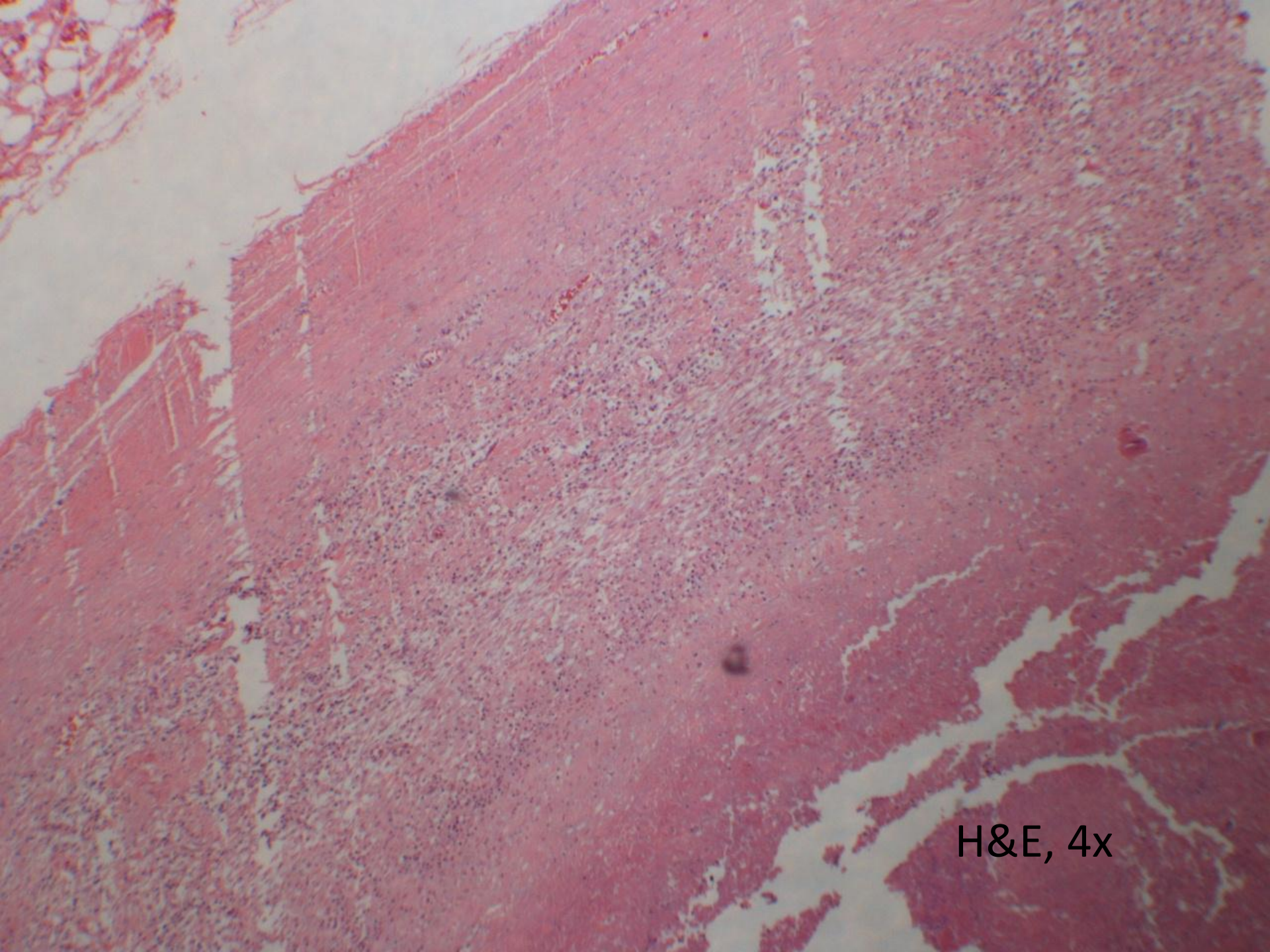


# *M. tb* confirmed Asian elephants (n=6)

- Histopathology
  - Inflammation
    - Classic granulomatous pneumonia
    - Areas of histiocytic and necrosuppurative bronchopneumonia
  - AF positive bacteria rare or very rare
    - Small % of granulomas examined are AF positive
      - 10%
    - Bacteria can be as few as 3-5 organisms
- Cytology
  - My experience, not valuable in the field

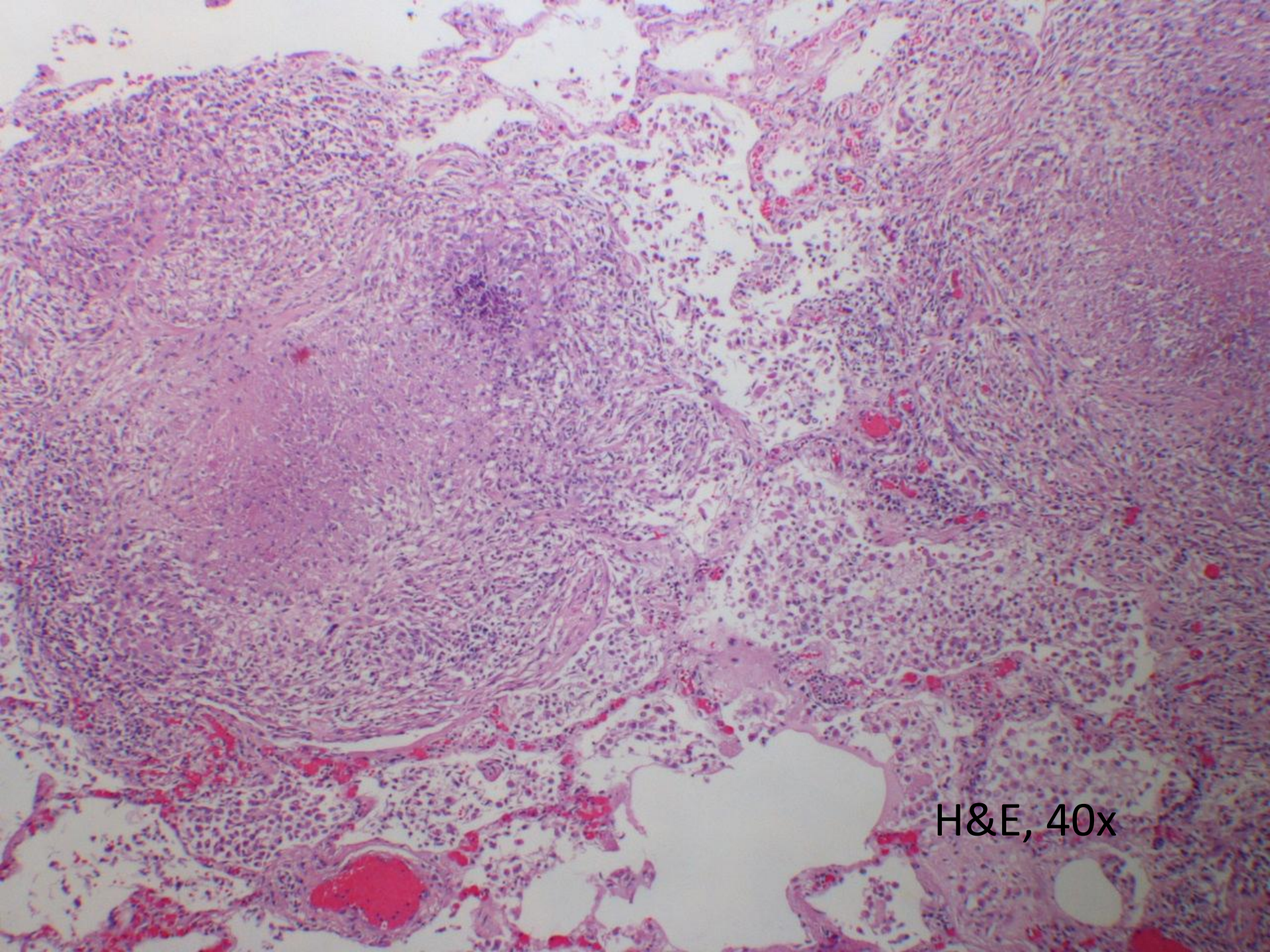


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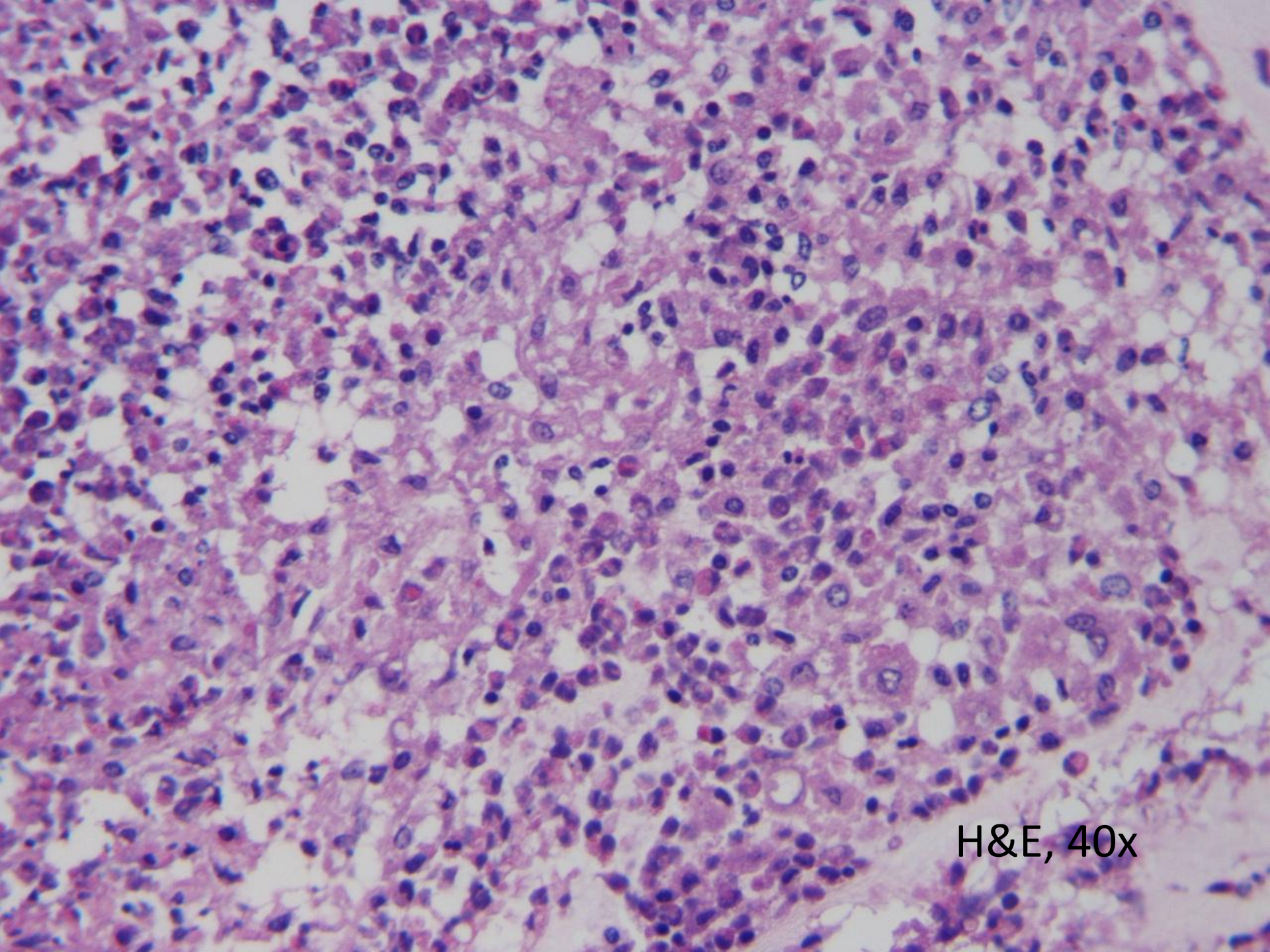


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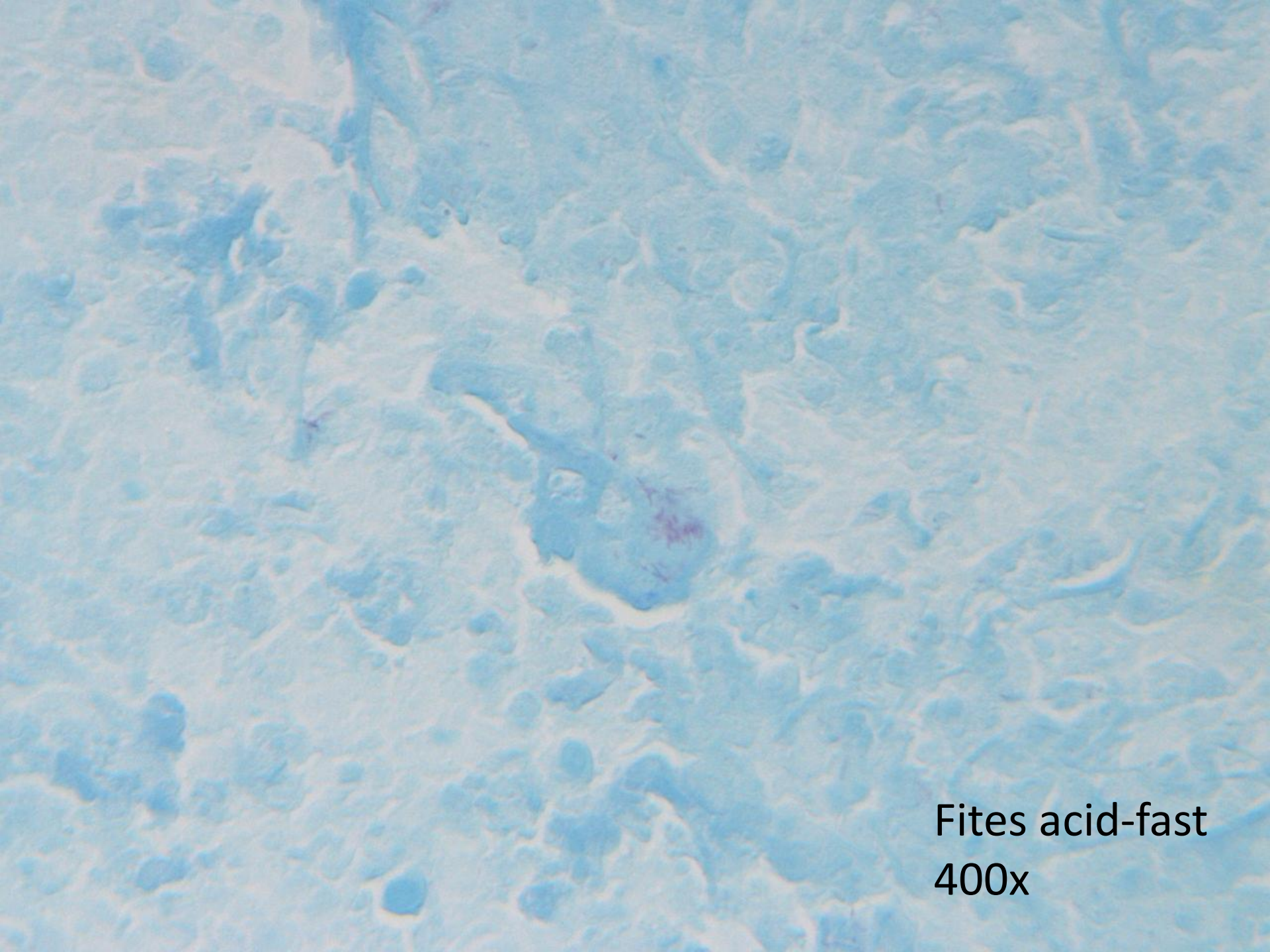




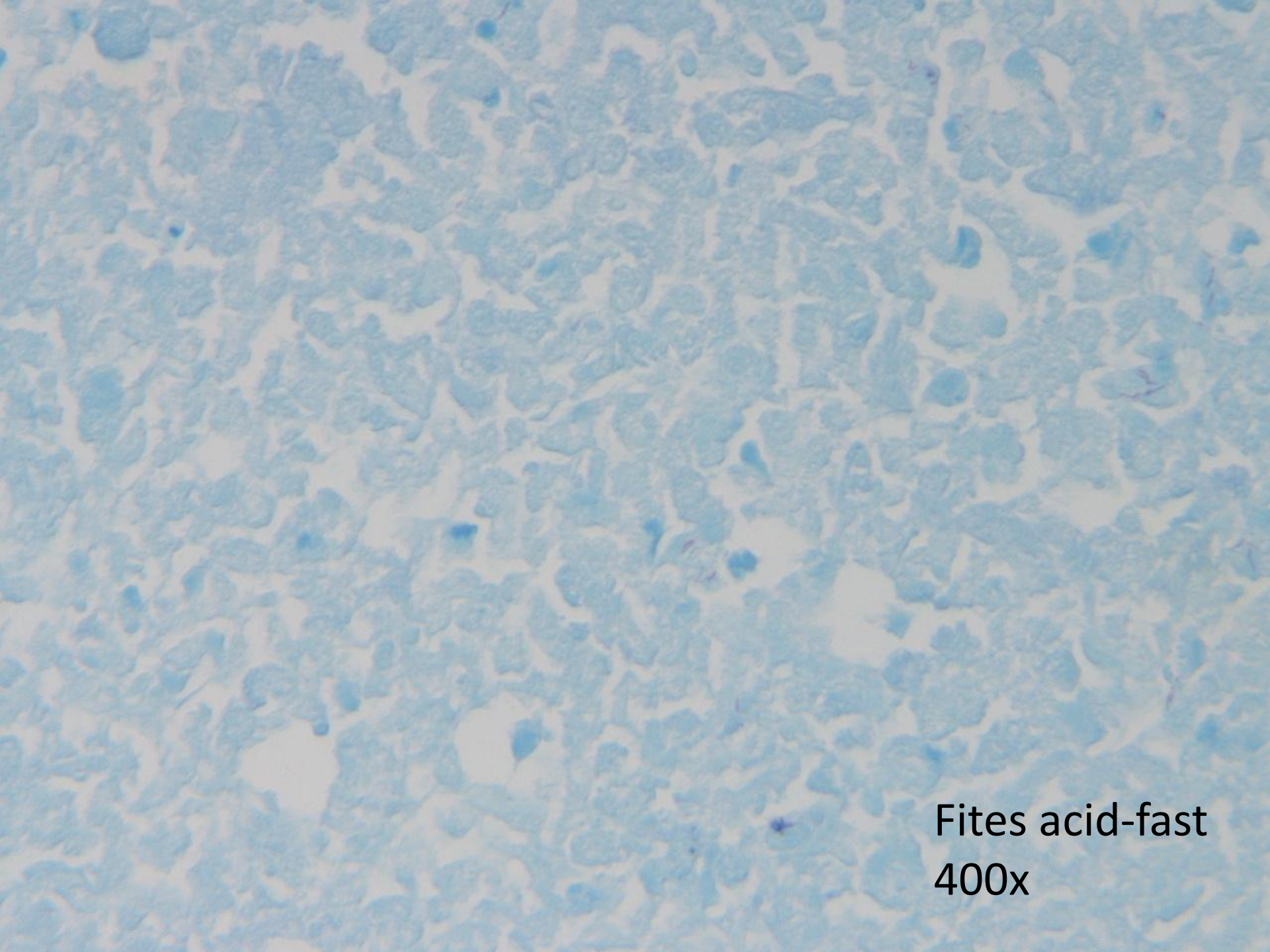
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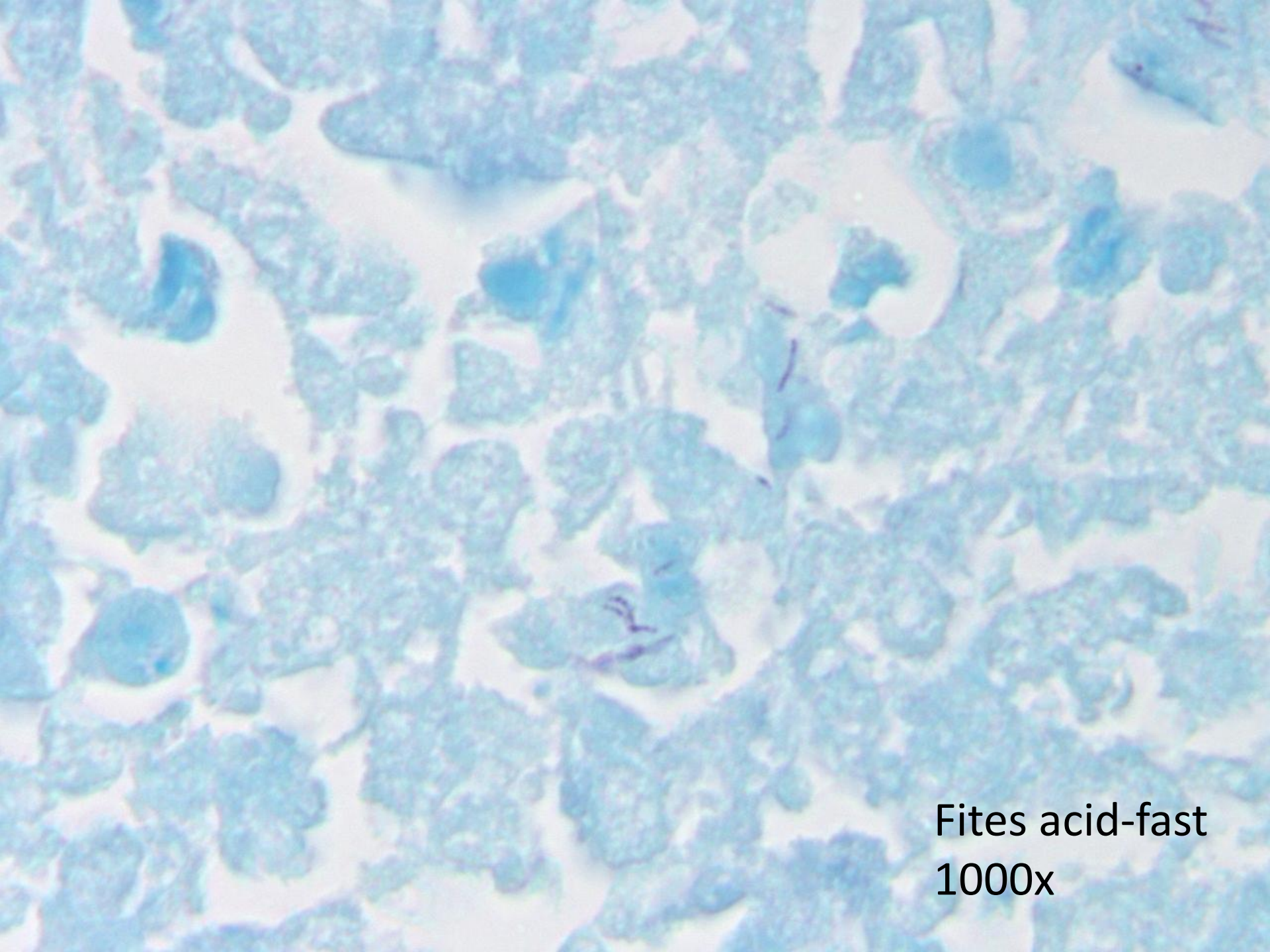
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Fites acid-fast  
400x



Fites acid-fast  
400x



Fites acid-fast  
1000x

# *M. tb* confirmed Asian elephants (n=6)

- Culture
  - NVSL most common
  - Lung lesions most commonly positive
  - Do not have data on # of tissues submitted
  - Formalin fixed + fresh tissue preferred to NVSL

# *Tb related disease in Asians*

## – 2/8 animals

- 1 - Gross and histopathologic granulomas in lung
  - Acid-fast negative
  - Historically trunk wash positive
- 1 – Gross lesions in lymph node/trachea/lung
  - Granulomas in lymph node and trachea
  - Lung described as fibrosis
  - No granulomatous inflammation on histopath
  - No trachea listed on histopath report
  - Historically STAT-pak, MAPIA positive
- Both animals culture negative
- Both animals had been treated

# *Summary*

- Mtb more common in Asians than Africans
- Lung and thoracic LN pathology most common
- Histopathologic lesions vary
- Acid-fast organisms are rare
- Culture of post mortem lesions is often successful
- Sampling techniques are inconsistent
- Historical information is lacking



# *Recommendations*

- Good solid necropsy data can help...
  - Identify active cases
  - Define latency
  - Provide information with regard to accuracy of diagnostic testing
    - Trunk wash
    - Serologic
    - Other

# *Recommendations*

- For elephants with a “TB related history” ...  
post mortem TB workup should be HIGH  
priority
  - Stat-PAK/MAPIA
  - Culture positive
  - Exposure history
  
  - Human safety always takes priority

# *Recommendations*

- Post mortem TB work up should include
  - Peri-mortem serologic testing if possible (bank at least)
  - Post-mortem “secretion” cultures
    - Trunk, trachea, airways
  - Thorough sampling of lung and lymph node lesions
    - Individually labeled tissue
    - Multiple tissues for culture
    - Multiple tissues for histopathology
    - Tissue for culture rather than swab
    - Be sure to sample lesional tissue
    - NVSL +/- NJ
    - Histopathology by pathologist with TB experience

# *Recommendations*

- Modify SSP necropsy/research protocol
  - Detailed procedures for TB sampling
    - Secretions
    - Tissues
  - Detailed requests for exposure, trunk wash, serologic history, clinical signs