

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

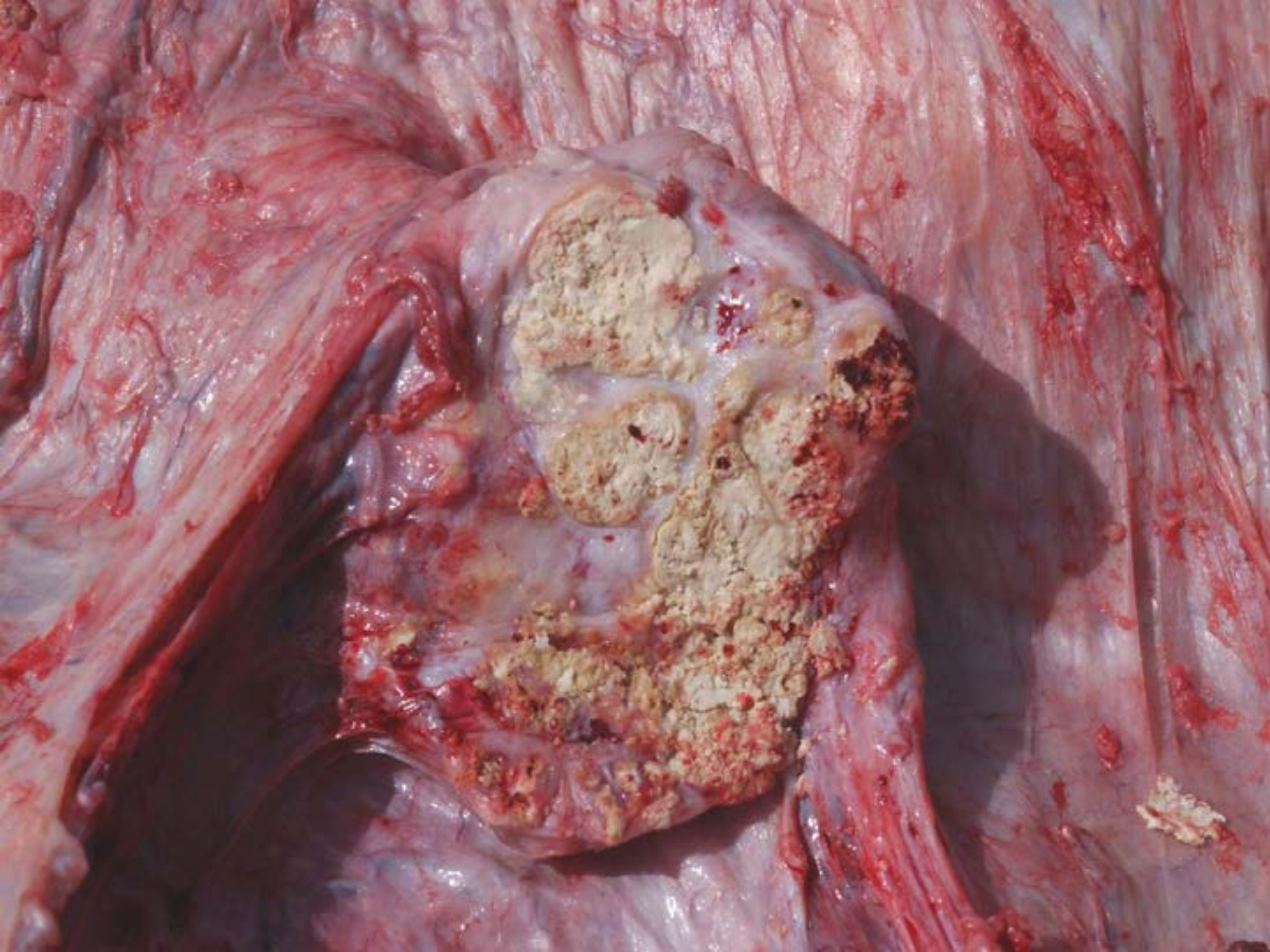
Mycobacterium-related disease in Asian elephants

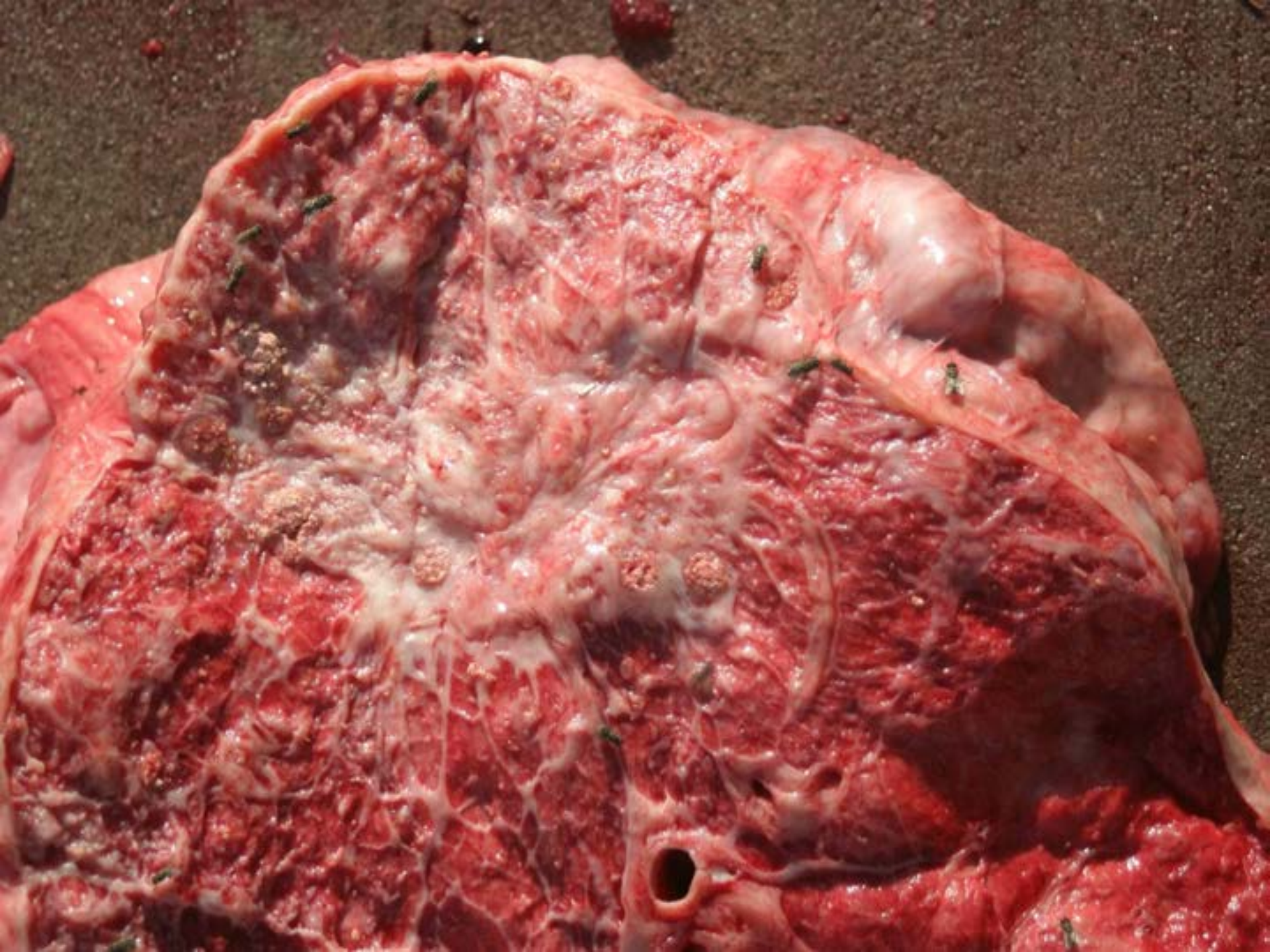
- 6 confirmed *M. tuberculosis* by post mortem culture
 - 2 historically trunk wash positive, tx hist unknown
 - 4 had at least an exposure history to TB+ animal
- 2 gross and/or histologic granulomatous disease, acid-fast negative, and culture negative
 - 1 historically trunk wash positive, treated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

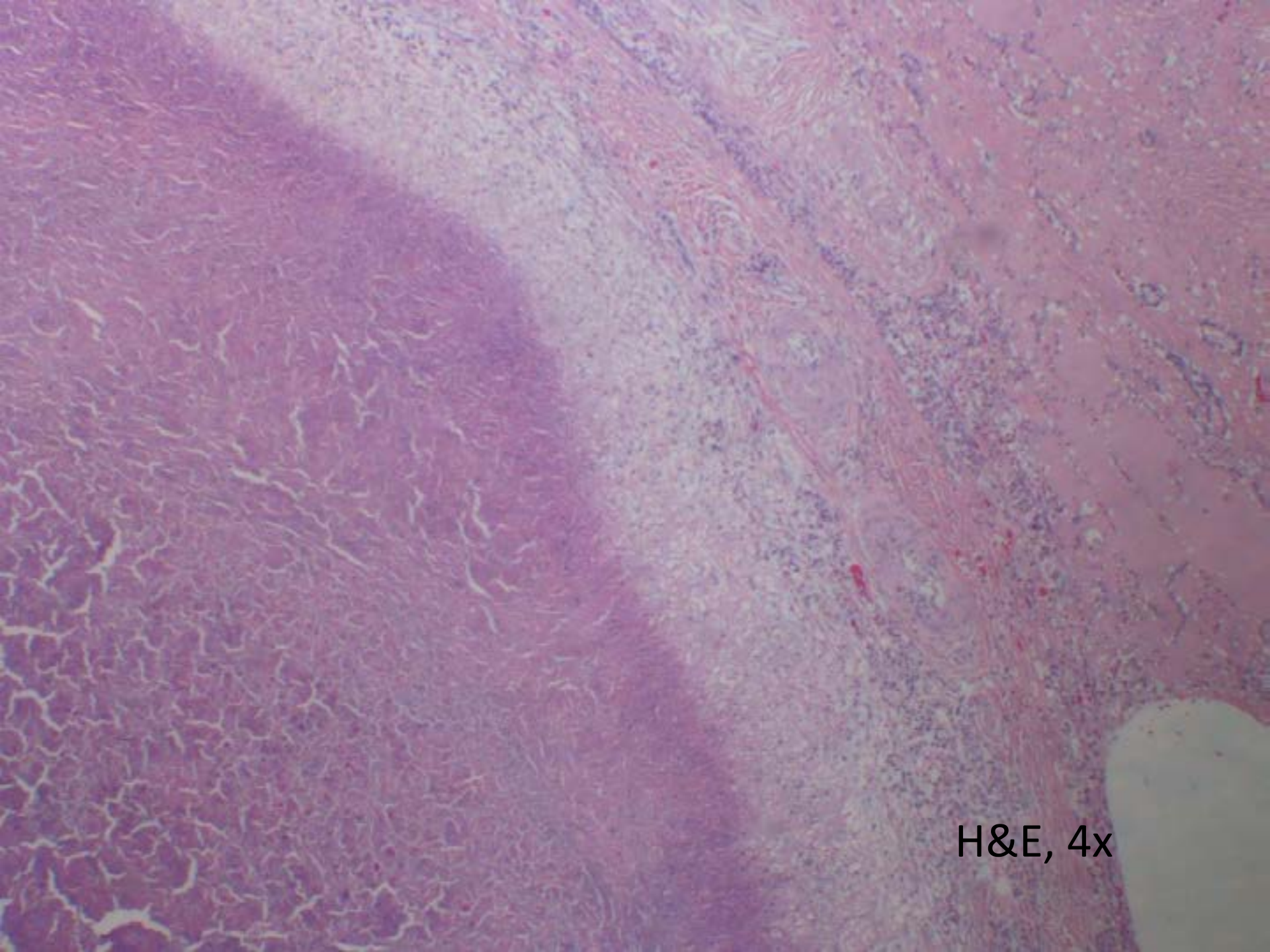
- Small % of granulomas examined are AF positive

- 10%

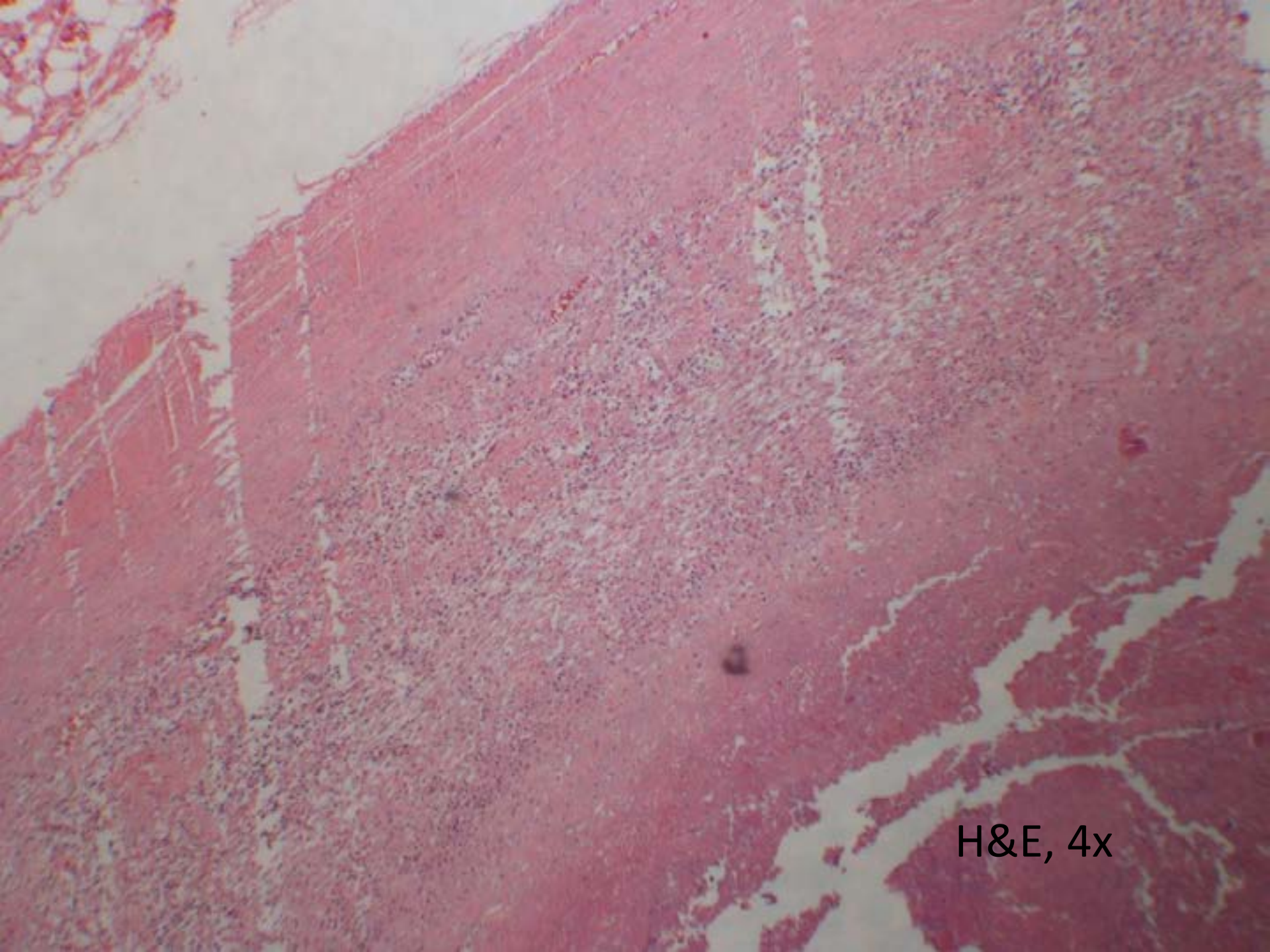
- Bacteria can be as few as 3-5 organisms

- Cytology

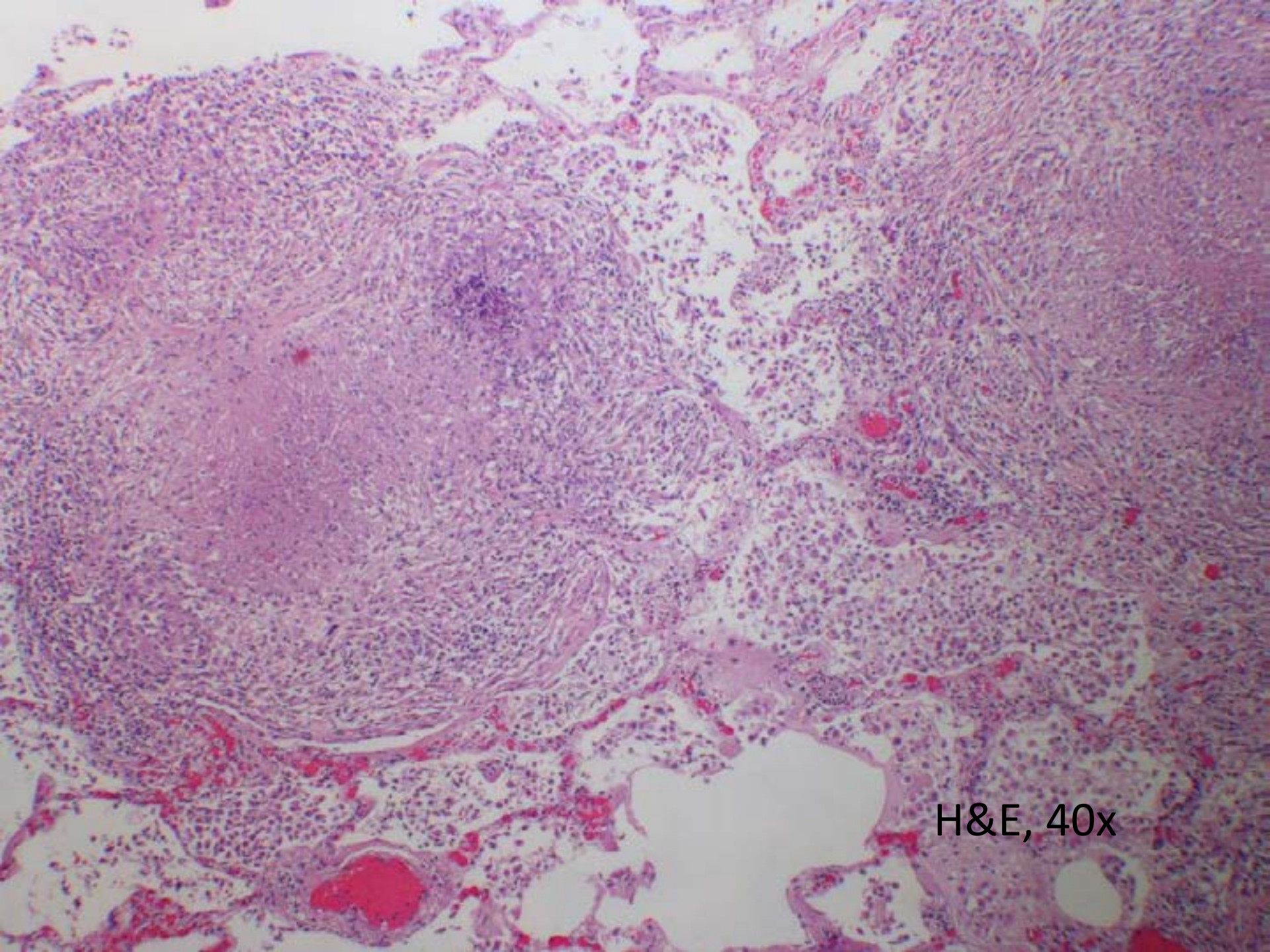
- My experience, not valuable in the field



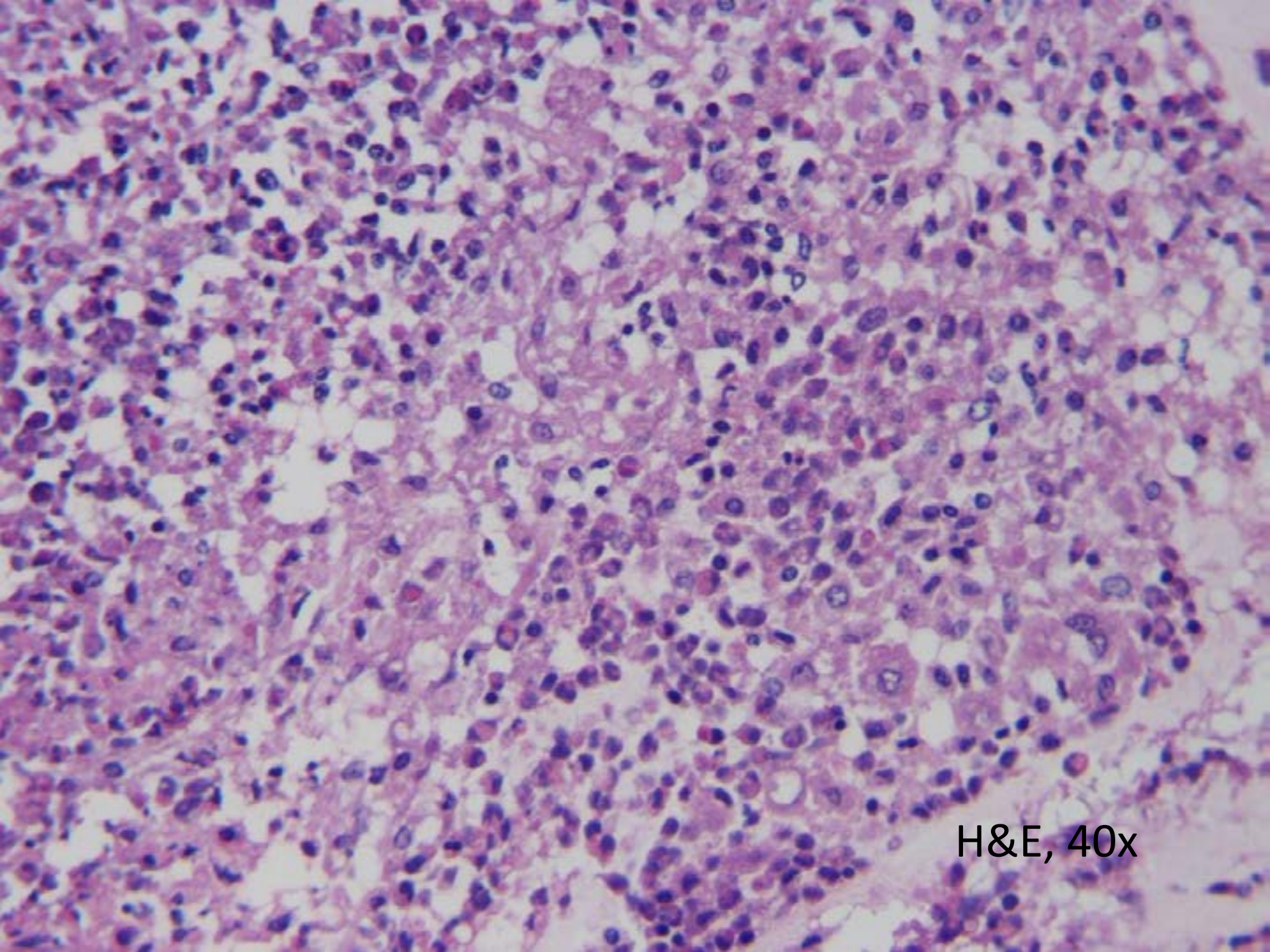
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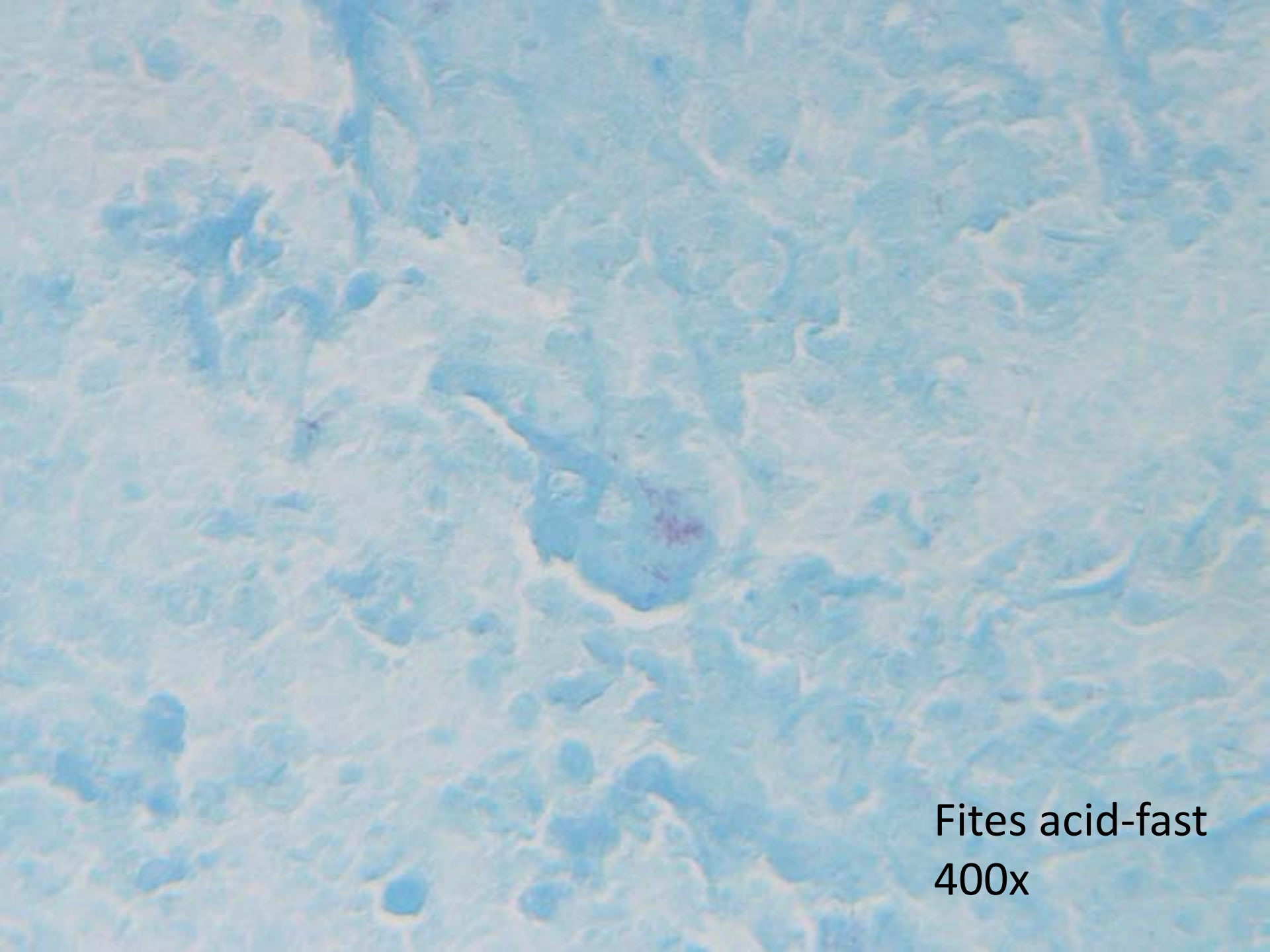
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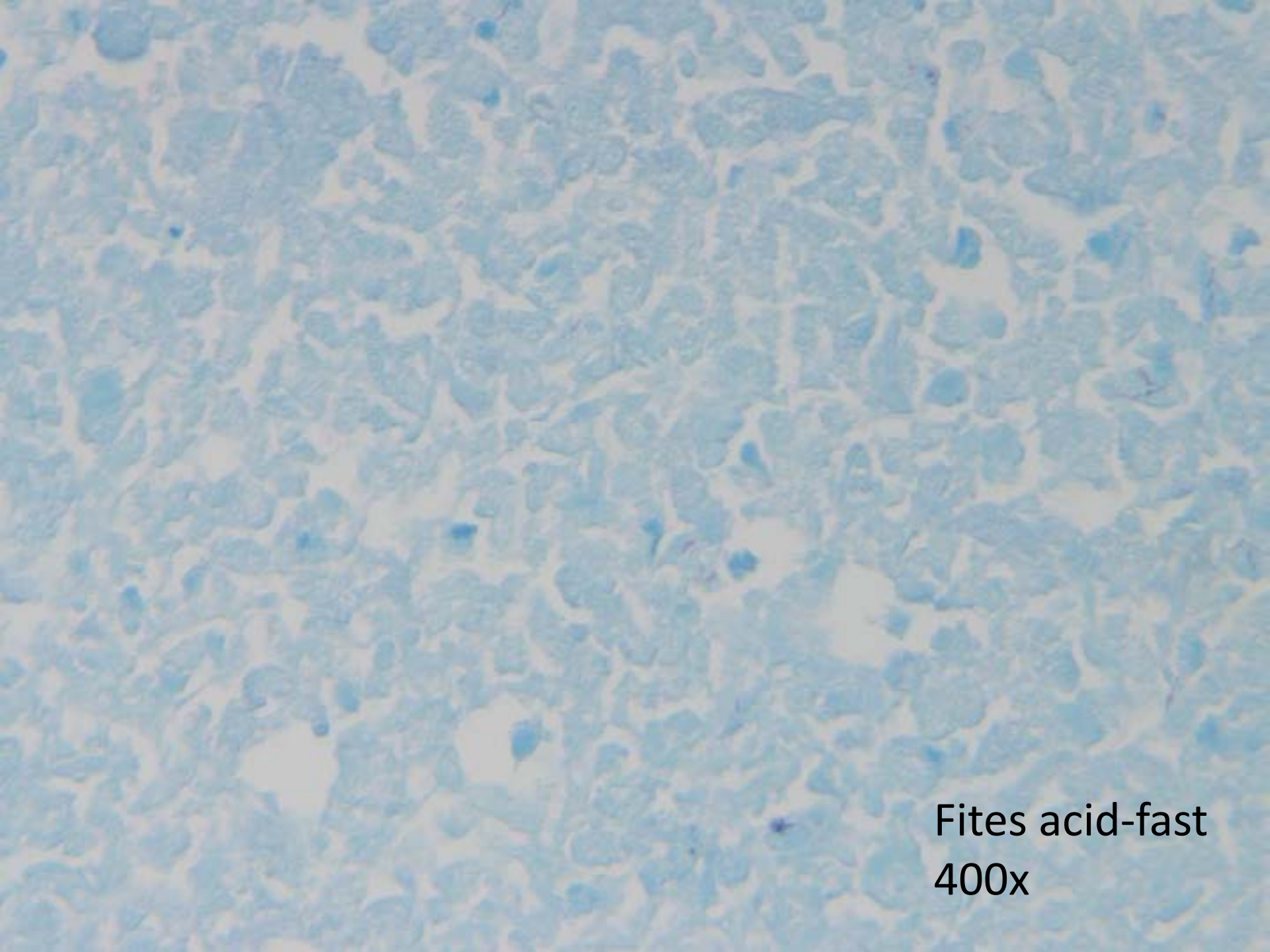
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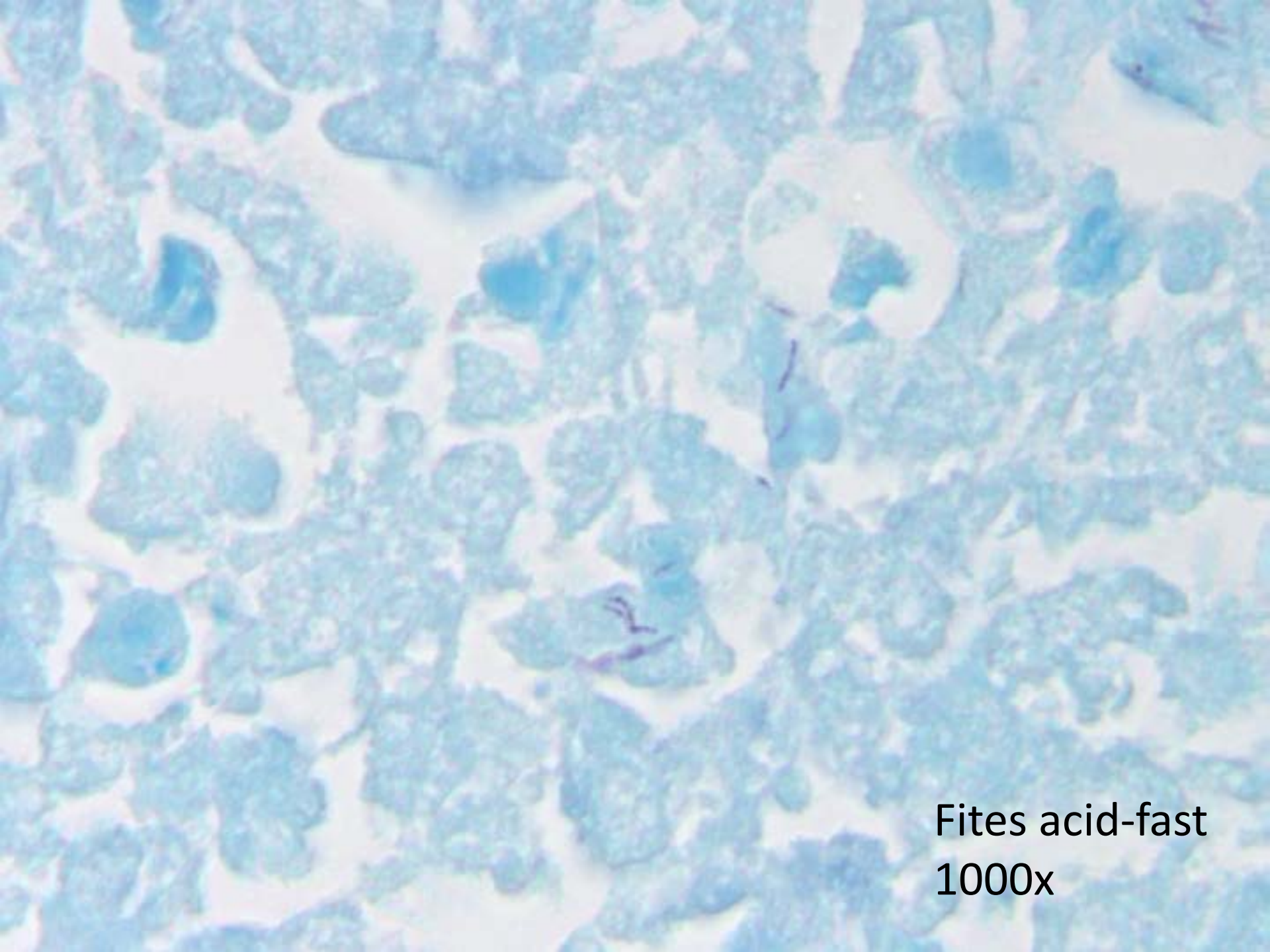
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Fites acid-fast
400x



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