Tuberculosis

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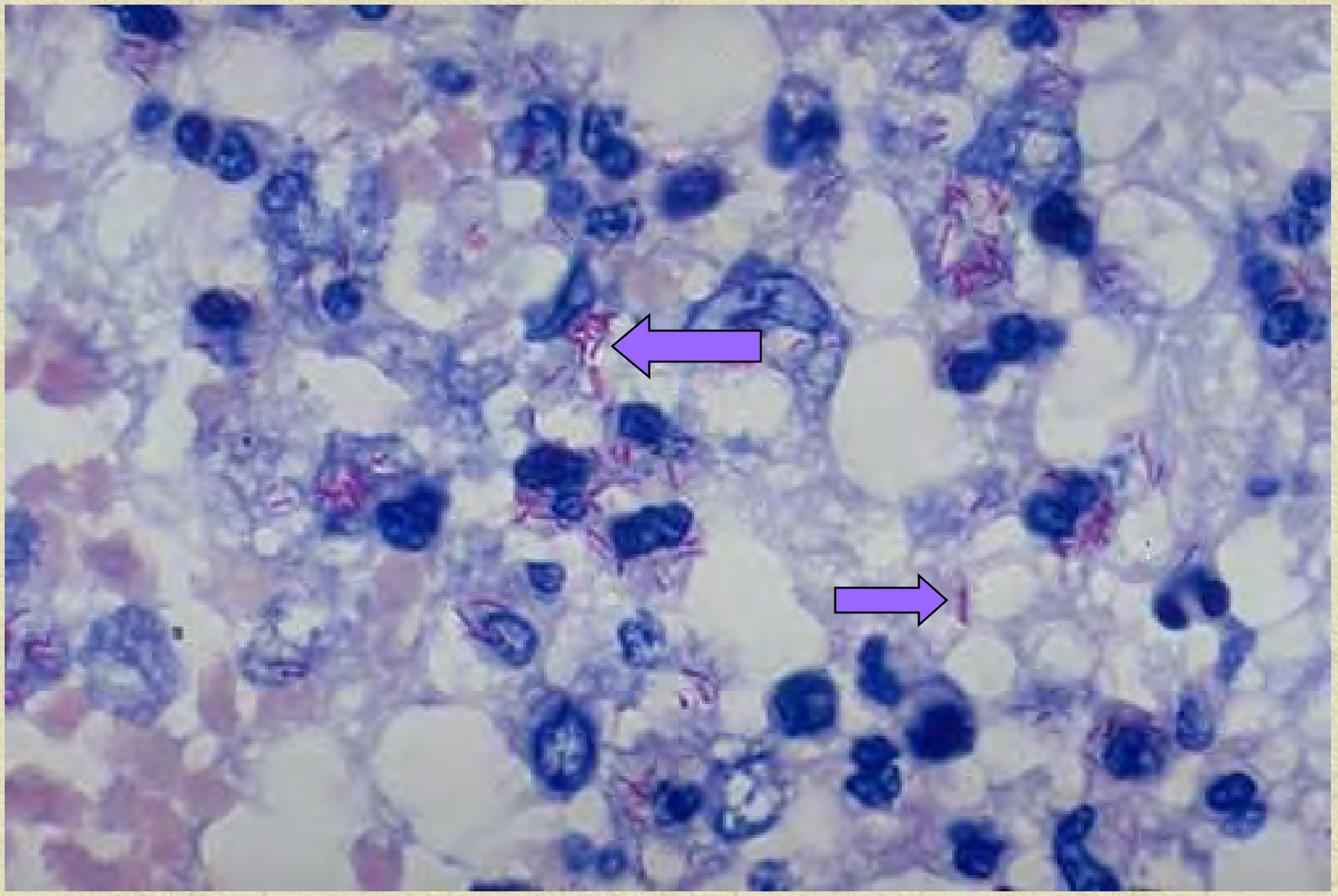
Introduction:

- Infects one third of world population..!
- 3 million deaths due to TB every year
- Under privileged population -
  - Crowding, Poverty, malnutrition, single male..! – economic burden.
- Since 1985 incidence is increasing in west
  - AIDS, Diabetes, Immunosuppressed patients, Diabetes, Drug resistance.

Microbiology of TB:

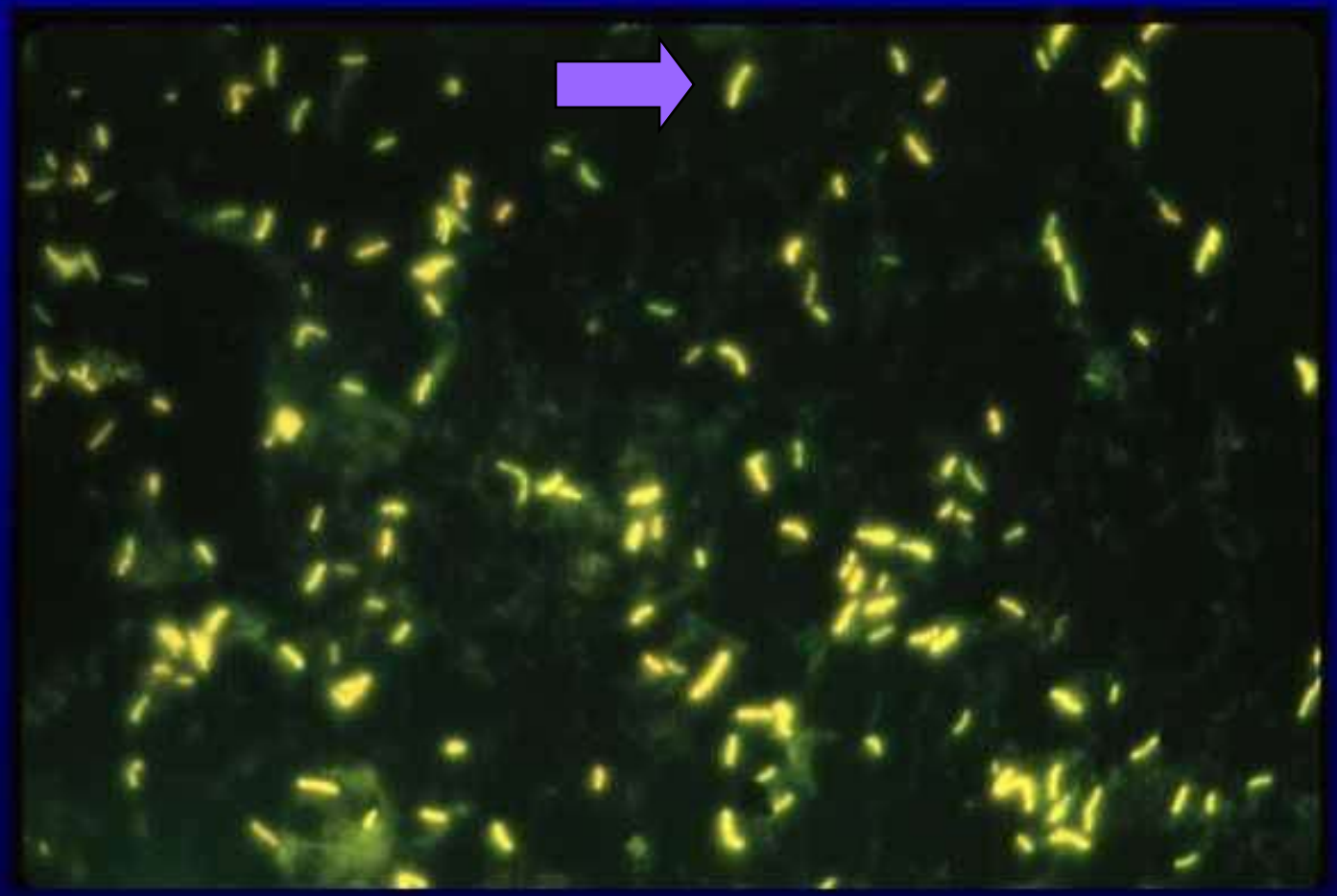
- Mycobacteria – ‘fungus like..
- Bacilli, Aerobic, non motile, no toxins, no spore.
- Mycolic acid wax in cell wall
- Carbol dye - Acid & alcohol fast (AFB)
- M. tuberculosis & M. bovis
- M. avium, M.intracellulare in AIDS - Atypical TB

AFB - Ziehl-Nielson stain



Colony Morphology – LJ Slant

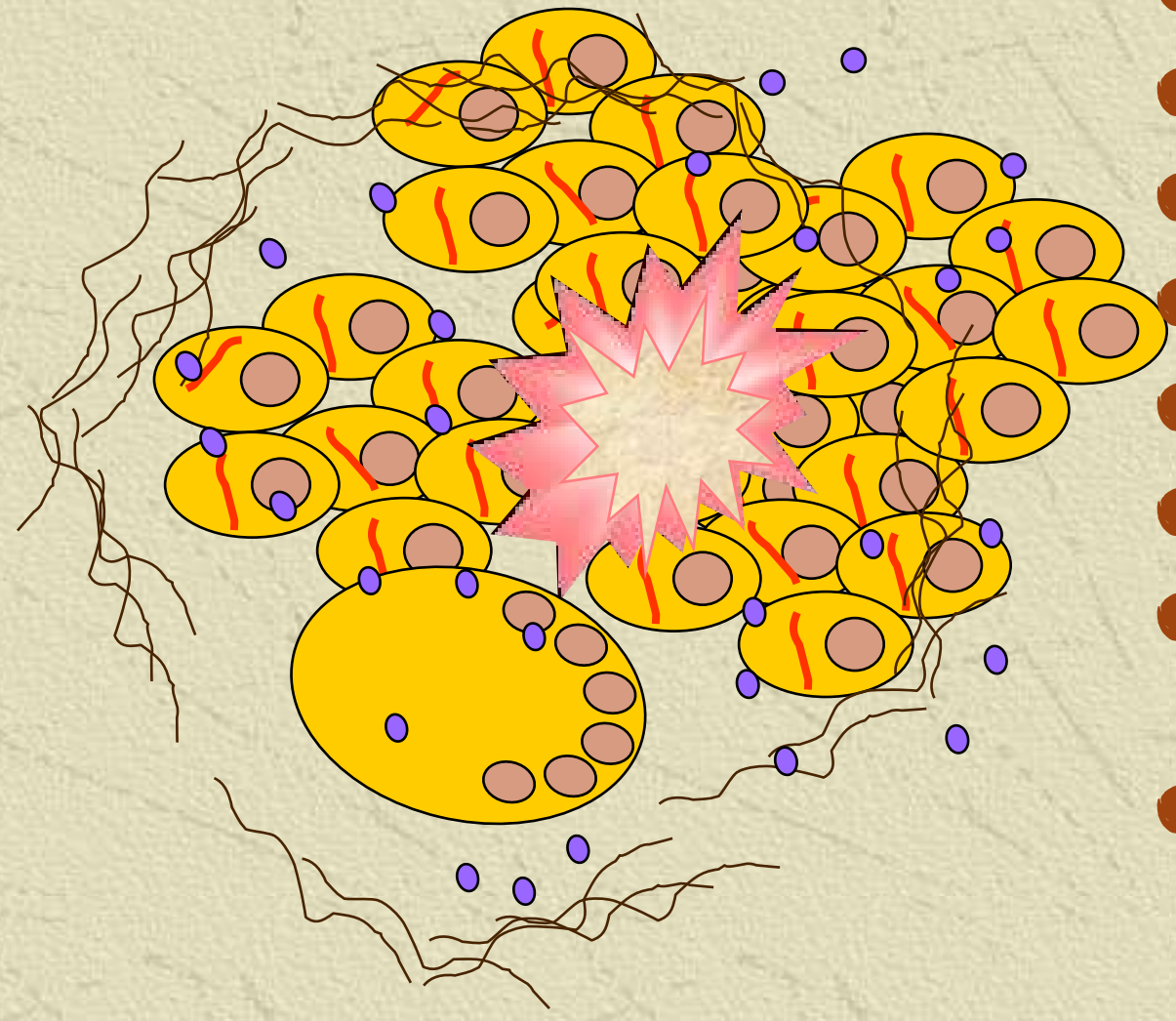
Sputum - TB Auromine/Rhodamine



Pathogenesis of TB:

- Type IV ? hypersensitivity – T cells – Macrophages → Granuloma
- Activated macrophages – epithelioid cells.
- Remain viable inside macrophages (Mycolic acid wax coat)
- Cord Factor - surface glycolipid Antigenic.
- Self destruction by lysosomal enzymes.
- **Gandhi Principle ….!**

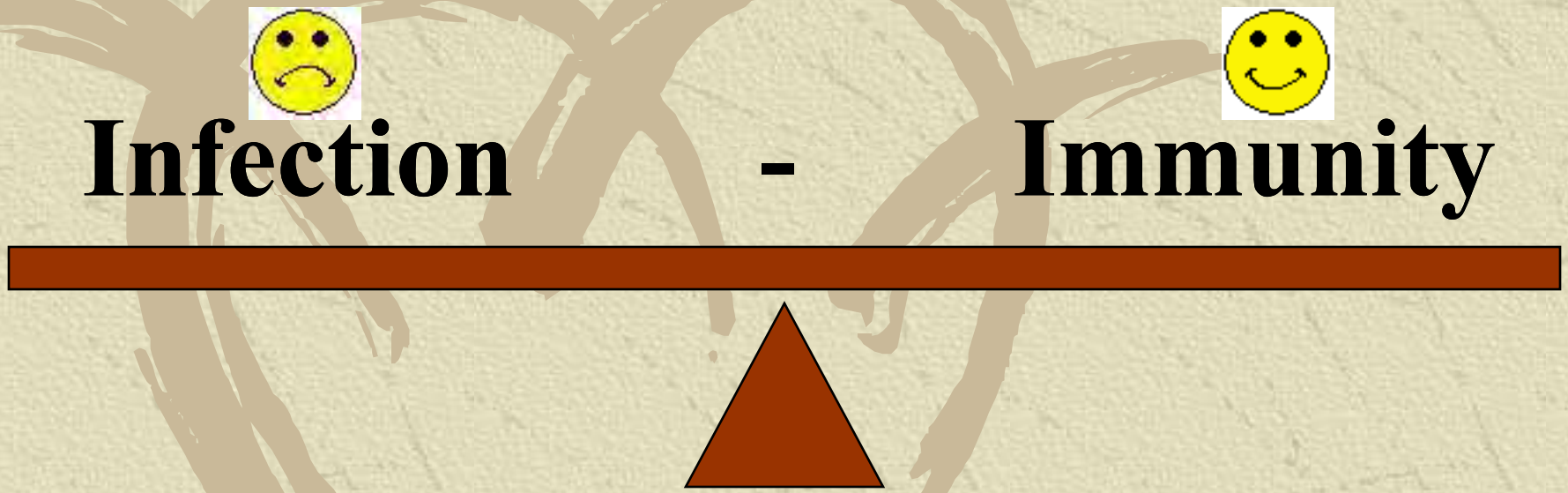
TB Pathogenesis



- Bacterial entry
- T Lymphocytes.
- Macrophages.
- Epitheloid cells.
- Proliferation.
- Central Necrosis.
- Giant cell formation.
- Fibrosis.

Lung TB - Cavitation

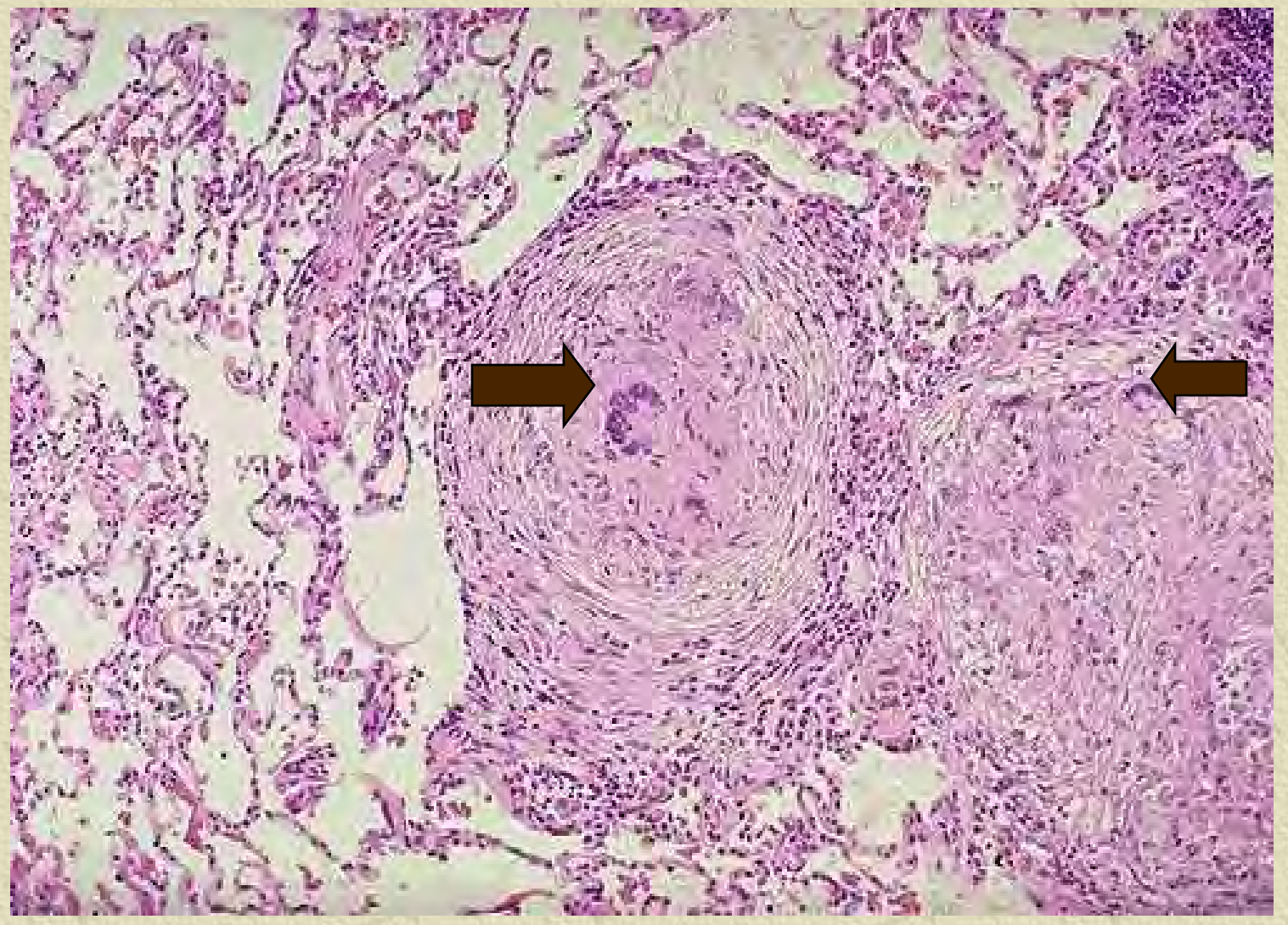
Pathogenesis of TB:



Morphology of Granuloma

1. Rounded tight collection of chronic inflammatory cells.
2. Central Caseous necrosis.
3. Active macrophages - epithelioid cells.
4. Outer layer of lymphocytes, plasma cells & fibroblasts.
5. Langhans giant cells – joined epithelioid cells.

Tuberculous Granuloma

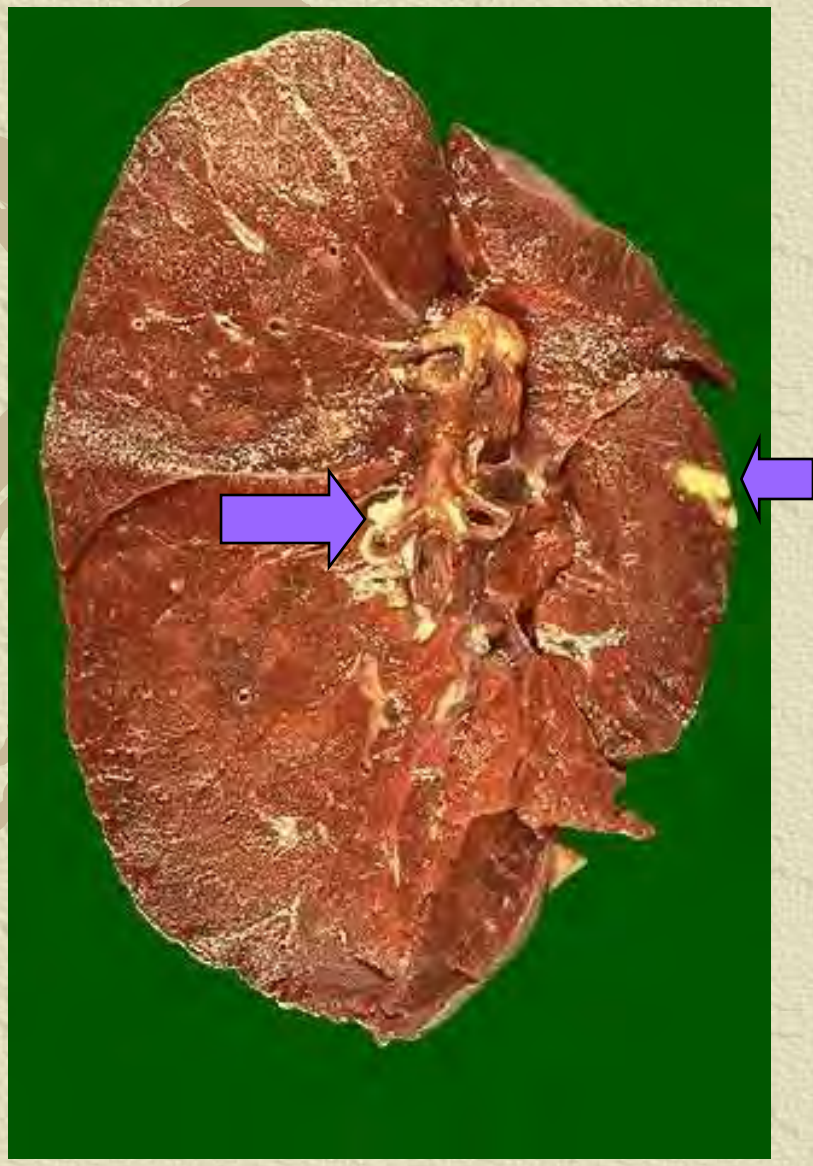


Primary tuberculosis

- In a non immunized individual – children* adult*
- Lesion in subpleural zone of lung – can be at other sites*
- Brief acute inflammation – neutrophils.
- 5-6 days invoke granuloma formation.
- 2 to 8 weeks – healing – Ghon focus (+ lymph node → Ghon complex)
- Develop immunity – Mantoux positive

Primary or Ghon's Complex

- Primary tuberculosis is the pattern seen with initial infection with tuberculosis in children.
- Reactivation, or secondary tuberculosis, is more typically seen in adults.



Primary Tuberculosis

In Non Immunized individuals (Children)

- **Primary Tuberculosis:**
  - Self Limited disease
  - Ghons focus, complex or Primary complex.
- **Primary Progressive TB**
  - Miliary TB and TB Meningitis.
  - Common in malnourished children
  - 10% of adults, Immuno-suppressed individuals

Secondary Tuberculosis:

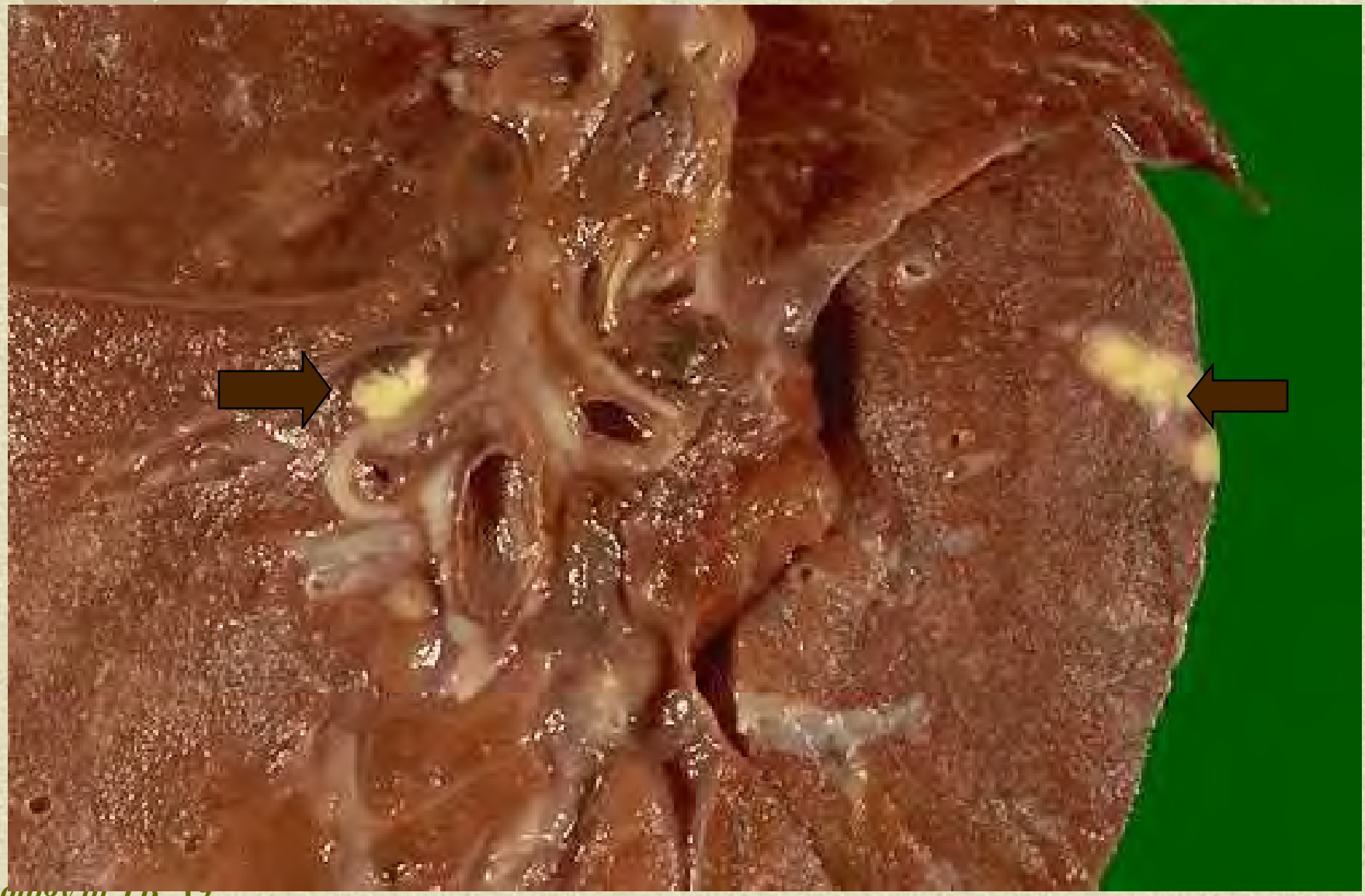
- Post Primary in immunized individuals.
- Cavitary Granulomatous response.
- Reactivation or Reinfection
- Apical lobes or upper part of lower lobes – O_2
- Caseation, cavity - soft granuloma
- Pulmonary or extra-pulmonary
- Local or systemic spread / Miliary
  - Vein – via left ventricle to whole body
  - Artery – miliary spread within the lung

Secondary Tuberculosis:

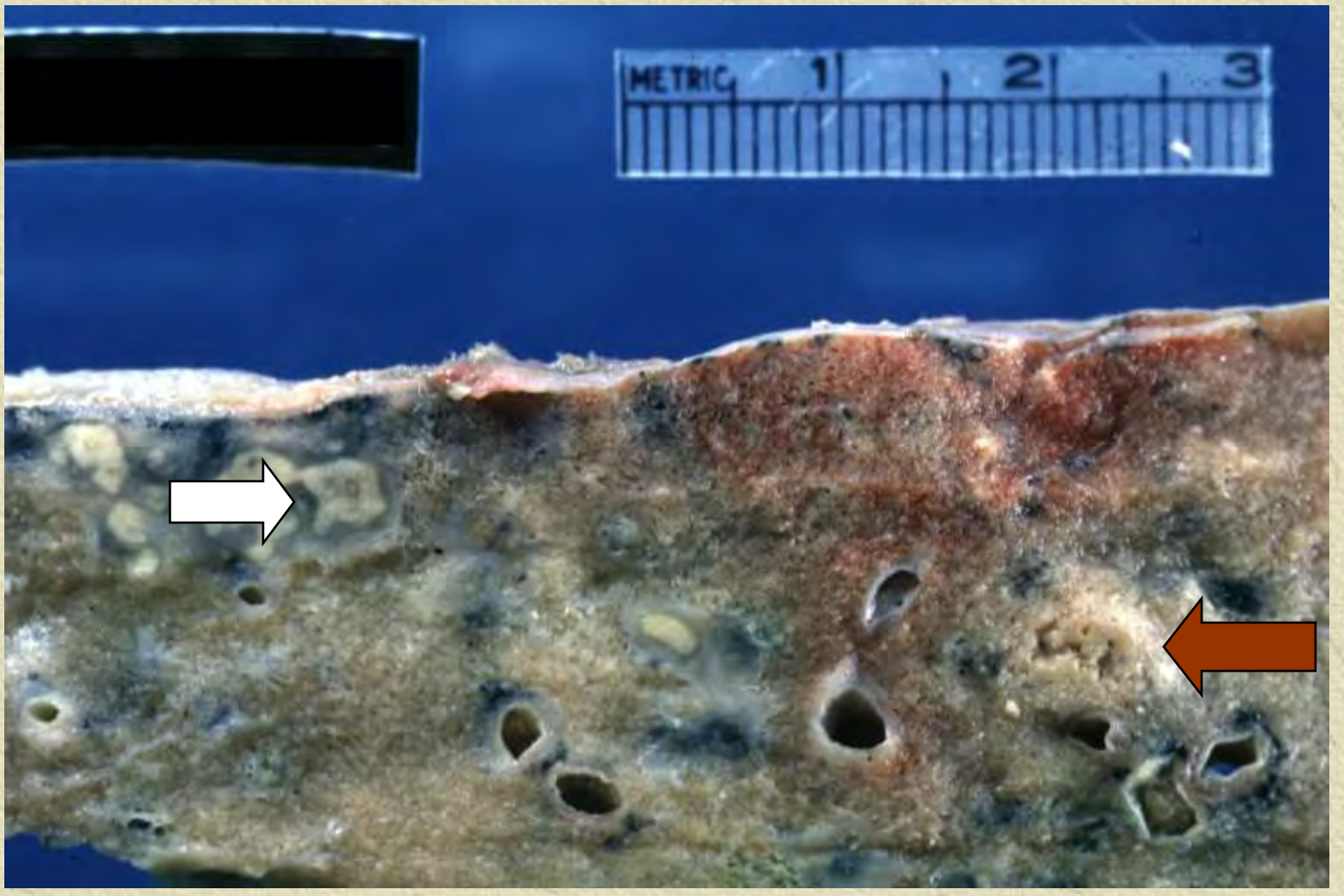
- Reactivation occurs in 10-15% of patients.
- Most commonly males 30-50 y
- Slowly Progressive (several months)
- Cough, sputum, Low grade fever, night sweats, fatigue and weight loss.
- Hemoptysis or pleuritic pain = severe disease

TB - Scrofula (Mexico)

Ghon Complex



Typical cavitating granuloma



Miliary TB

- Millet like – grain.
- Extensive micro spread.
- Through blood or bronchial spread
- Low immunity
- Pulmonary or Systemic types.

Miliary TB

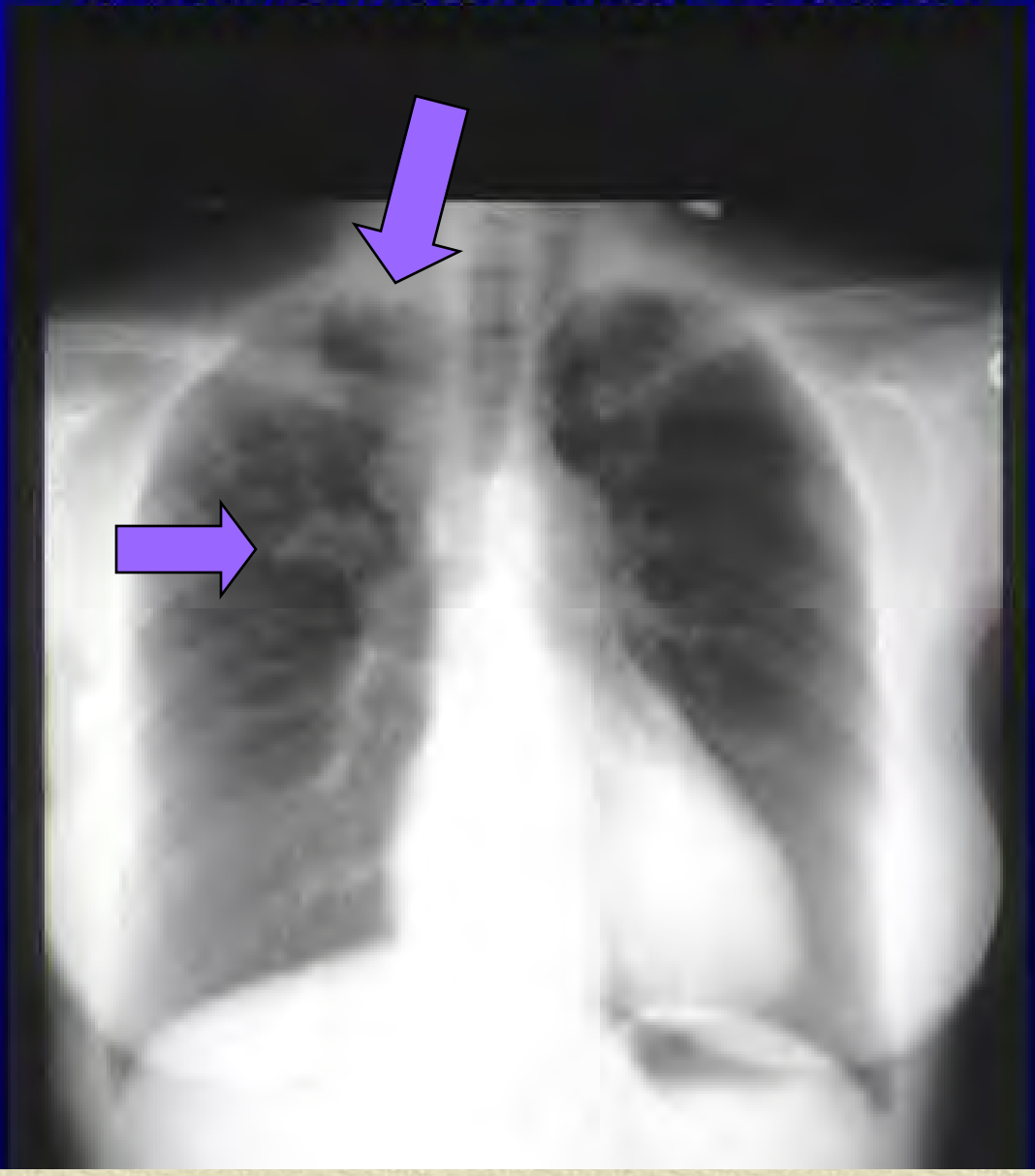
Miliary spread TB

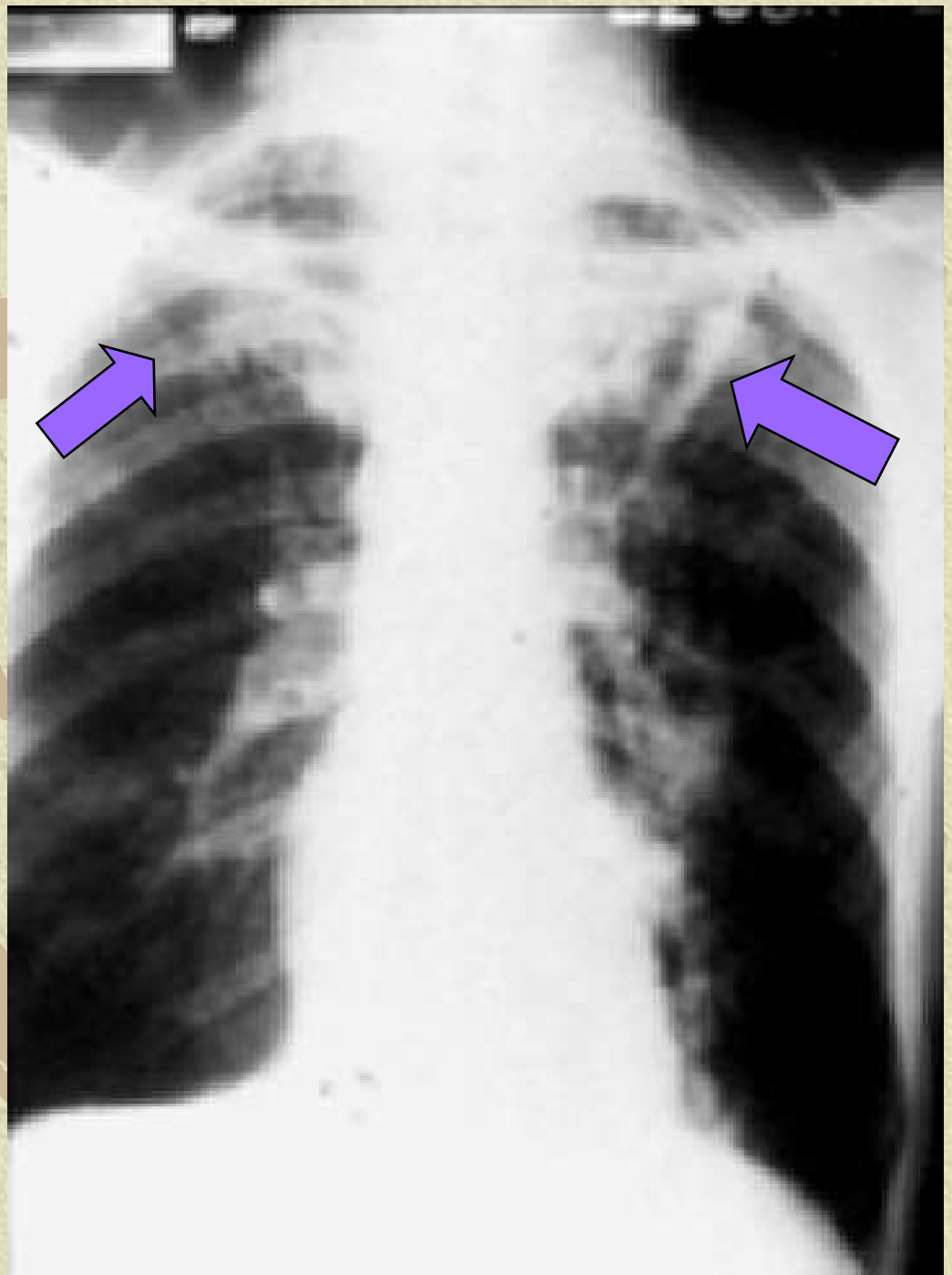
Miliary TB Lung

Cavitary Tuberculosis

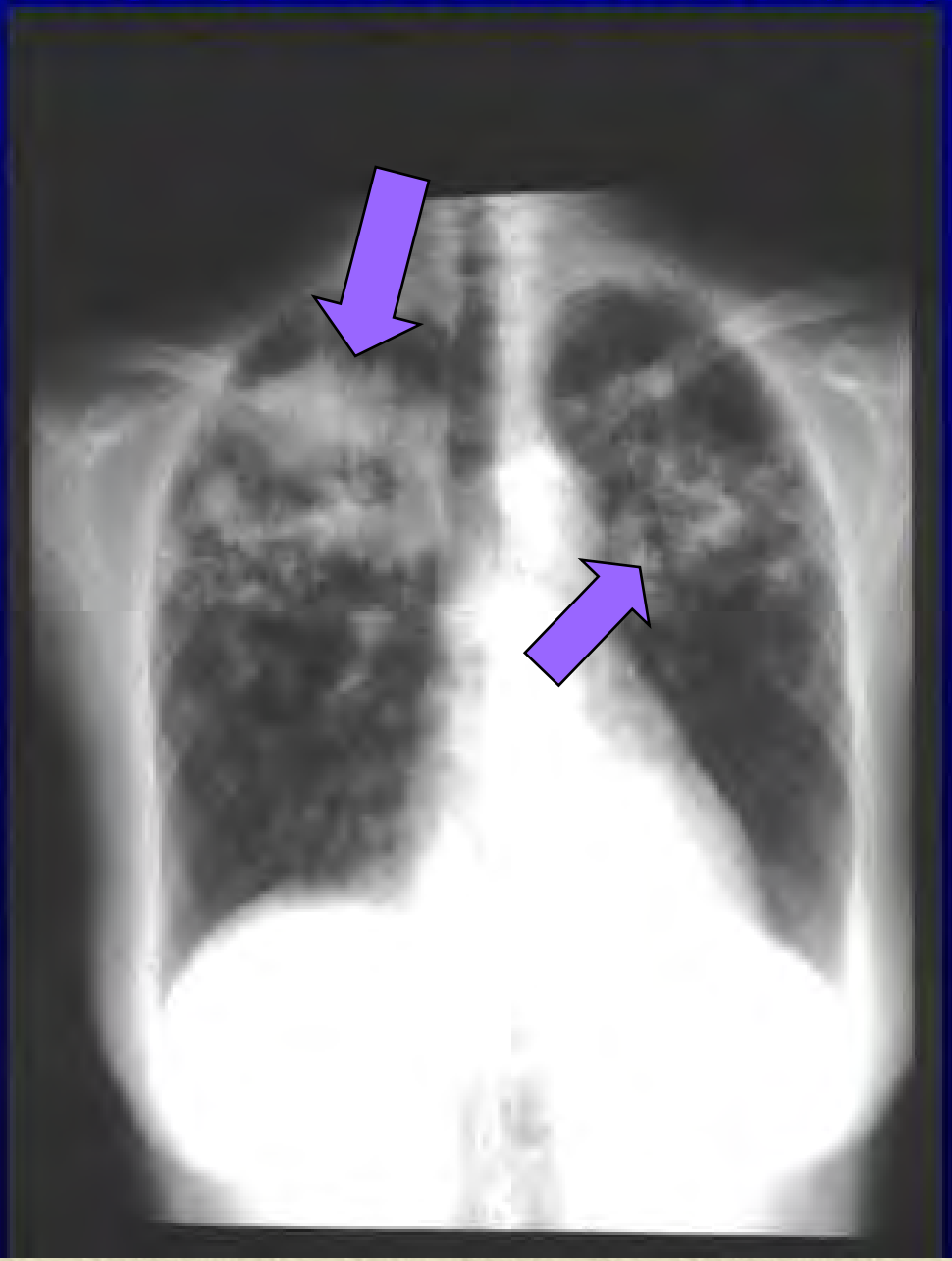
- When necrotic tissue is coughed up → cavity.
- Cavitation is typical for large granulomas.
- Cavitation is more common in the secondary reactivation tuberculosis - upper lobes.

Tuberculosis CXR

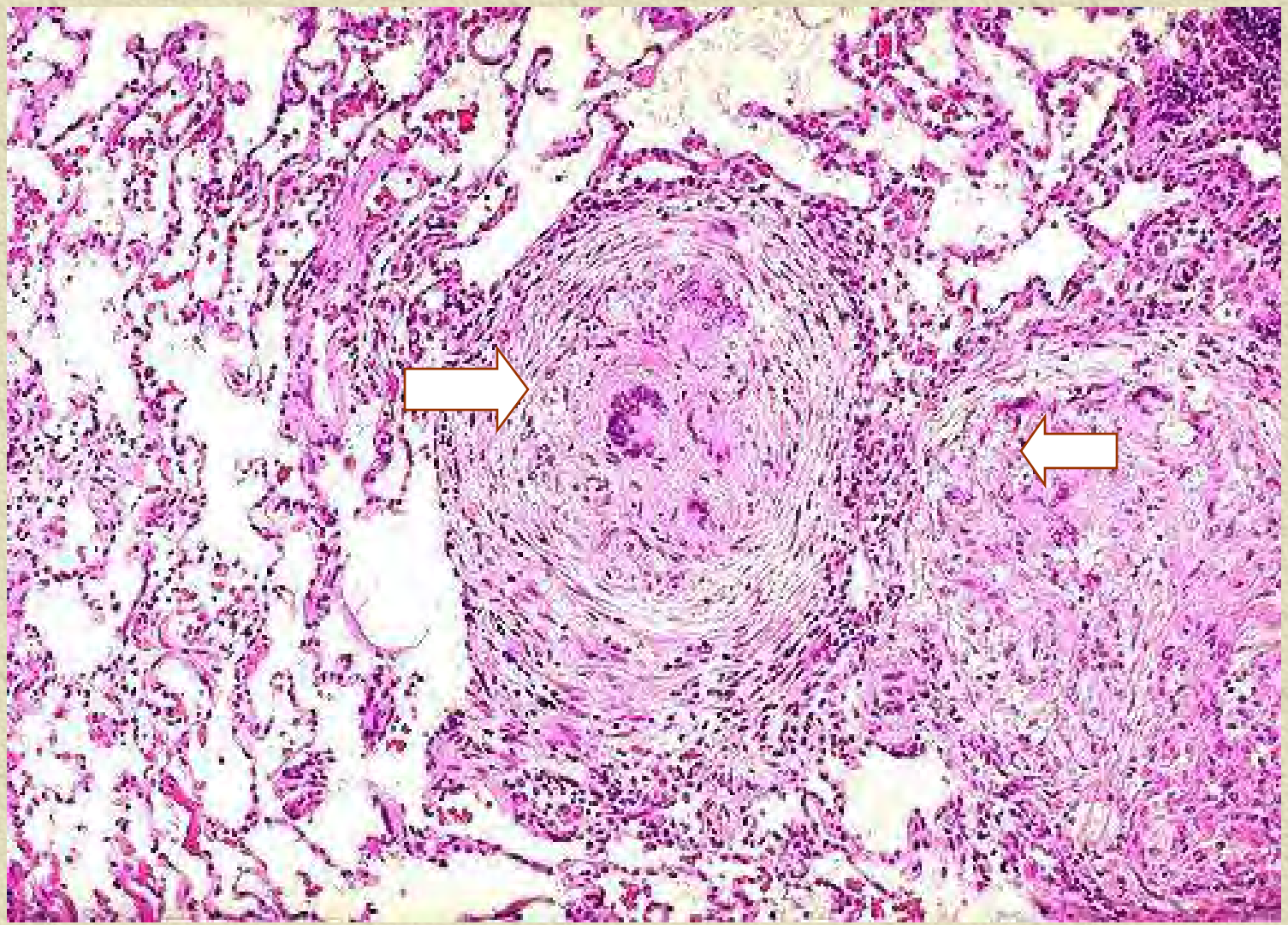




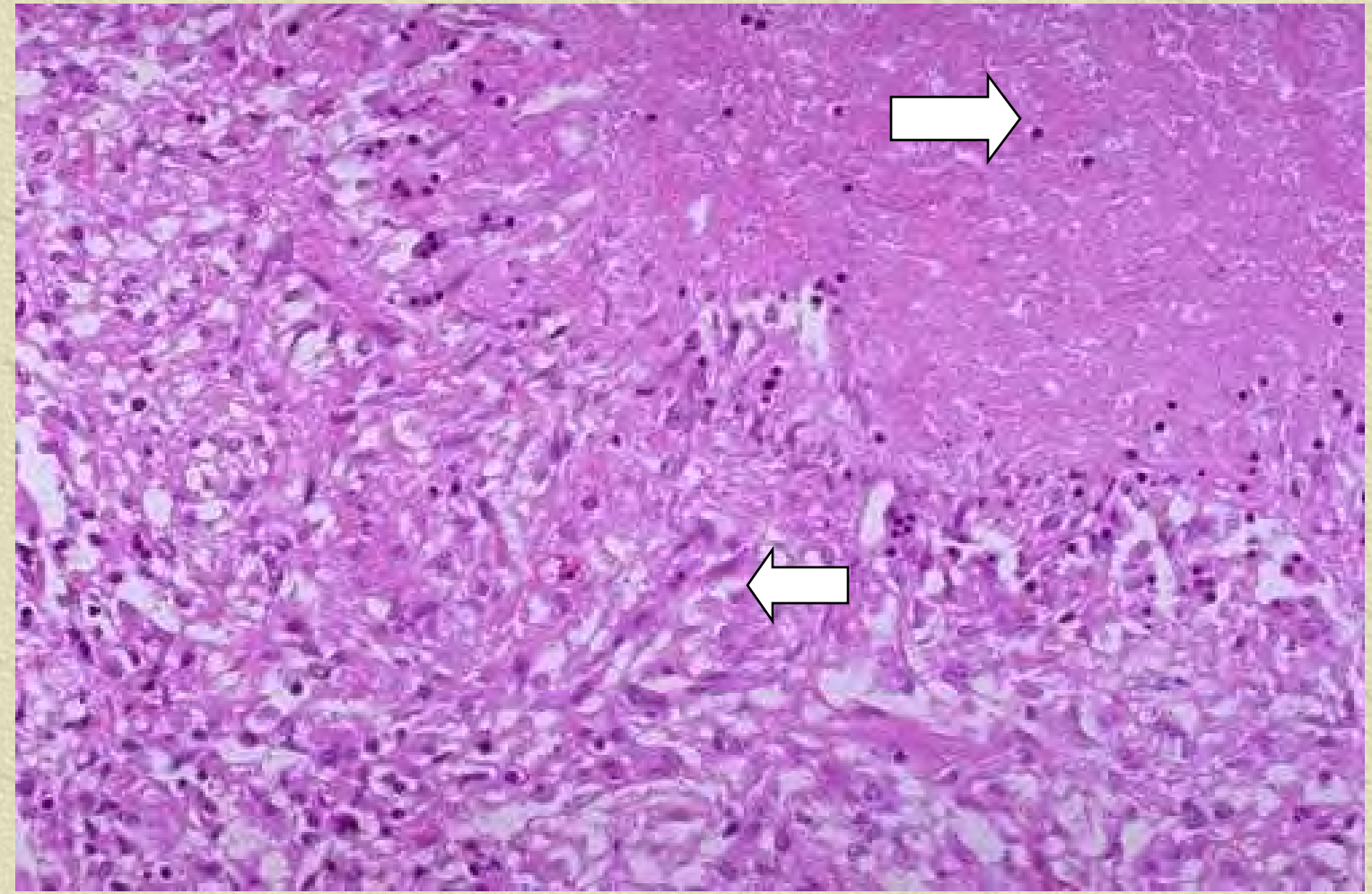
Untreated Tuberculosis CXR



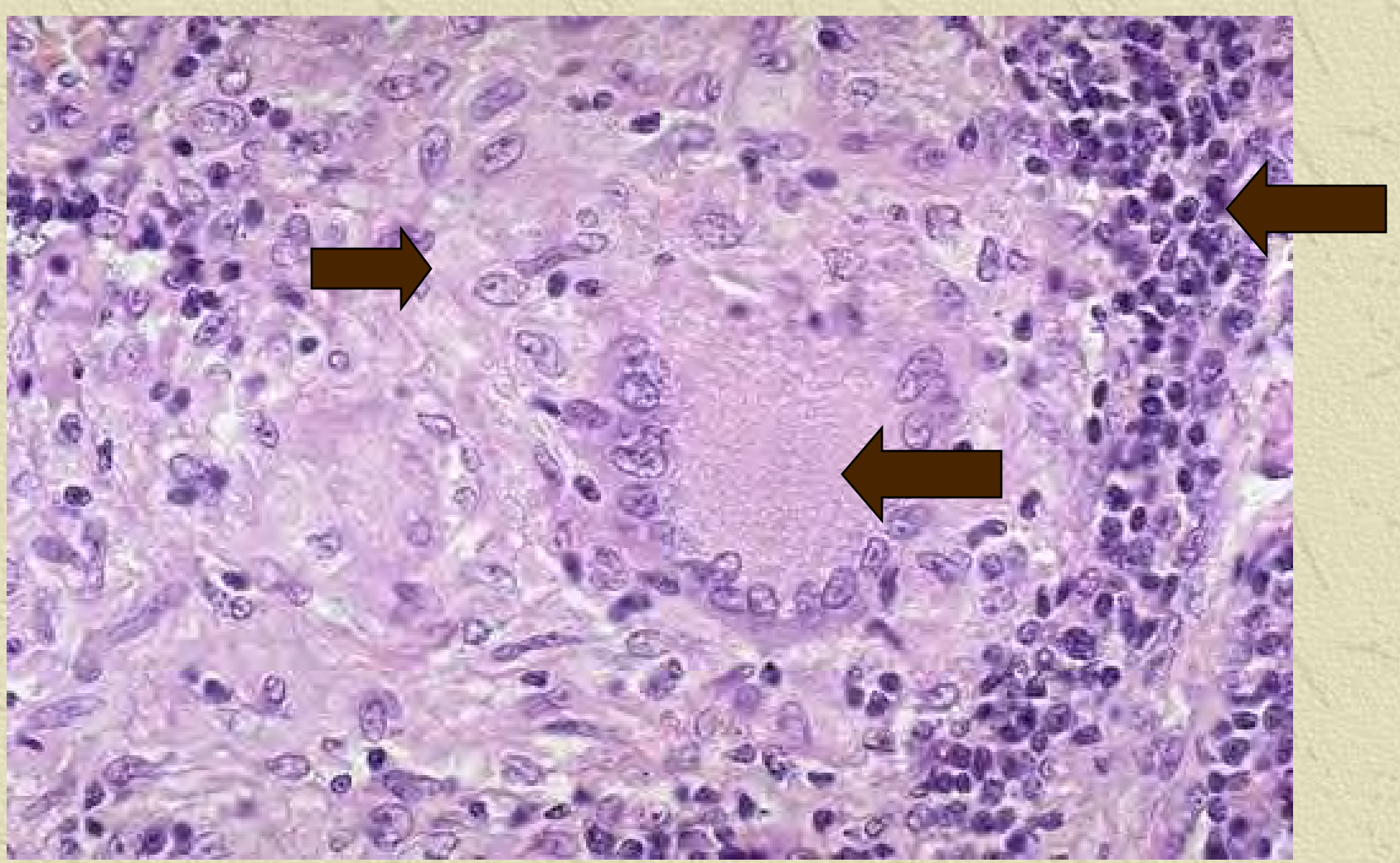
Tuberculous Granulomas



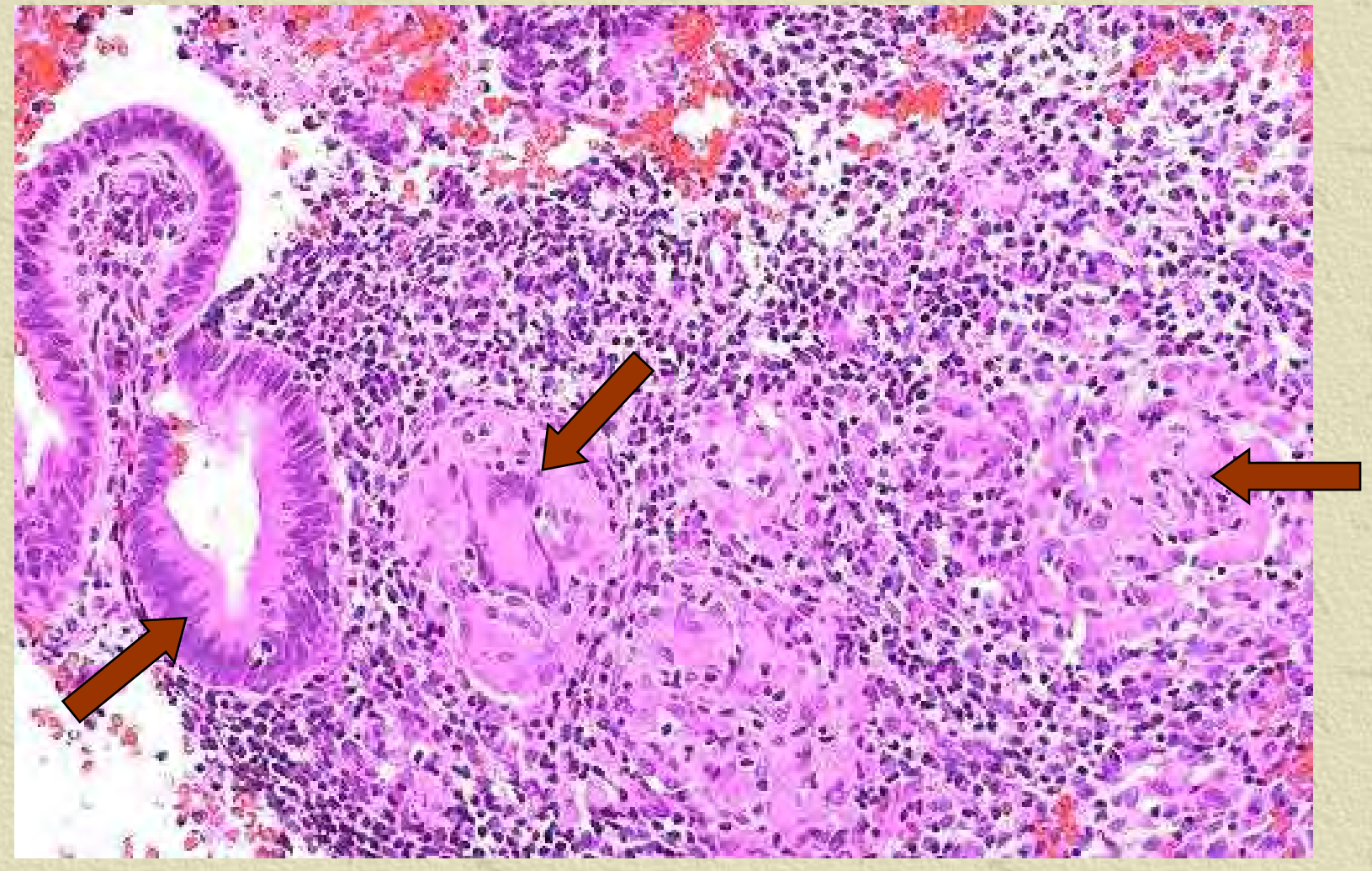
Caseation Necrosis



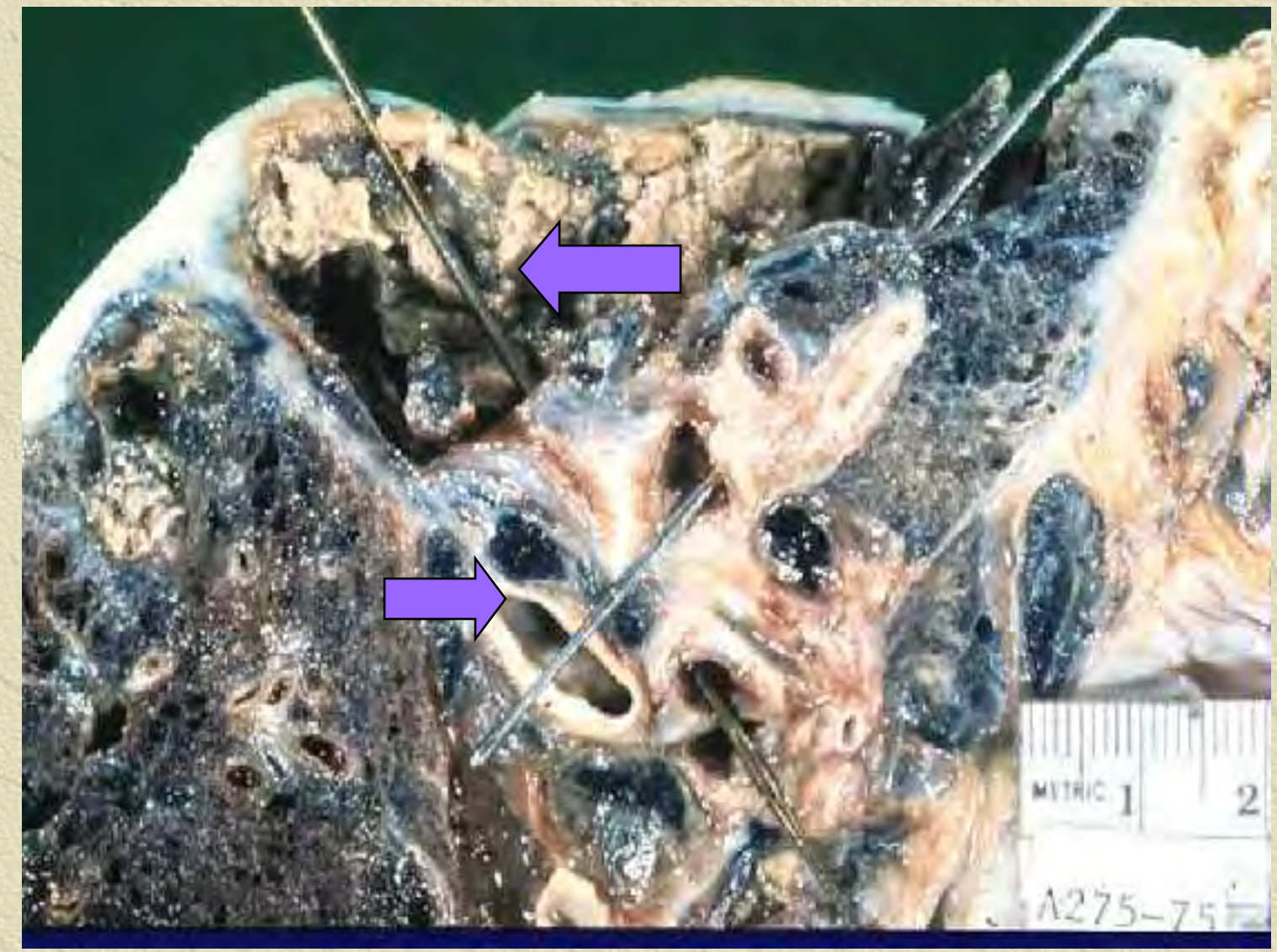
Epitheloid cells in Granuloma



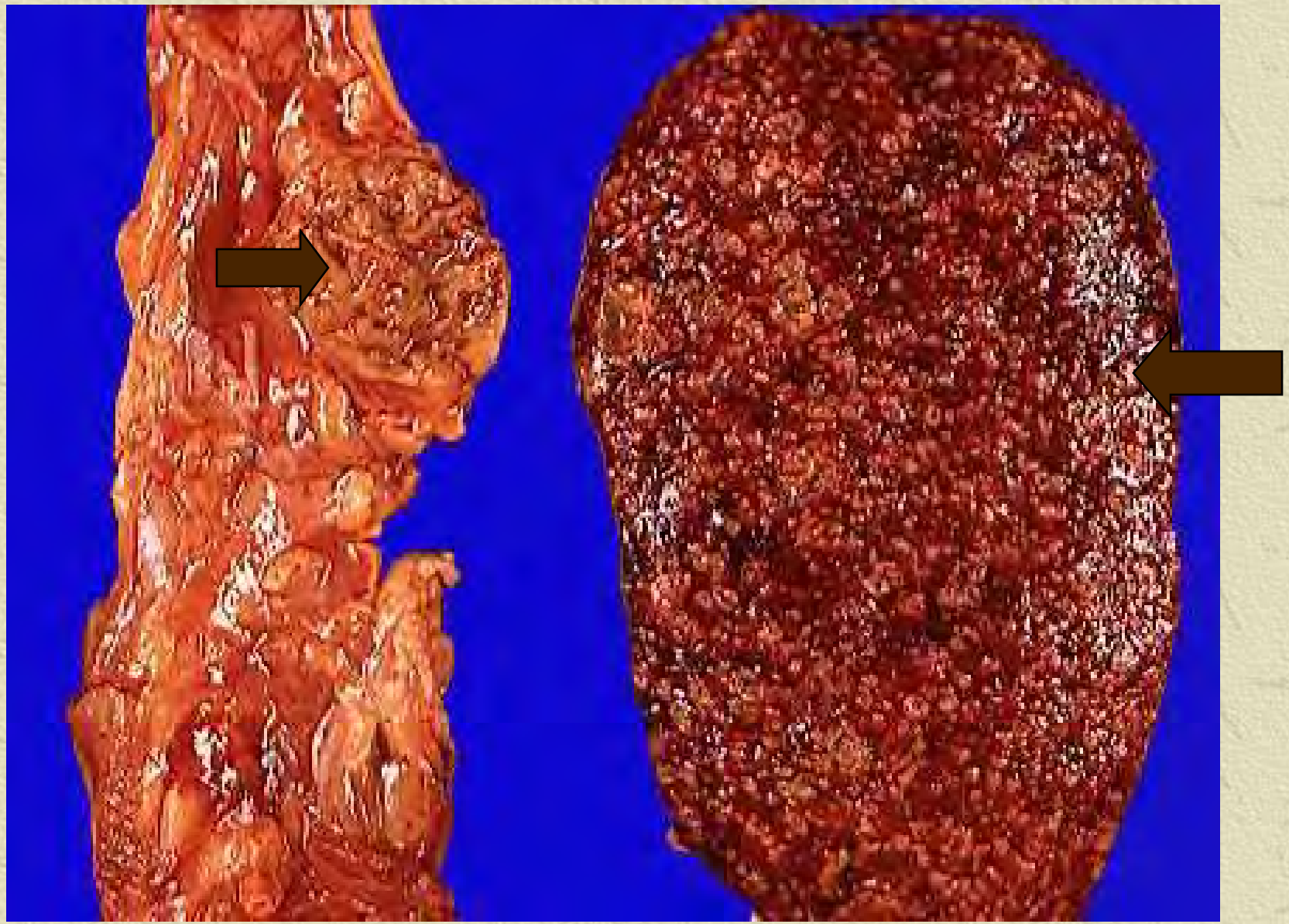
Cells in Granuloma



Cavitary Secondary TB

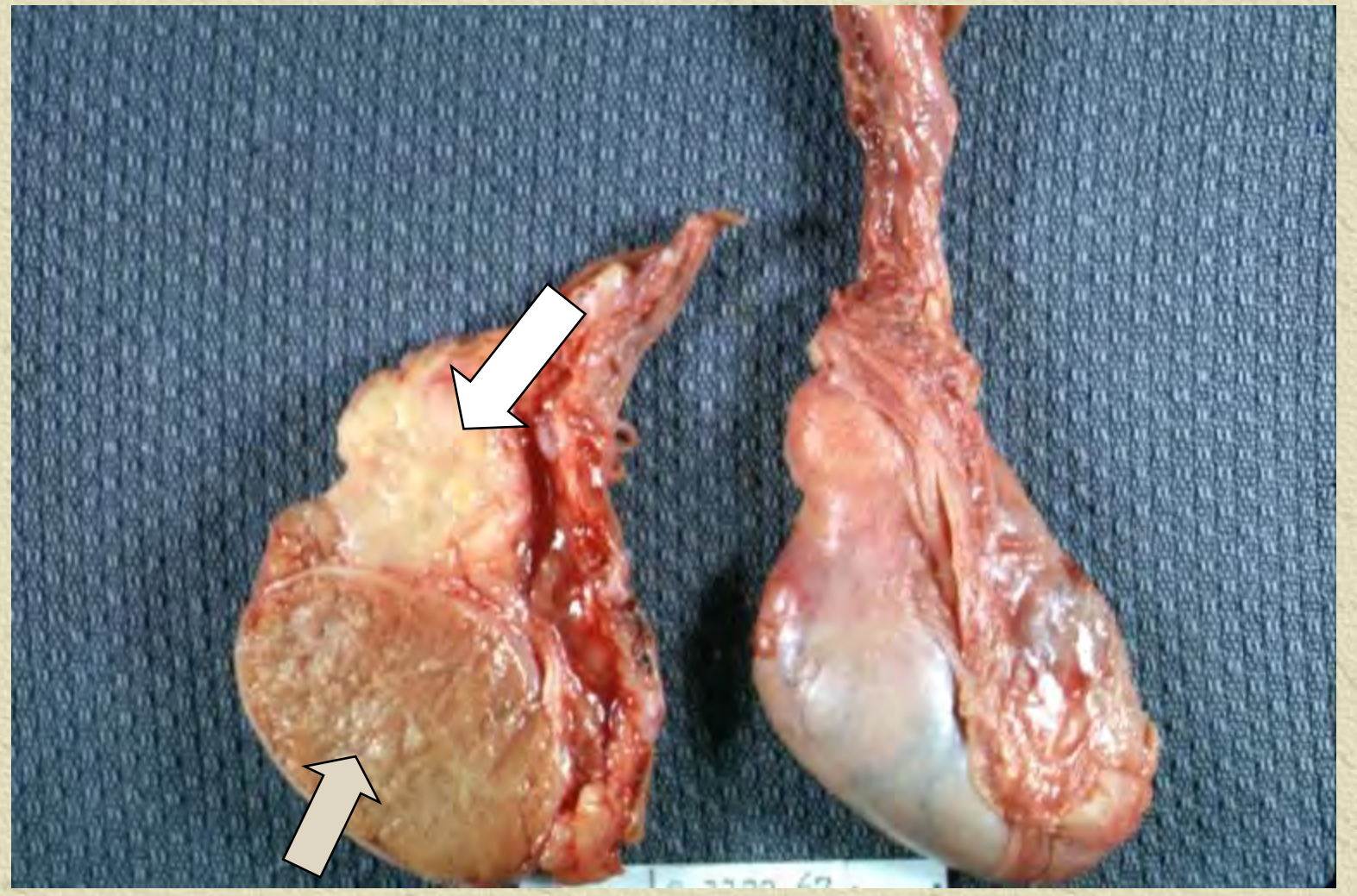


Systemic Miliary TB

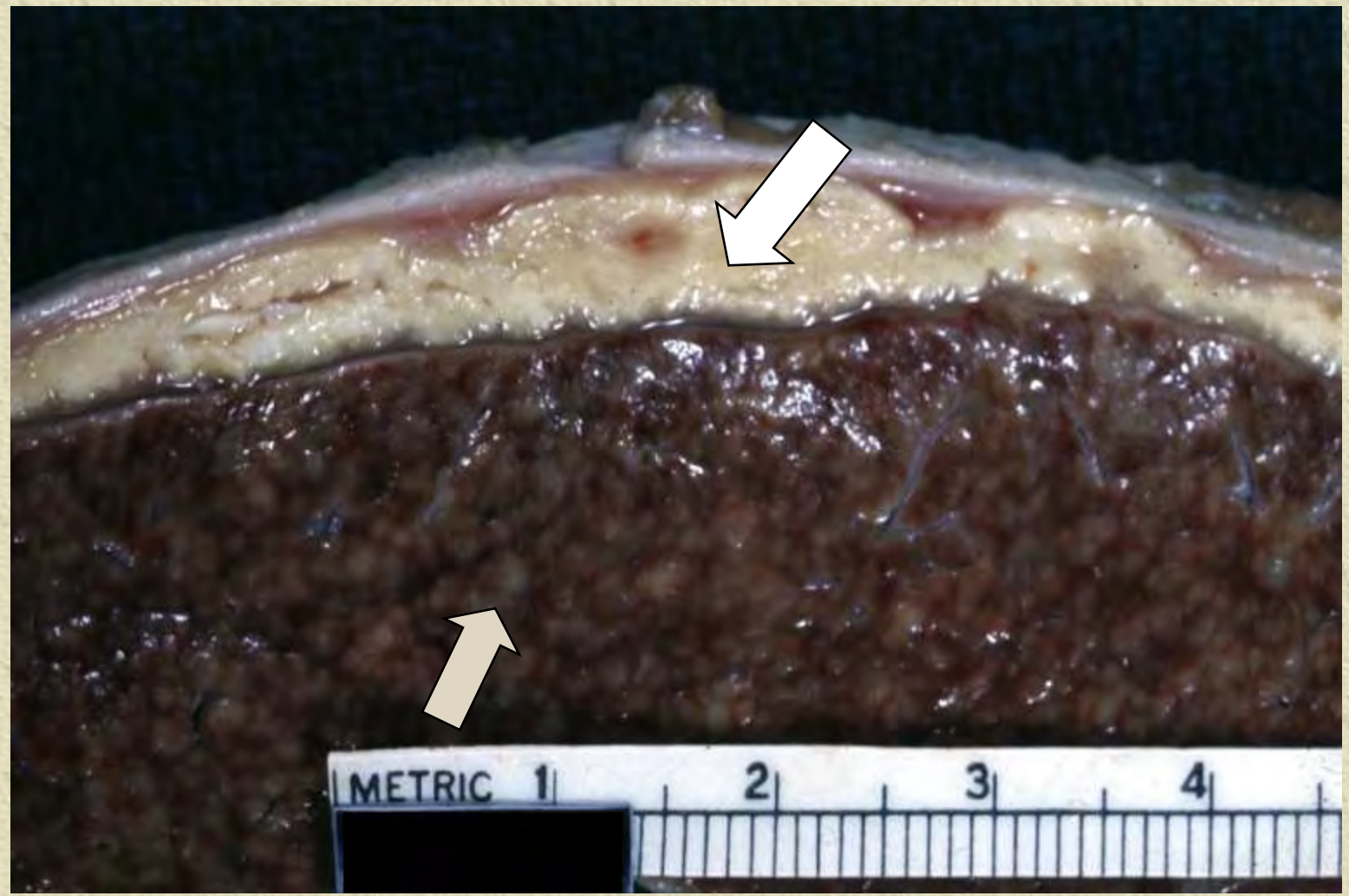


Adrenal TB - Addison Disease

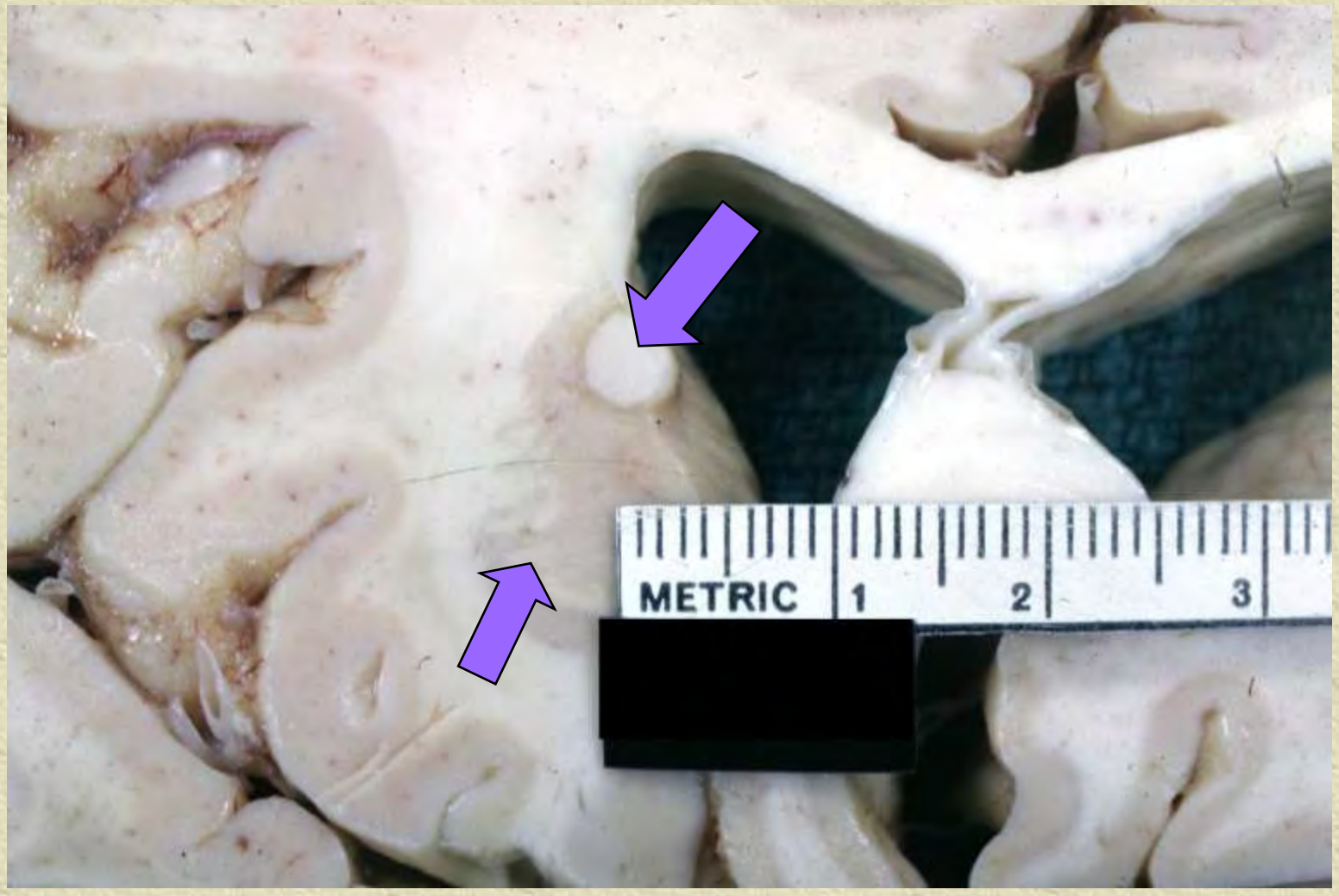
Testes TB Orchitis.



TB Peritonitis + liver Miliary TB



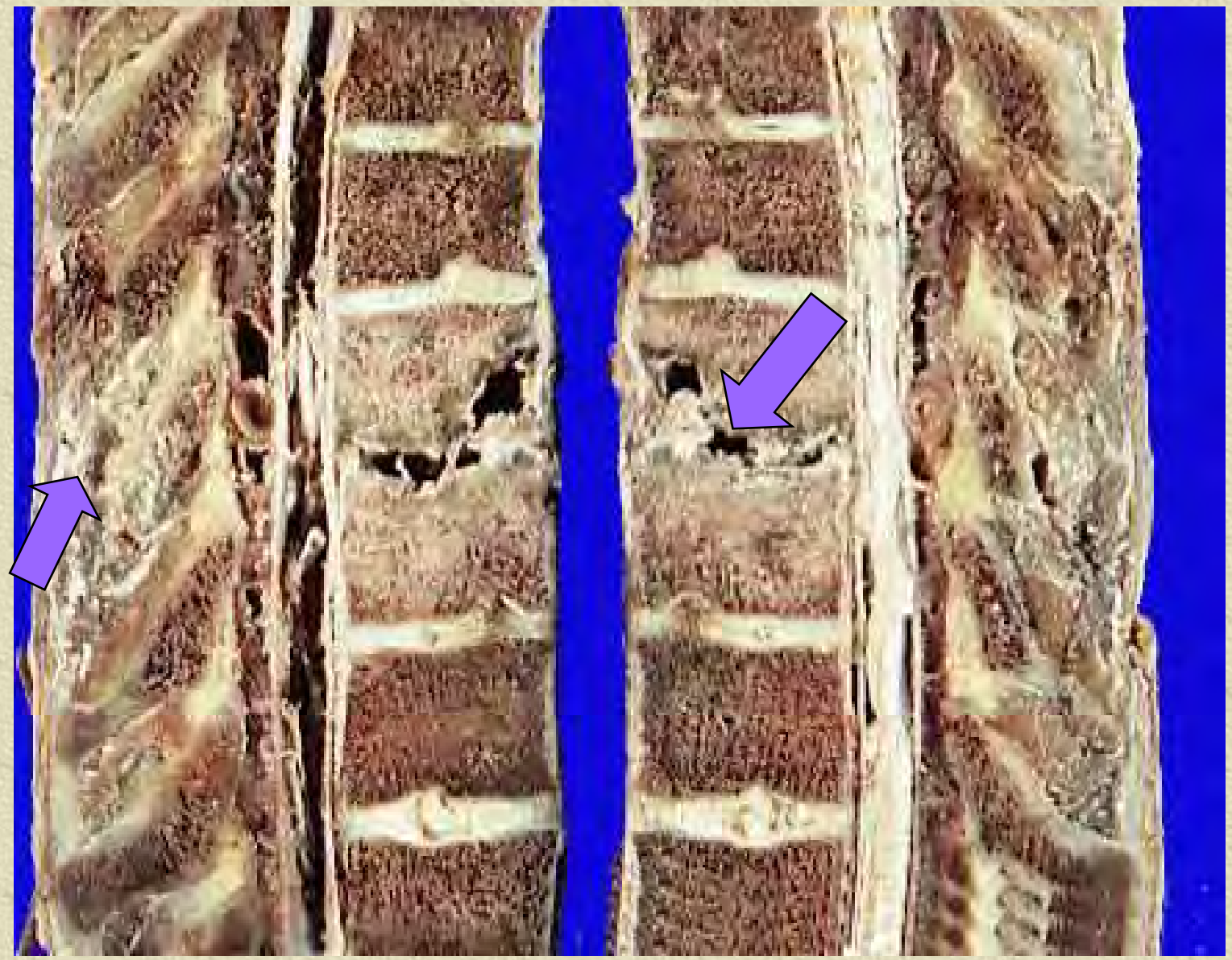
TB Brain – Caudate n.



TB Intestine

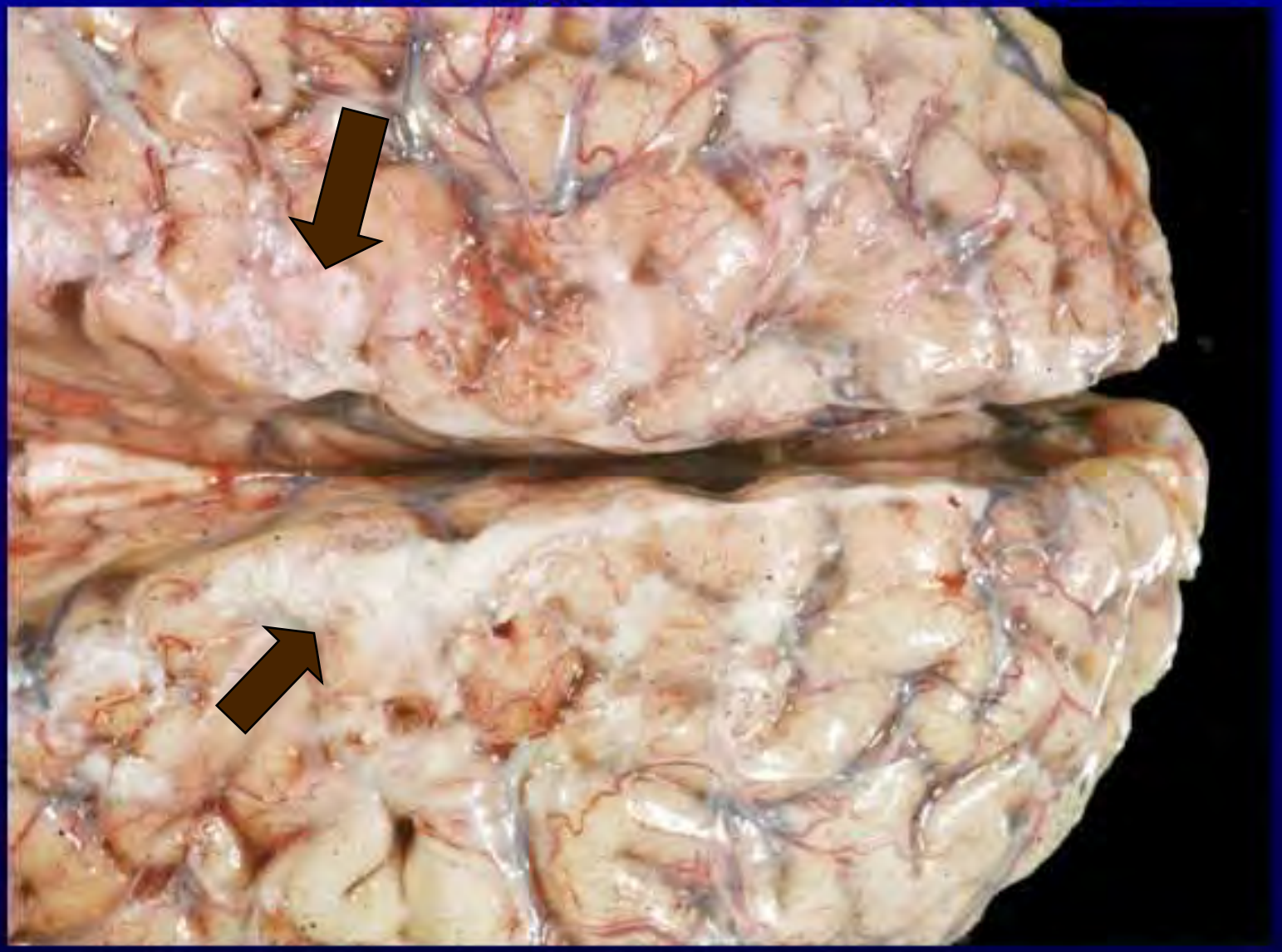
Prostate TB

Spinal TB - Potts Disease



TB Meningitis Patient

TB Meningitis Gross Brain



Diagnosis of TB

- Clinical features are not confirmatory.
- Zeil Nielson Stain - $1x10^4$/ml, 60% sensitivity
- Release of acid-fast bacilli from cavities intermittent.
- 3 negative smears to assure low infectivity*
- Culture most sensitive and specific test.
  - Conventional Lowenstein Jensen media 3-6 wks.
  - Automated techniques within 9-16 days
- PCR is available, but should only be performed by experienced laboratories
- PPD for clinical activity / exposure sometime in life.

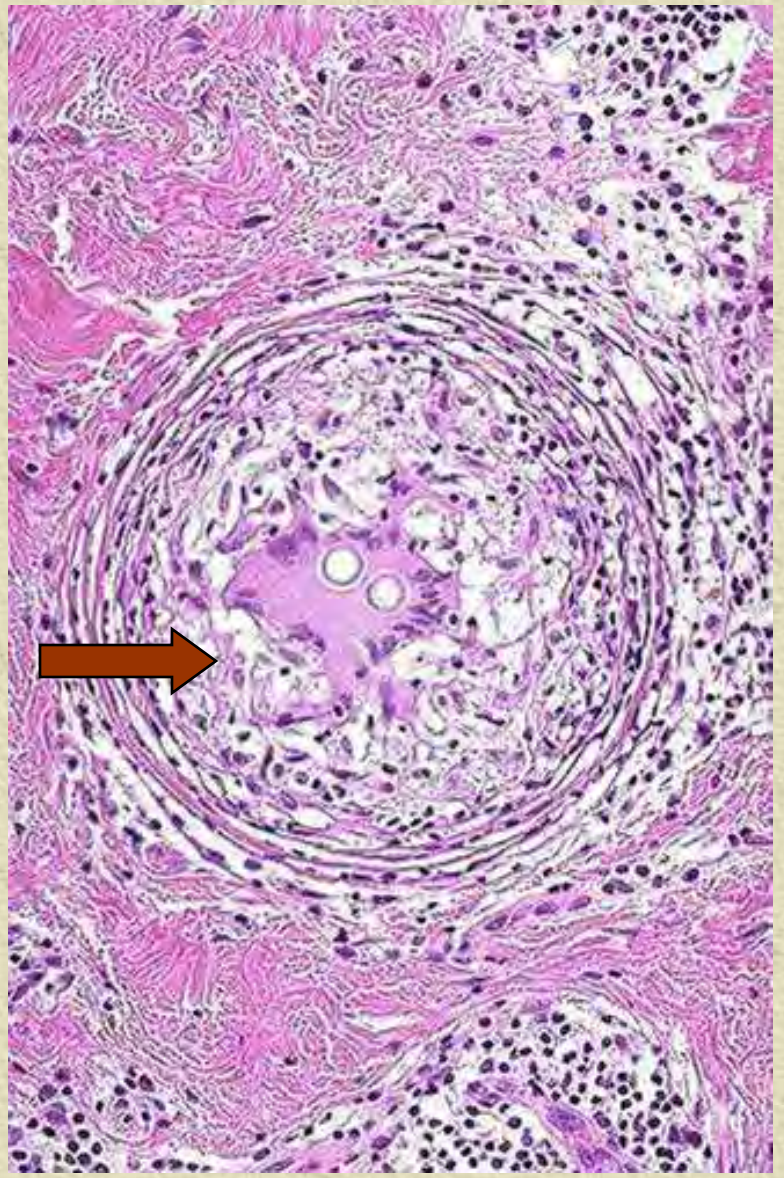
PPD Tuberculin Testing

- Sub cutaneous
- Weal formation
- Itching – no scratch.
- Read after 72 hours.
- Induration size.
- 5-10-15mm (non-ende)
- < 72 hour is not diag*
- +ve after 2-4 weeks.
- BCG gives + result.

PPD result after – 72 hours.

*Granuloma or LH giant cell is **not** pathagnomonic of TB…*

- Foreign body granuloma.
- Fat necrosis.
- Fungal infections.
- Sarcoidosis.
- Crohns disease.



Conclusions:

- Chronic, Mycobacterial, infection - Weight loss, fever, night sweats, lung damage.
- Commonest fatal infection in the world.
- CXR - apical lesions (CXR atypical AIDS)
- AIDS, Diabetes, malnutrition & crowding.
- Two forms Primary, Secondary
- Pulmonary, extrapulmonary, miliary.
- AFB positivity - infectiousness - isolation
- Multi drug to prevent selection of resistance
- Prevention depends on PPD & INH prophylaxis

What is New…?

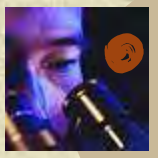
- 14-30% of TB patients also HIV infected.
- New drugs - Rifapentine, Interferons, Thalidomide.
- Immune therapy : Killed M. vaccine stimulates CD8 cells (increased INF and IL-12).
- The genome of TB has been identified (~4000 genes) potential to develop new vaccines and tests.

Name of journal and author	Abstract	Methodology	Conclusion
Clinical Utility of CT-Based Bronchial Aspirate TB-PCR for the Rapid Diagnosis of Pleural Tuberculosis Lee J, Lee SY, Choi KJ, Lim JK, Yoo SS, Lee SY, Cha SI, Park JY, Kim CH	Thoracoscopic pleural biopsy is often required for rapid and confirmative diagnosis in patients with suspected pleural tuberculosis(PL-TB)., we evaluated the clinical utility of the chest computed tomography (CT)-based bronchial aspirate (BA) TB-polymerase chain reaction (PCR) test in such patients.	Bronchoscopic evaluation was performed in 54 patients with presumptive PL-TB through diagnostic thoracentesis but without a positive result of sputum acid-fast bacilli (AFB) smear, pleural fluid AFB smear, or pleural fluid TB-PCR test. Diagnostic yields of BA were evaluated according to the characteristics of parenchymal lesions on chest CT.	The BA TB-PCR test seems to be a satisfactory diagnostic modality in patients with suspected PL-TB and patchy consolidative CT findings. For rapid and confirmative diagnosis in these patients, the bronchoscopic approach with TB-PCR may be preferable to the thoracoscopy

MCQs

- **The main cause of tuberculosis in human beings is:**
  1) M. tuberculosis;
  2) M. bovis;
  3) M. africanum;
  4) M. microti.

- **Ways of penetration of mycobacterium in organism are:**
  1) air-borne;
  2) alimentary;
  3) transplacental;
  4) contact.



Following antiTB drug is associated with major visual side effects:

A) INH

B) Rifampicin

C) Ethambutol

D) Pyrazinamide

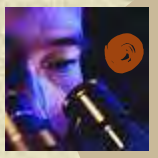
- **Gohn's focus is usually:**

A) Subpleural

B) Peribronchial

C) Apical

D) In lymph node



Mantoux test :

A) Is carried out by intradermal inoculation of live attenuated bacilli.

B) Positivity indicates prior exposure of the individual to M. Tuberculosis.

C) Positivity indicates good immunity against TB

D) Is a measure of individuals humoral immunity