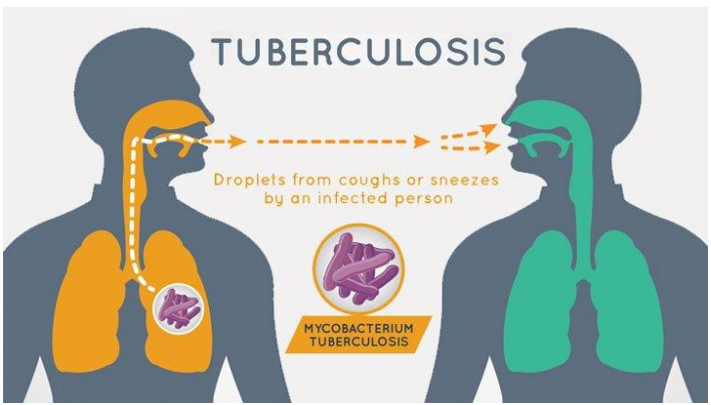
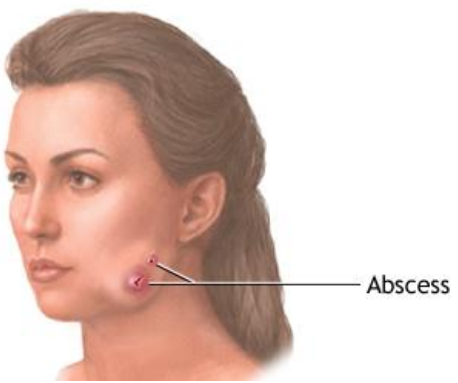
TUBERCULOSIS & ACTINOMYCOSIS





DR SAJDA KHAN GAJDHAR
Course coordinator
General Pathology

Lecture learning outcome

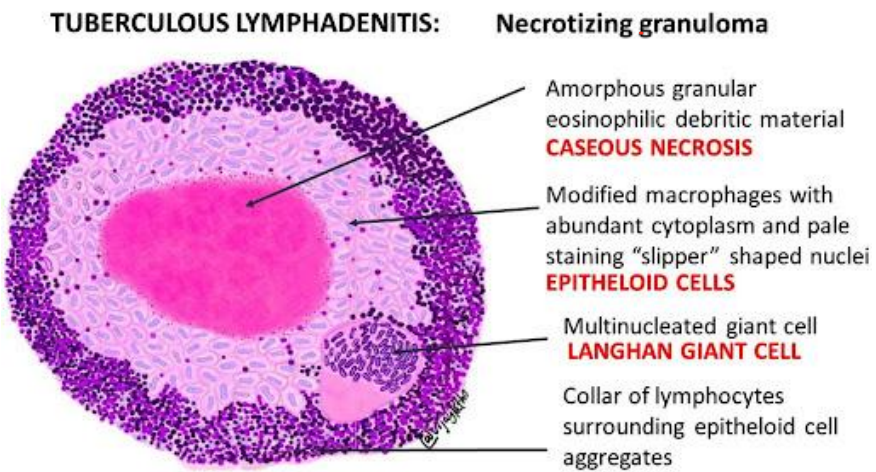
L9 : Tuberculosis & Actinomycosis

LLO	By the end of this lecture, students should be able to:
L9.1	Define granuloma and discuss types of tuberculosis
L9.2	Explain pathogenesis of pulmonary tuberculosis.
L9.3	Interpret the laboratory investigation in diagnosis of tuberculosis infection.
L9.4	Discuss actinomycosis and the clinical outcome of actinomycosis in cervicofacial region.

Essential reading:

- **Harsh Mohan: Essential Pathology for Dental Students (with Practical Pathology). 5th ed; 2017; Jaypee Brothers Medical Publishers**
- **Harsh Mohan: Textbook of Pathology. 7th ed; 2014; Jaypee Brothers Medical Publishers**
- **Kumar: Robbins Basic Pathology. 10th ed; 2017; Elsevier**

GRANULOMA



Granuloma is a **circumscribed, tiny lesion, composed predominantly of collection of modified macrophages called epithelioid cells, and rimmed at the periphery by lymphoid cells**: T cell, giant cells, fibrosis

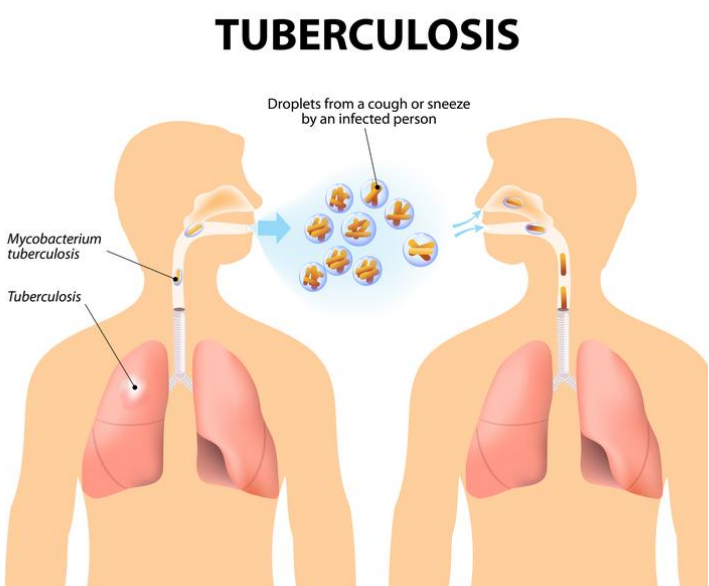
Besides the presence of epitheloid cells, granulomas have presence of fibrosis, necrosis and giant cells.

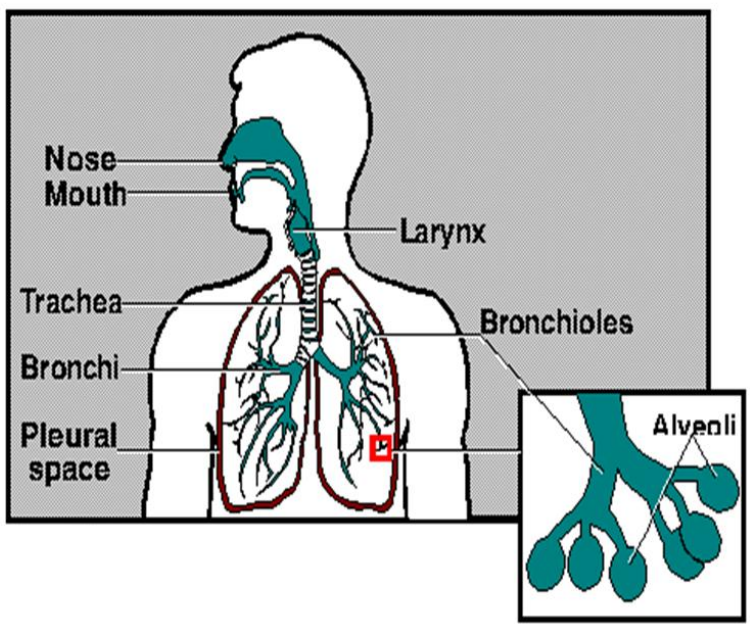
Tuberculosis (TB)

- Tuberculosis represents **classical example of chronic granulomatous inflammation.**
- It is an **Infectious disease caused by the microorganism Mycobacterium tuberculosis (strict aerobe, Acid fast rods)**
- **Mycobacterium bovis: Oropharygeal and intestinal TB**
- More common in developing countries of Africa and Asia.
- Other factors contributing : **malnutrition, inadequate medical care, poverty, crowding, chronic debilitating conditions like uncontrolled diabetes, alcoholism and immunocompromised states like AIDS**

PULMONARY TUBERCULOSIS

- **Lung** is the main organ affected in tuberculosis
- MBT is carried on **droplets in the air** (coughing or sneezing) and can enter the body through the airway





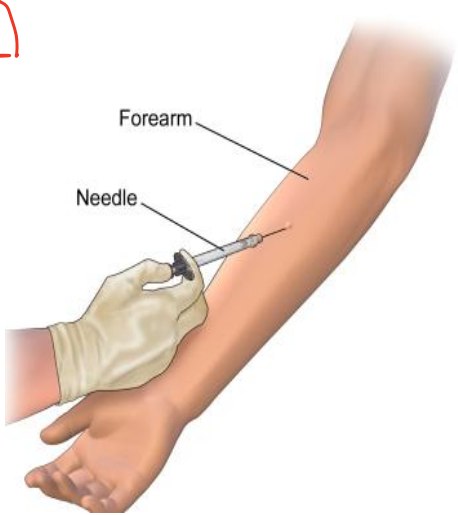
The process of catching tuberculosis involves two stages:

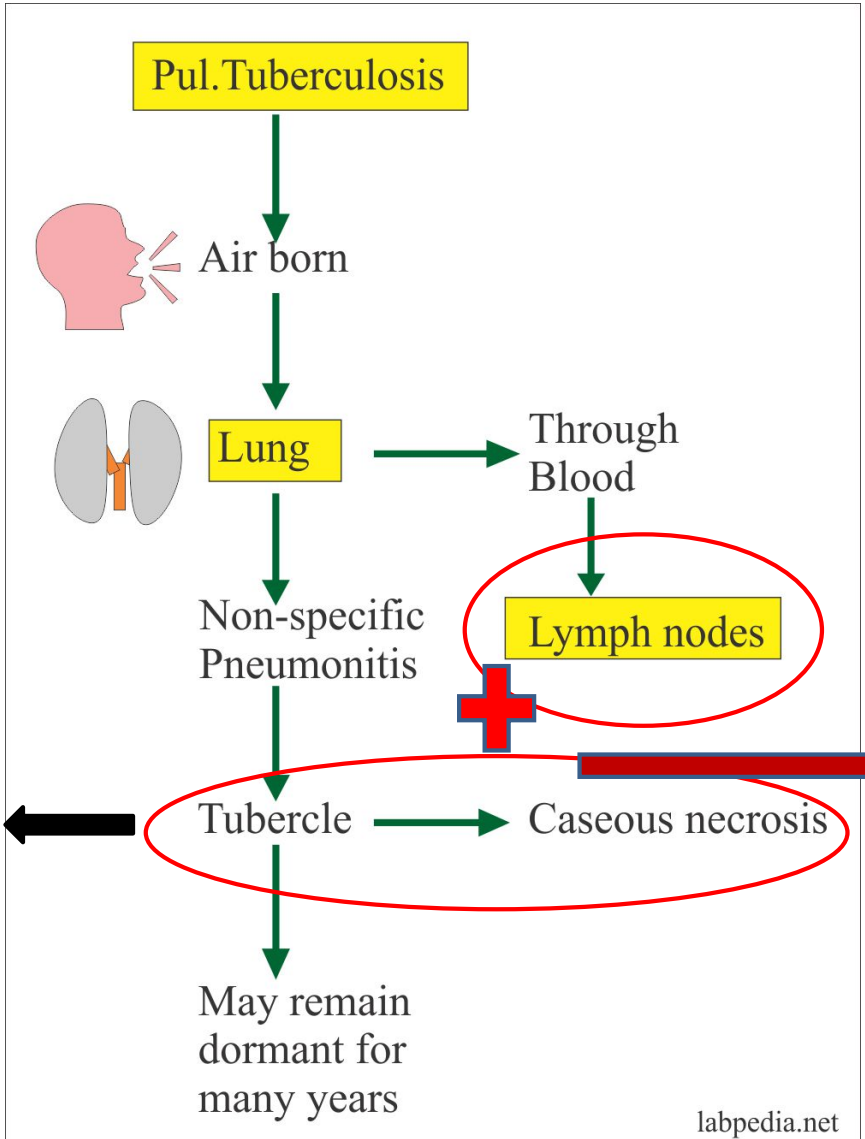
FIRST : A person has to become infected. Asymptomatic

SECOND: The infection has to progress to disease.

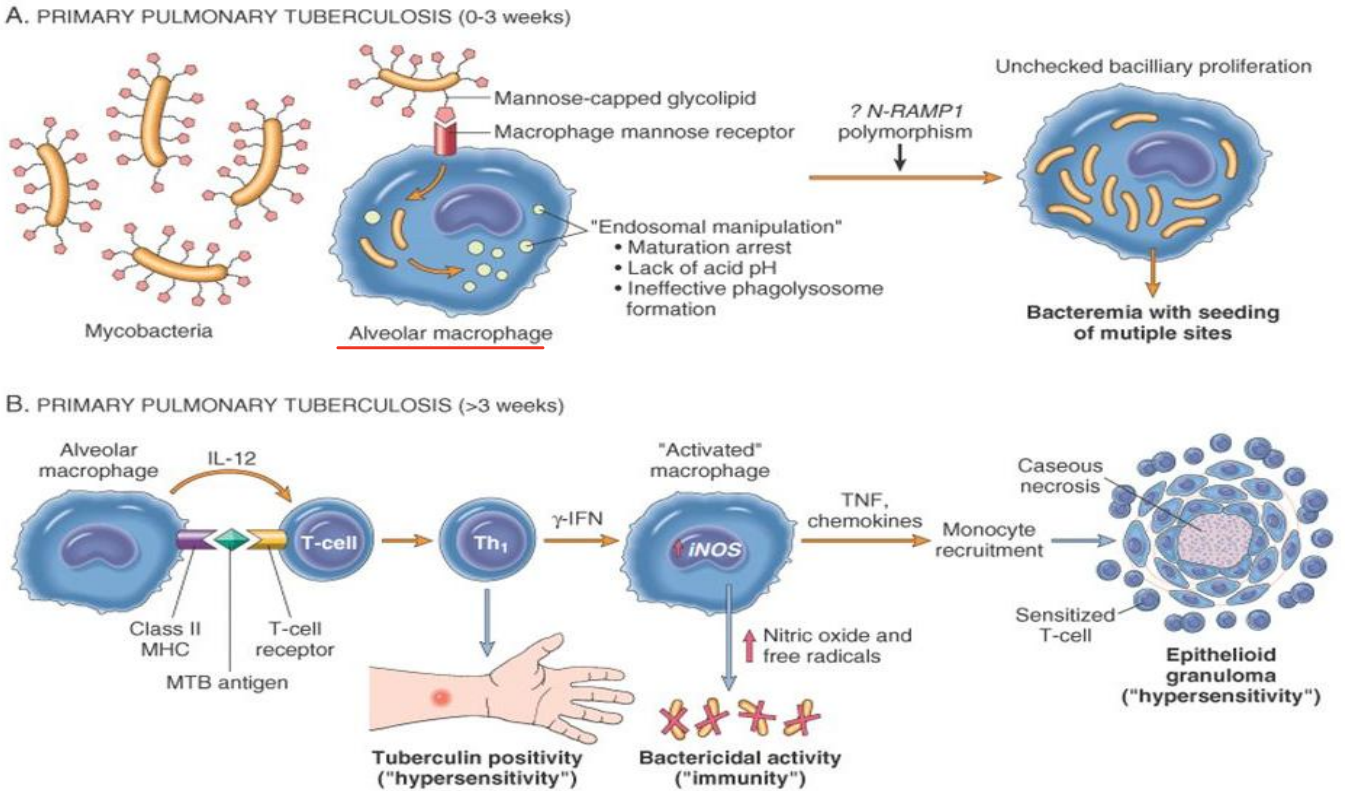
Mantoux test (tuberculin test)

- Mantoux test is preferable: **0.1 cc** containing 5 tuberculin units (TU) of **purified protein derivatives (PPD)** from human strain
- Site of injection is **subcutaneous of flexor of arm**
- **48 –72** hours later skin is observed for induration& redness
- **Positive -> 10mm**
- Inconclusive –5 –9mm
- Negative -< 5mm




Pul.Tuberculosis
Air born
Lung
Through Blood
Non-specific Pneumonitis
Lymph nodes
Ghon;s/ primary focus
Tubercle
Caseous necrosis
Ghon;s/primary complex
May remain dormant for many years
labpedia.net

PATHOGENESIS OF PULMONARY TUBERCULOSIS



Primary

Pathogenesis < 3 Wks:

- M. tuberculosis enters macrophages by endocytosis
- M. tuberculosis organisms replicate within the phagosome by blocking fusion of the phagosome and lysosome.
- Resulting in bacteremia and seeding of multiple sites.

Pathogenesis > 3 Wks:

- Mycobacterial antigens that enter lymph nodes & displayed to T cells.
- IL – 12 causes T_H1 differentiate and activated.
- Mature T_H1 cells, both in lymph nodes and in the lung, produce IFN-γ.
- IFN-γ activates the macrophage Kill directly
- Activated macrophage secretes IL-12 & TNF.
- TNF recruit monocytes. → more macrophages

Types of tuberculosis

A. Primary tuberculosis

B. Secondary tuberculosis

C. Tertiary tuberculosis

1. Primary Tuberculosis(PT)/ Ghon's complex, Childhood TB)

- The infection of an individual who **has not been previously infected or immunized** is called PT.

- **Inhalation** causes infection in susceptible host, usually **asymptomatic** focus of pulmonary infection

Primary complex or Ghon's complex

Consists of 2 components

ghon's focus

1. **Lesion in lung is called primary (ghons) focus: small 1,2 cm, white, solitary area of consolidation** in **subplural area** of upper part of lower lobe or lower part of upper lobe.

granuloma

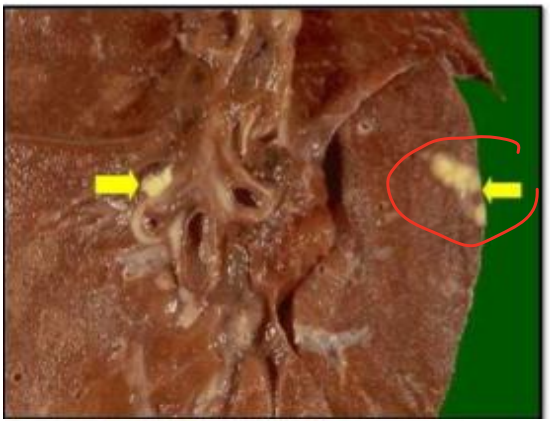
2. **Lymph node and lymphatics**: **:** Enlarged Hilar lymph node

ghon's complex

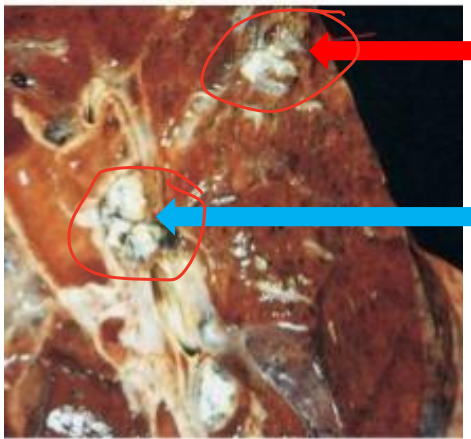
granuloma

GHON;S COMPLEX

Gross



- Ghon's focus: Grey white firm solitary nodule
- Hilar lymphadenopathy: matted multiple lymphnode, also shows grey white cut surface



Ghon;s foci

Hilar lymph node

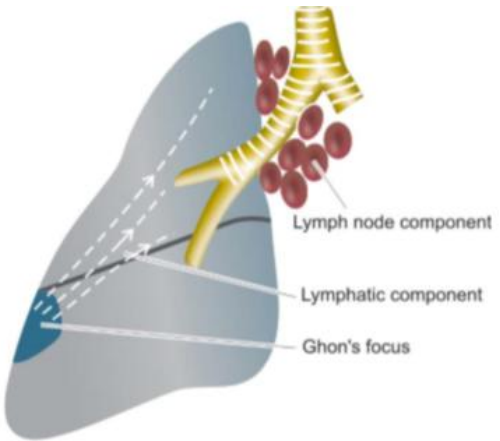
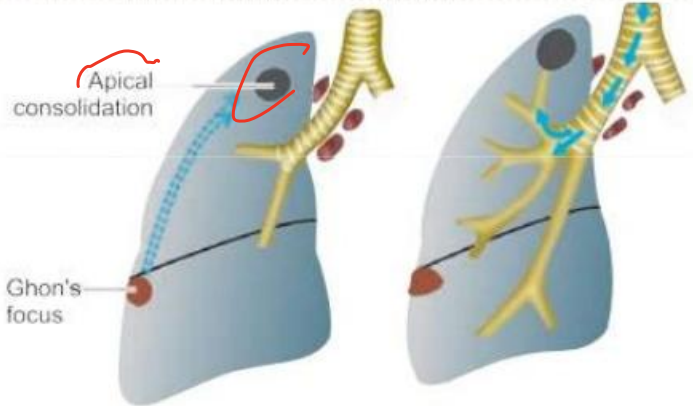


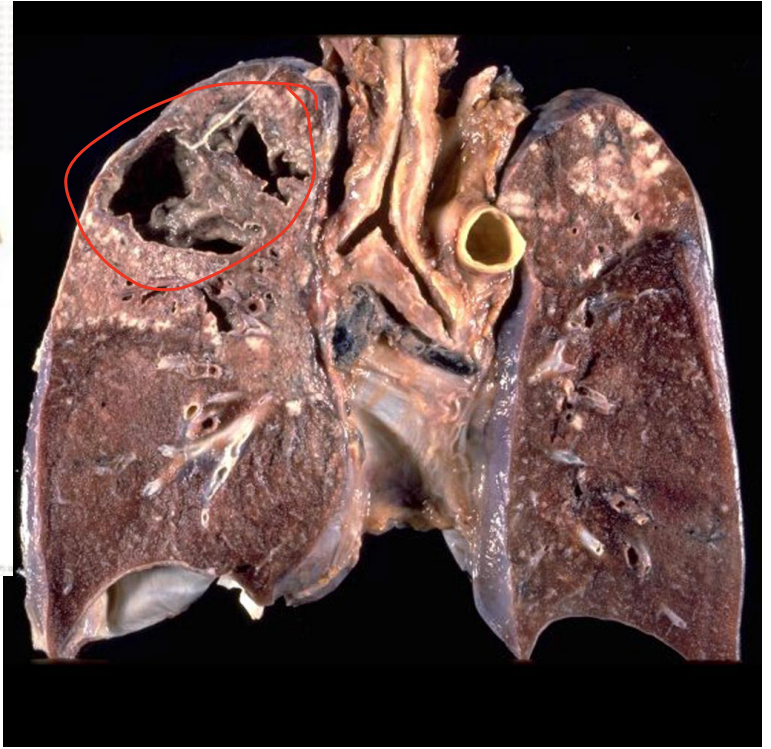
Figure 11.5 The primary complex composed of 3 components: Ghon's focus, draining lymphatics, and hilar lymph nodes.

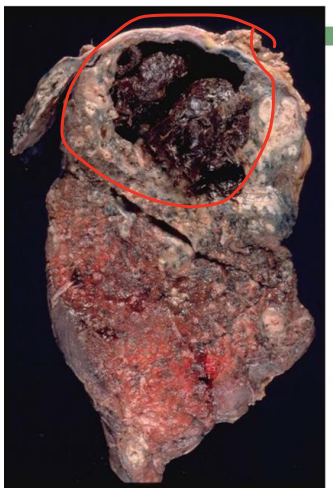
2. Secondary Tuberculosis, post-primary or reinfection

- The infection of an individual who has been **previously infected or** reactivation of dormant primary complex **or** fresh dose of reinfection by the tubercle bacilli.
- **Most common infectivity** to other individuals.
- Secondary tuberculosis occurs most commonly in **lungs in the region of apex** (Because O2 tension is high and favorable for growth of aerobic MBT) and form cavitation.

Secondary Tuberculosis





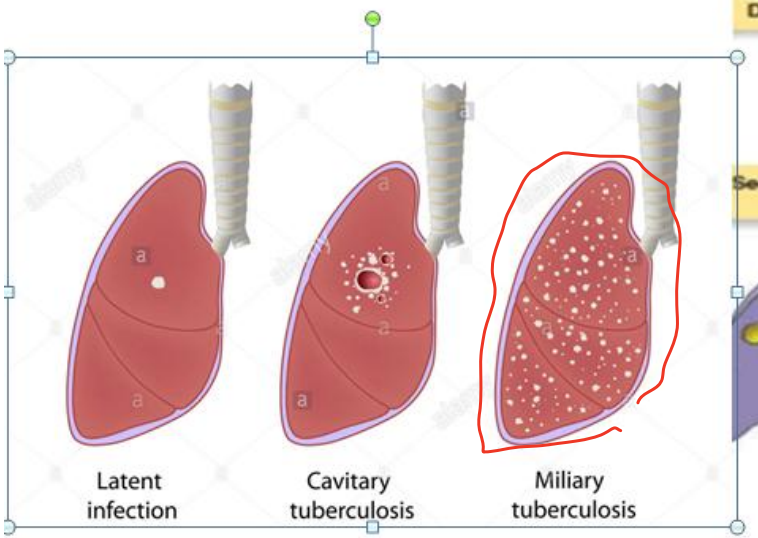


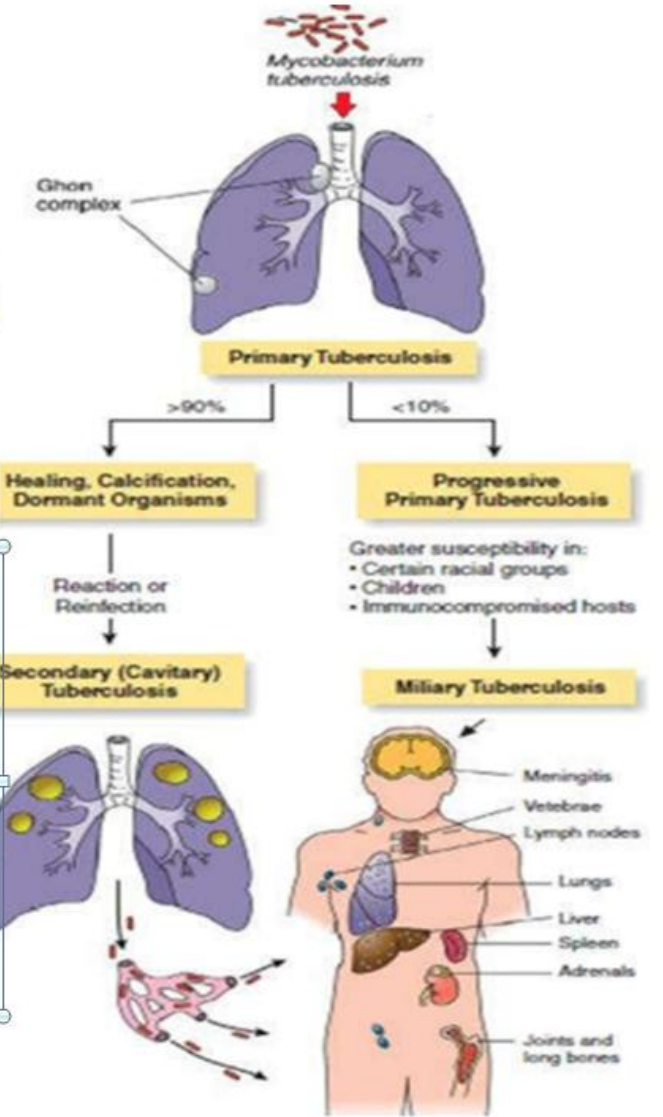
Cavitatory tuberculosis with intracavitary hemorrhage. Extensive necrosis with cavitation, usually occurring in the upper lung lobe .

3. Miliary (tertiary) Tuberculosis

- Occurs when **immunity is poorly suppressed.** immunocompromised
- The spread through circulation and multi **organ involvment seen.**
- Grossly, the miliary lesions are **millet seed-sized (1 mm diameter), yellowish, firm** areas scattered

Spleen miliary TB





Clinical Features of TB

Asymptomatic

The primary TB: may be symptom-free, or the individual may experience a flu-like illness.

Secondary TB: called active disease

1. **Fever (intermittent),**
2. **Night sweats,**
3. **Weight loss,**
4. **Loss of apatite,**
5. **Productive cough with blood-stained sputum.**

saliva spit with blood

Diagnosis

The diagnosis of pulmonary disease is based clinical, pathological and radiological findings. Evidence of tubercle bacilli must be present.

Clinical findings:	Radiological Findings:
1. Fever [Intermittent] 2. Cough with sputum [Mucoid or purulent or bloody] 3. Loss of weight 4. Loss of appetite 5. Night sweats	X – ray: Ranke complex or cavity in apex.

ghon's complex in gross but in Radiograph is Ranke complex

Laboratory findings:

1. Acid fast positivity of bacilli in tissue biopsy or sputum.
2. Cultures of sputum or bronchoscopy material reveals bacilli and it is time consuming.
   [Conventional cultures require up to 10 weeks, but culture in liquid media can provide an answer within 2 weeks]
3. PCR amplification is fast and even 10 organisms in clinical specimens can be detected when compared with more than 10,000 organisms required for smear positivity.
4. Culture remains the gold standard because it also allows testing of drug susceptibility.

ACTINOMYCOSIS

- Actinomycosis is a **chronic suppurative disease** caused by filamentous, branched, gram positive, **anaerobic bacteria, Actinomycetes israelii.**
- The organisms are commensals in the **oral cavity, alimentary tract and vagina.**
- The infection is **always endogenous** in origin and not by person-to-person contact.
- It leads to multiple abscesses and sinuses.

TYPES OF ACTINOMYCOSIS

Depending upon the anatomic location of lesions, actinomycosis is of 4 types:

1. Cervicofacial — abscess in lower jaw
2. Thoracic
3. Abdominal
4. Pelvic

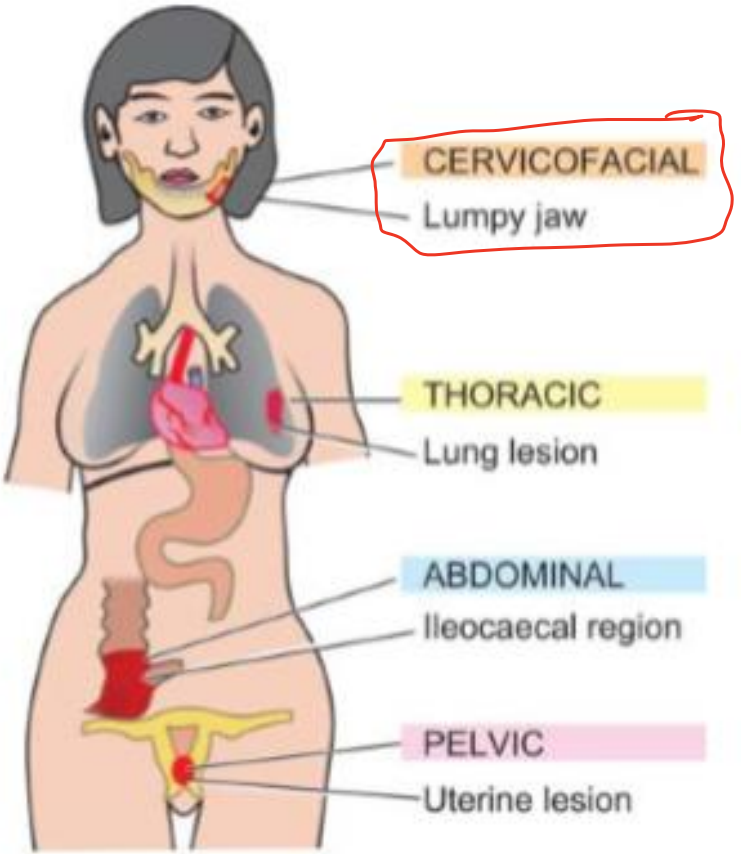


Figure 11.21 Actinomycosis, sites and routes of infection.

Cervicofacial actinomycosis.

- **Commonest form (60%)** and has the **best prognosis**.
- The infection enters from tonsils, carious teeth, periodontal disease or trauma following tooth extraction.

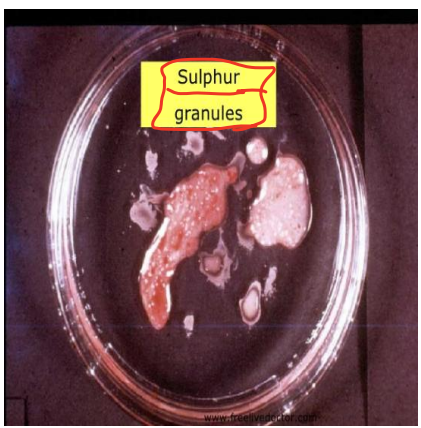
Initially, a **firm swelling develops in the lower jaw ('lumpy jaw').**

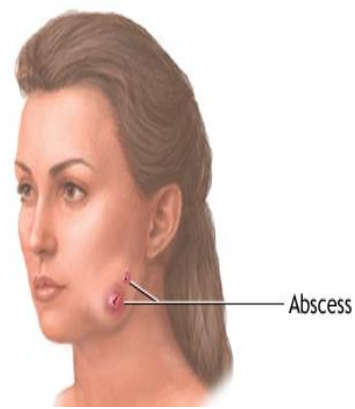
mass **breaks down and abscesses** and **sinuses are formed.**

The **discharging pus contains typical tiny yellow sulfur granules.**

The infection may extend into adjoining soft tissues and may **destroy the bone.**

Fever, hard tender lumps around mandible



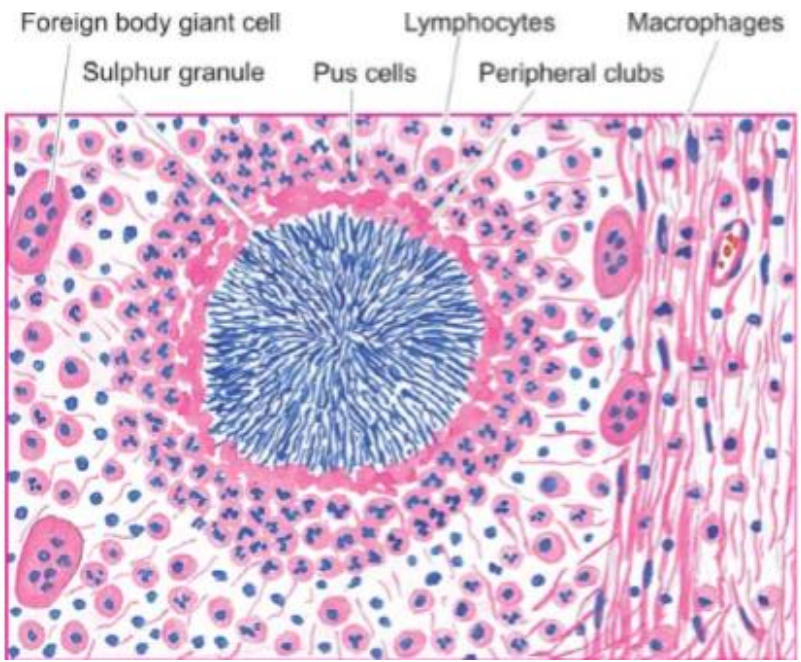


Thoracic and Abdominal actinomycosis (30%)

- Due to **aspiration of the organism from oral cavity** or extension of infection from abdominal or hepatic lesions.

- Initially, the disease resembles pneumonia but subsequently the infection spreads to the whole of lung, pleura, ribs and vertebrae.

Microscopy



Granulomatous inflammation with central suppuration (abscess) at the periphery chronic inflammatory cells, giant cells and fibroblasts are seen.

The center of each abscess contains the **bacterial colony (gram-positive) 'sulphur granule' characterised by radiating filaments**

Thank you