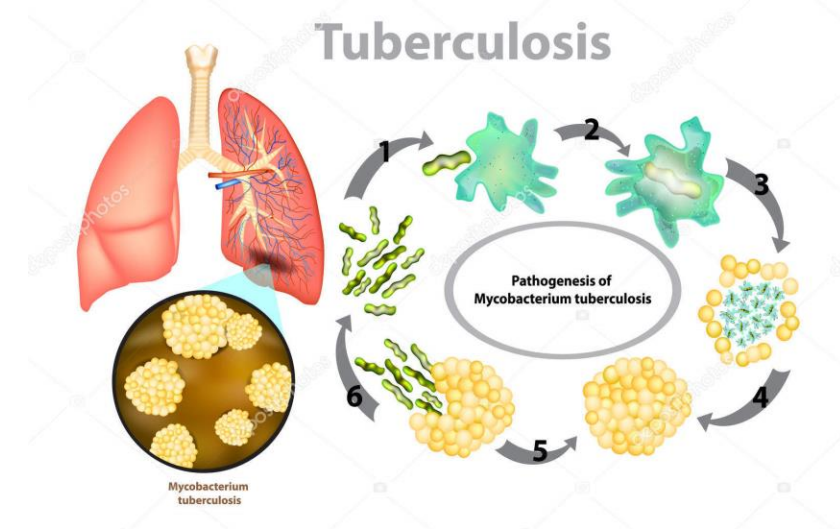


# RSM-4 PULMONARY INFECTIONS-2

Dr. Sura Al-Rawabdeh, M.D

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# Chronic Pneumonias



- ▶ Chronic pneumonia most often is a localized lesion in an immunocompetent individual, with or without regional lymph node involvement.
- ▶ There is typically granulomatous inflammation, which may be due to :
  - Bacteria (e.g., *M. tuberculosis*).
  - Fungi.
- In immunocompromised patients, the usual presentation is widespread disease due to systemic dissemination of the causative organism.
- Tuberculosis is by far the most important entity within the spectrum of chronic pneumonias

# Tuberculosis



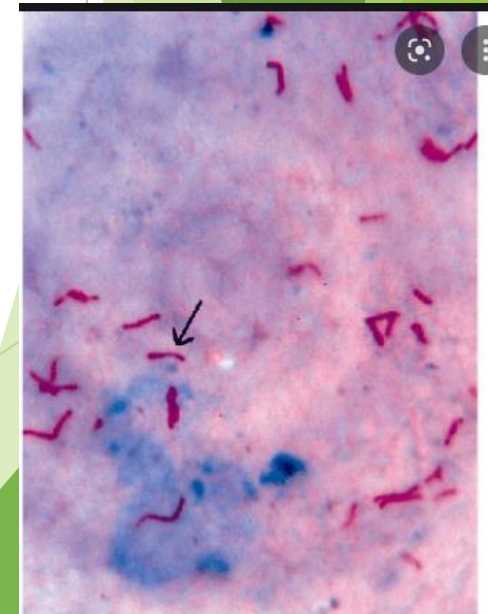
TUBERCULOSIS



- ▶ Tuberculosis is a communicable chronic granulomatous disease caused by *Mycobacterium tuberculosis*.
- ▶ It usually involves the lungs but may affect any organ or tissue in the body.
- ▶ The World Health Organization (WHO) considers tuberculosis to be the most common cause of death resulting from a single infectious agent.
- ▶ Tuberculosis flourishes under conditions of poverty, crowding, and chronic debilitating illness

# Etiology and Pathogenesis

- ▶ Mycobacteria are slender rods that are acid-fast (i.e., they have a high content of complex lipids that readily bind the Ziehl-Neelsen stain).
- ▶ *M. tuberculosis hominis* is responsible for most cases of tuberculosis; the reservoir of infection typically is found in individuals with active pulmonary disease.
- ▶ Transmission usually is direct, by inhalation of airborne organisms in aerosols generated by expectoration or by exposure to contaminated secretions of infected individuals

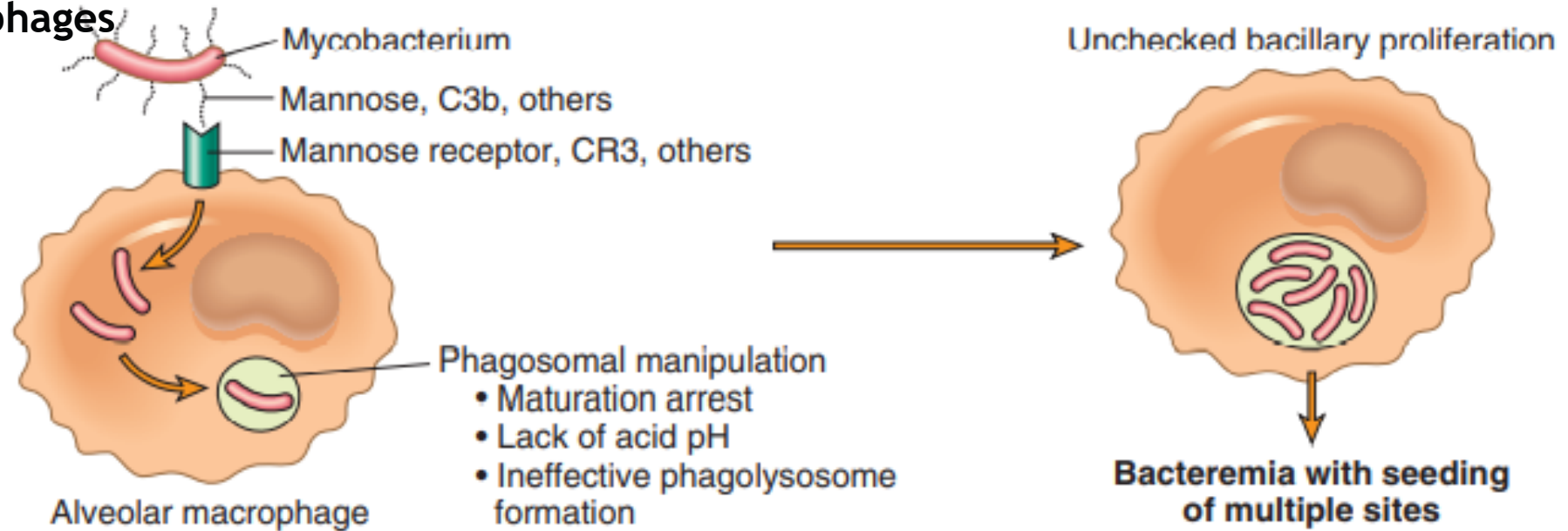


# Pathogenesis

**\*\* (the first 3 weeks) in the nonsensitized patient**

## A INFECTION BEFORE ACTIVATION OF CELL MEDIATED IMMUNITY

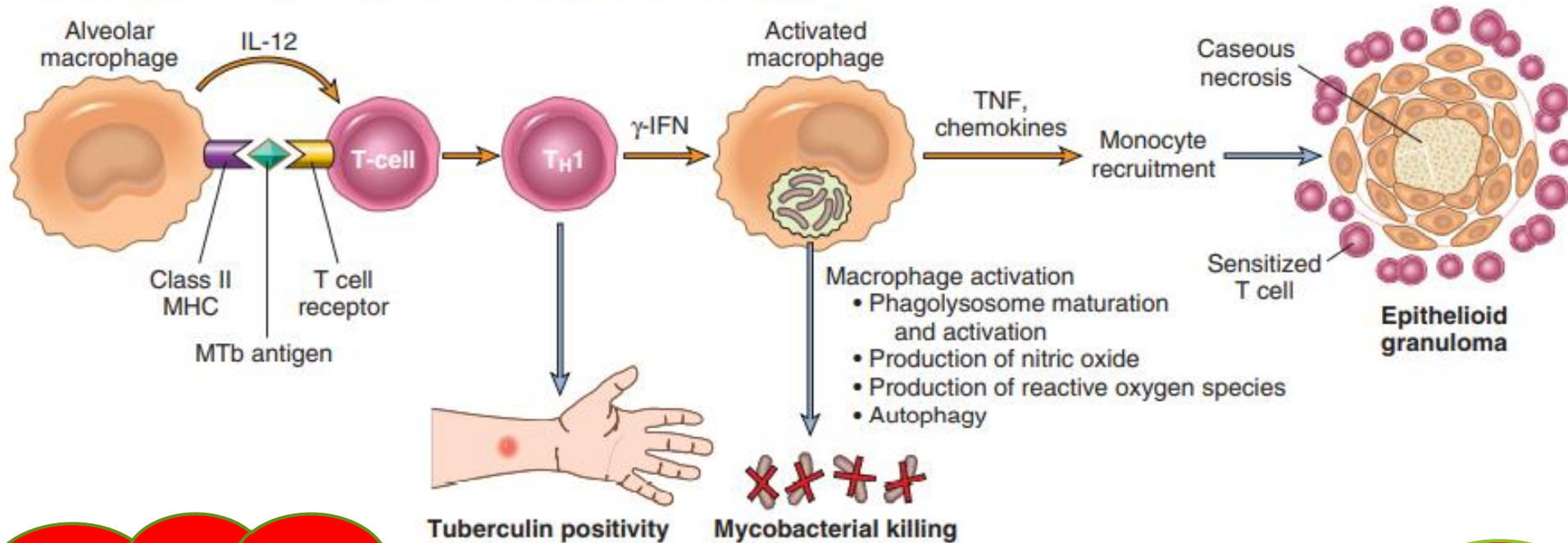
### 1. Entry into macrophages



### 2. Replication in macrophages.

# Development of cell-mediated immunity. This occurs approximately 3 weeks after exposure

## B INITIATION AND CONSEQUENCES OF CELL MEDIATED IMMUNITY



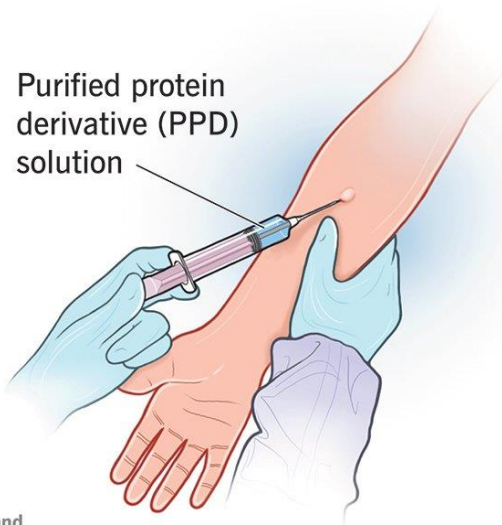
Individuals with inherited mutations in any component of the TH1 pathway are extremely susceptible to infections with mycobacteria

patients with rheumatoid arthritis who are treated with a TNF antagonist have an increased risk for tuberculosis reactivation.

# Tuberculin test

- ▶ About 2 to 4 weeks after the infection has begun, intracutaneous injection of 0.1 mL of sterile purified protein derivative (PPD) induces a visible and palpable induration (at least 5 mm in diameter) that peaks in 48 to 72 hours

## TB (tuberculosis) skin test *Intradermal injection*



# Primary Tuberculosis

- ▶ Primary tuberculosis is the form of disease that develops in a previously unexposed and therefore unsensitized patient.
- ▶ In the large majority of healthy individuals, the only consequence of primary tuberculosis are the foci of scarring (fibrocalcific nodule at the site of the infection).
- ▶ **BUT!!!!!!!!!!!!**
- ▶ these foci may harbor viable bacilli and thus serve as a nidus for disease reactivation at a later time if host defenses wane

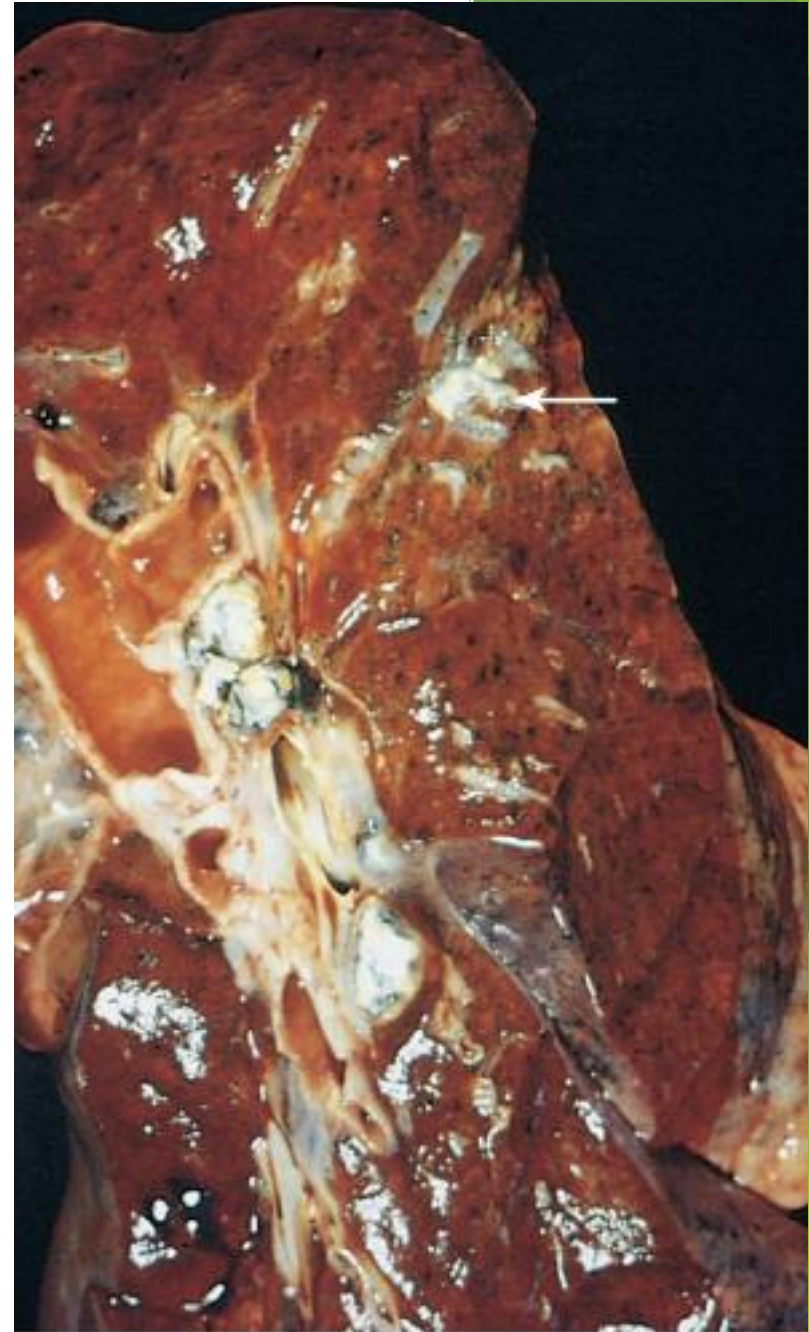




# MORPHOLOGY

- ▶ A 1-cm to 1.5-cm area of gray-white inflammatory consolidation emerges. This is called the Ghon focus, with caseous necrosis in the center.
- ▶ Tubercle bacilli, either free or within phagocytes, travel via the lymphatic vessels to the regional lymph nodes.
- ▶ This combination of parenchymal and nodal lesions is called the Ghon complex.
- ▶ Lymphatic and hematogenous dissemination to other parts of the body also occurs during the first few weeks.

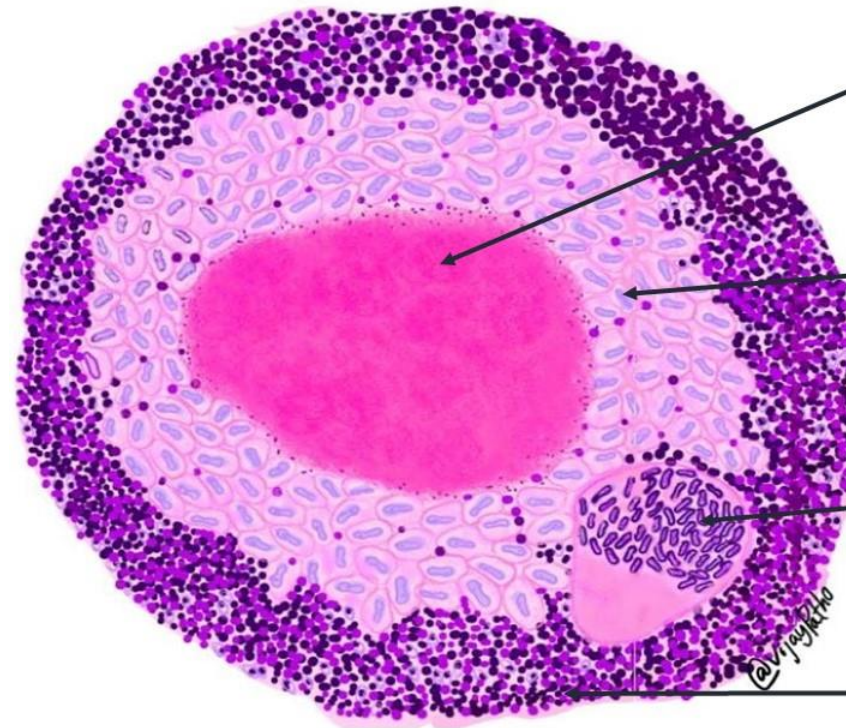
**Ghon complex:**  
The gray-white parenchymal sub pleural focus  
with Hilar lymph nodes caseation.



- ▶ **Histologically:**
- ▶ sites of infection are involved by a characteristic inflammatory reaction marked by:
- ▶ the presence of caseating and noncaseating granulomas, which consist of epithelioid histiocytes and multinucleate giant cells.

### TUBERCULOUS LYMPHADENITIS:

### Necrotizing granuloma

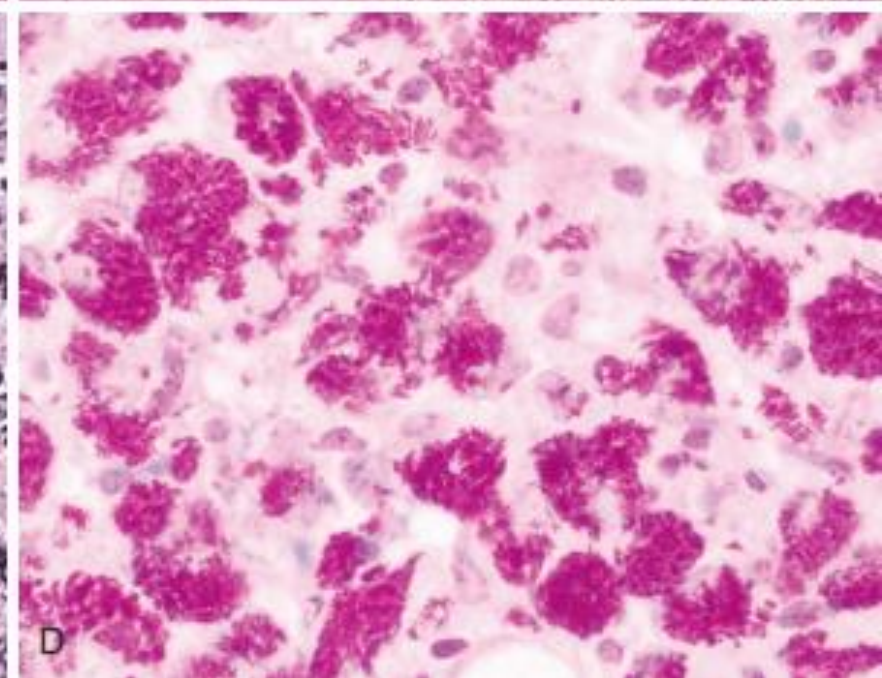
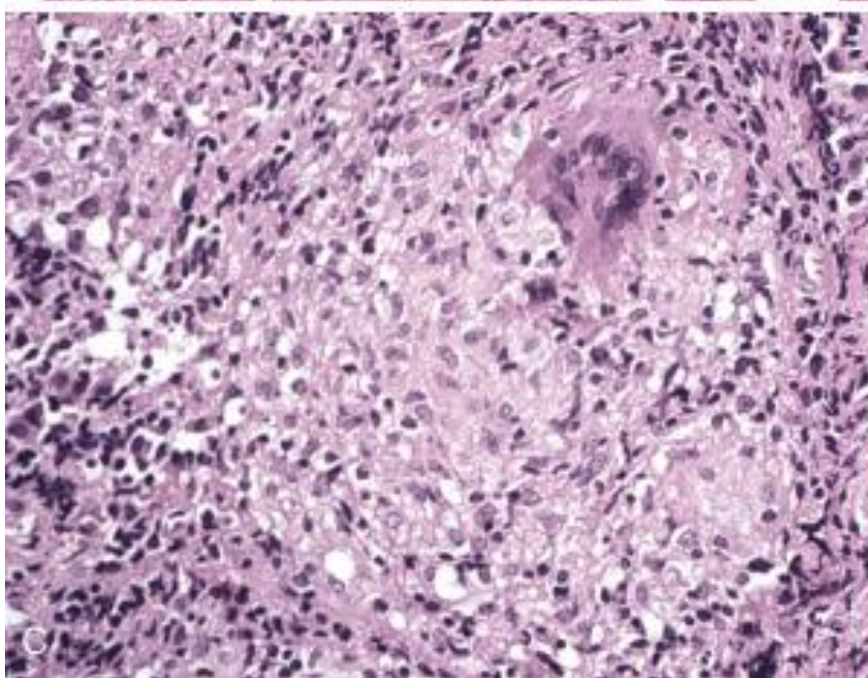
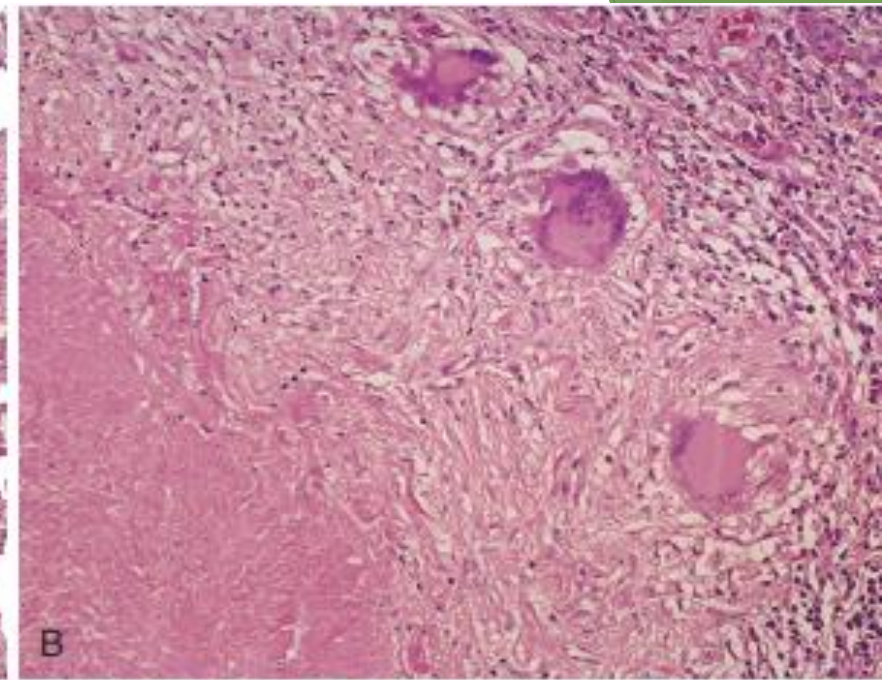
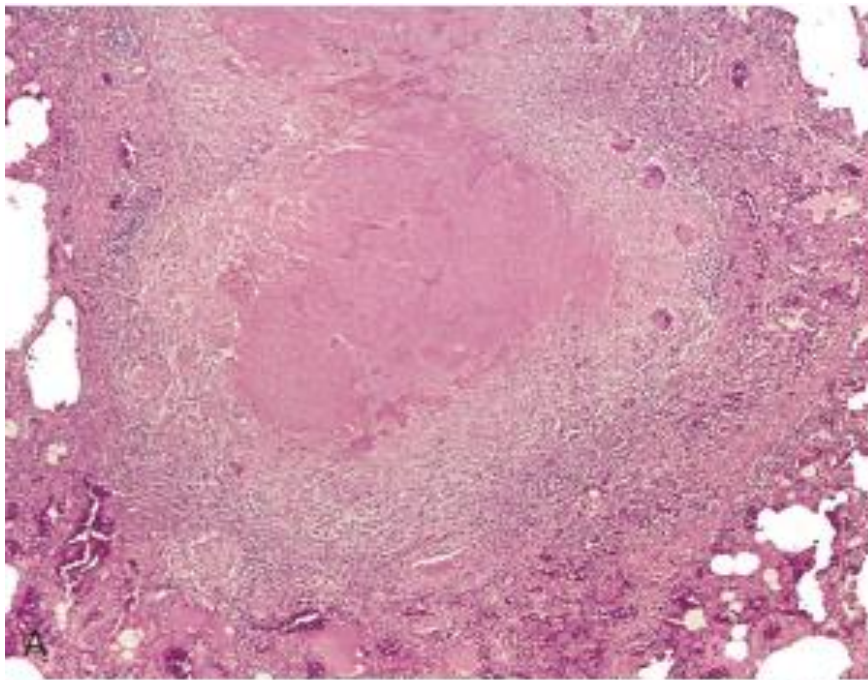


Amorphous granular eosinophilic debris material  
**CASEOUS NECROSIS**

Modified macrophages with abundant cytoplasm and pale staining "slipper" shaped nuclei  
**EPITHELOID CELLS**

Multinucleated giant cell  
**LANGHAN GIANT CELL**

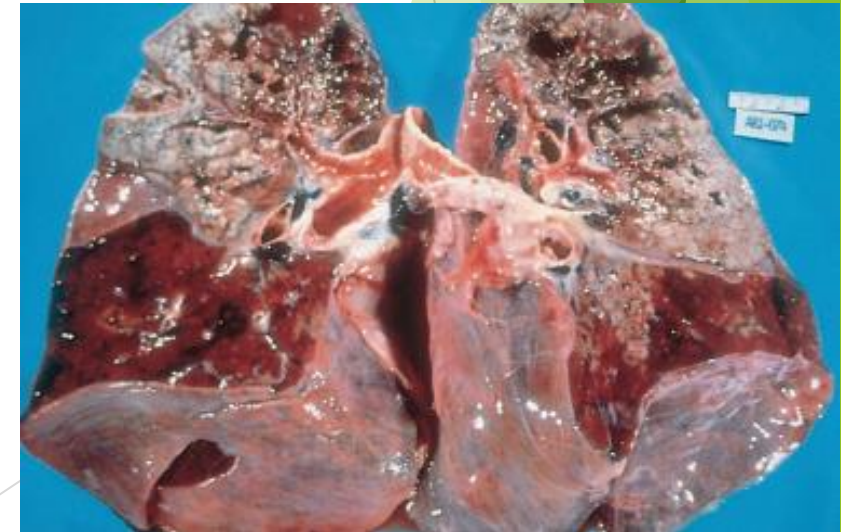
Collar of lymphocytes surrounding epithelioid cell aggregates



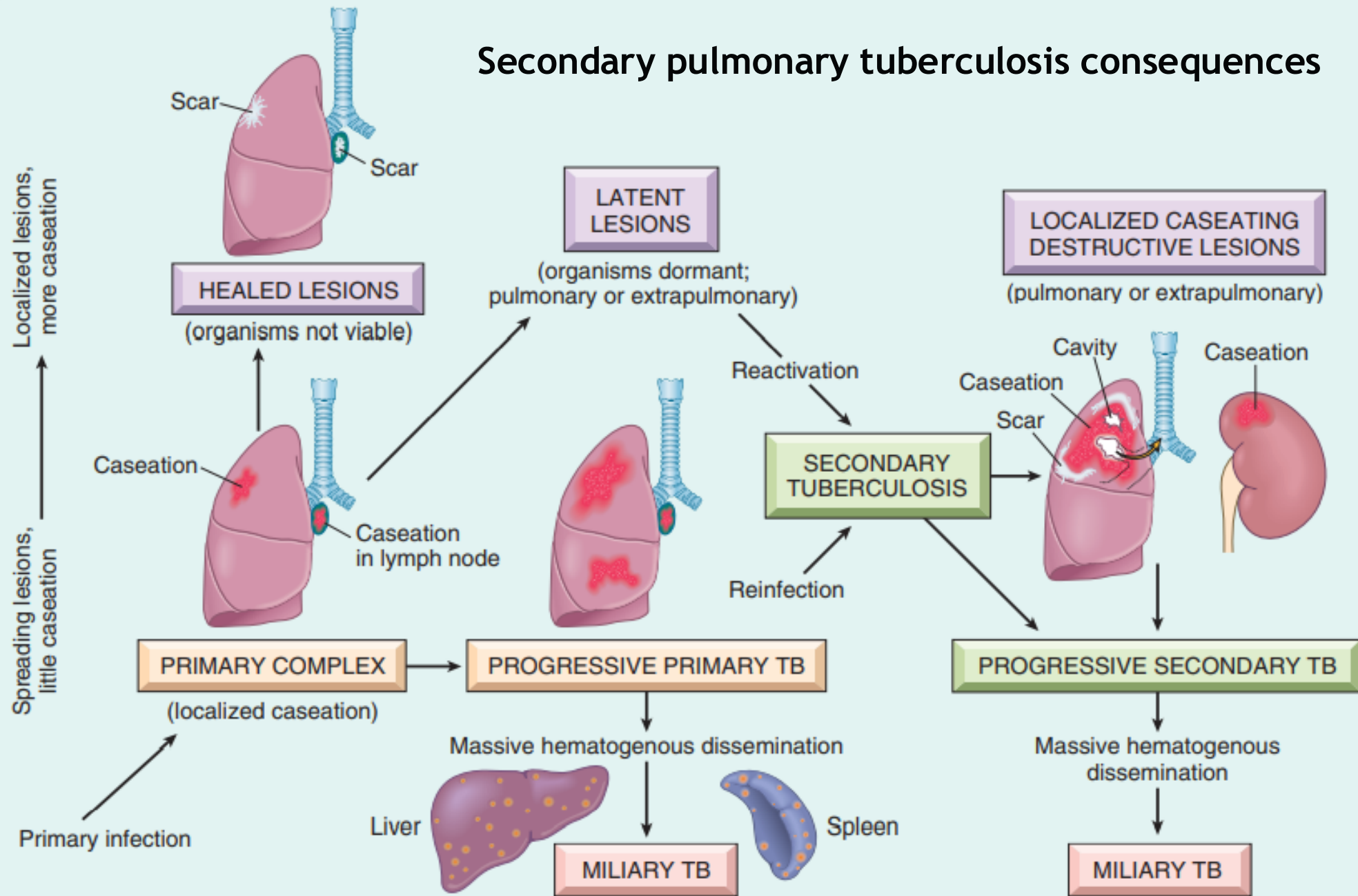
# Secondary Tuberculosis (Reactivation Tuberculosis)

- ▶ Secondary tuberculosis is the pattern of disease that arises in a previously sensitized host.
- ▶ It may appear shortly after primary tuberculosis, but more commonly arises from reactivation of dormant primary lesions many decades after initial infection.
- ▶ only a few patients (<5%) with primary disease subsequently develop secondary tuberculosis.

- ▶ Secondary pulmonary tuberculosis is classically localized to the apex of one or both upper lobes, may relate to high oxygen tension in the apices.
- ▶ The regional lymph nodes are less prominently involved early in the disease .
- ▶ Cavitation is common in the secondary form, leading to erosion into and dissemination along airways.
- ▶ So the sputum containing many bacilli!!!!!!



# Secondary pulmonary tuberculosis consequences



# Secondary pulmonary tuberculosis consequences

## ▶ 1. progressive pulmonary tuberculosis:

- The apical lesion enlarges and the area of caseation expands.
- Erosion into a bronchus evacuates the caseous center, productive cough?
- Erosion of blood vessels results in hemoptysis.

## 2. Miliary pulmonary disease :

- occurs when organisms reach the bloodstream through lymphatic vessels and then recirculate to the lung via the pulmonary arteries.



▶ 3. pleural involvement:

- pleural effusions, tuberculous empyema, or obliterative fibrous pleuritis may develop.

▶ 4. Systemic miliary tuberculosis:

- when the organisms disseminate hematogenously throughout the body.

- Systemic miliary tuberculosis is most prominent in the liver, bone marrow, spleen, adrenal glands, meninges, kidneys, fallopian tubes, and epididymis

▶ 5. Isolated-organ tuberculosis:

- if one of the organs or tissues seeded hematogenously and may be the presenting manifestation of tuberculosis.
- Organs typically involved include the meninges (tuberculous meningitis), kidneys (renal tuberculosis), adrenal glands, bones (osteomyelitis), and fallopian tubes (salpingitis).

▶ 6. Lymphadenitis :

- is the most frequent form of extrapulmonary tuberculosis, usually occurring in the cervical region .
- Lymphadenopathy tends to be unifocal.

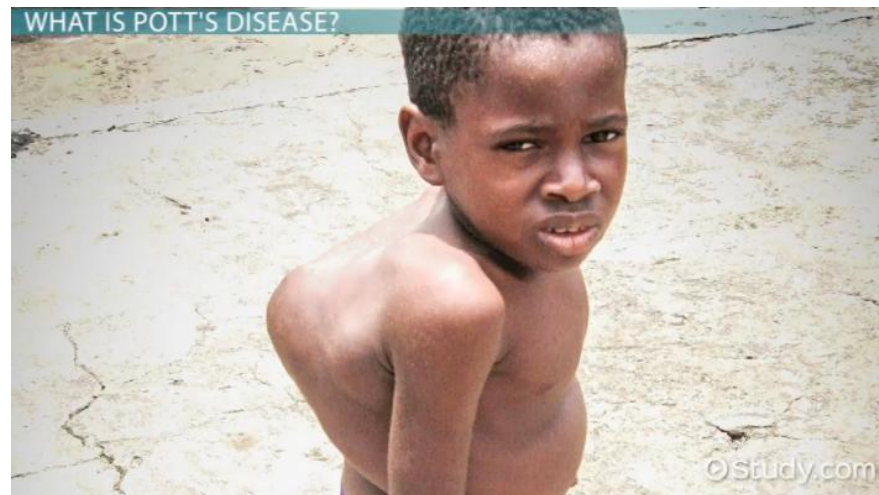
# Clinical Features

- ▶ Localized secondary tuberculosis may be :
  - Asymptomatic.
  - Cytokines-related (TNF, IL-1) symptoms:
    - include malaise, anorexia, weight loss, and fever.
    - mucoid and later purulent-bacilli containing sputum.
    - hemoptysis .
  - Pleuritic pain.



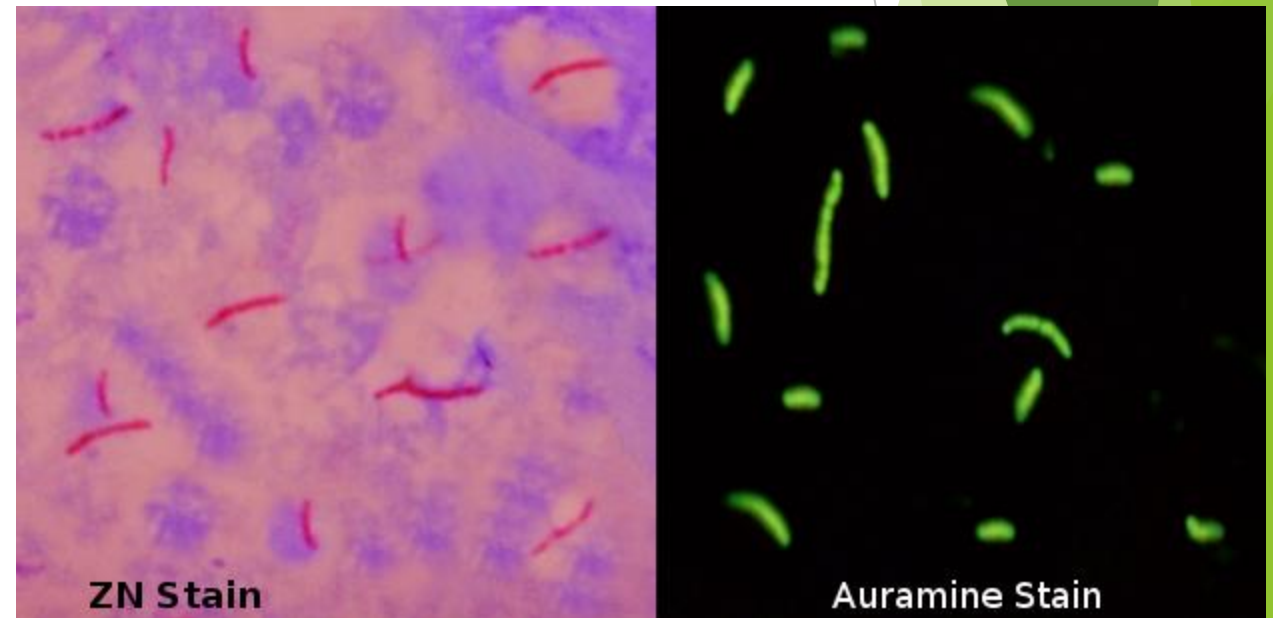
# Extrapulmonary manifestations

- Tuberculous salpingitis may present as infertility.
- Tuberculous meningitis with headache and neurologic deficits.
- Pott disease with back pain and paraplegia.



# diagnosis

- ▶ Demonstration of acid-fast organisms in sputum by staining or by use of fluorescent auramine rhodamine.
- ▶ Cultures for mycobacteria require up to 10 weeks.
- ▶ PCR amplification.



# TUBERCULOSIS

MYCOBACTERIUM TUBERCULOSIS IS CARRIED THROUGH THE AIR IN INFECTIOUS DROPLETS PRODUCED WHEN INFECTED INDIVIDUALS COUGH



FEVER, FATIGUE, WEIGHT LOSS, PRODUCTIVE COUGH, AND BLOOD-STREAKED SPUTUM



NIGHT SWEATS

THE PPD TEST CONSISTS OF A SUBCUTANEOUS INJECTION OF TUBERCULIN ANTIGEN WITH A SUBSEQUENT READING IN 48 TO 72 HOURS



THE REACTION IS REPORTED ACCORDING TO THE DIAMETER OF THE INDURATION, NOT ERYTHEMA

Good Luck

The background features abstract, overlapping geometric shapes in various shades of green, ranging from light lime to dark forest green. These shapes are primarily located on the right side of the frame, creating a modern, layered effect against the white background.