TUBERCULOSIS

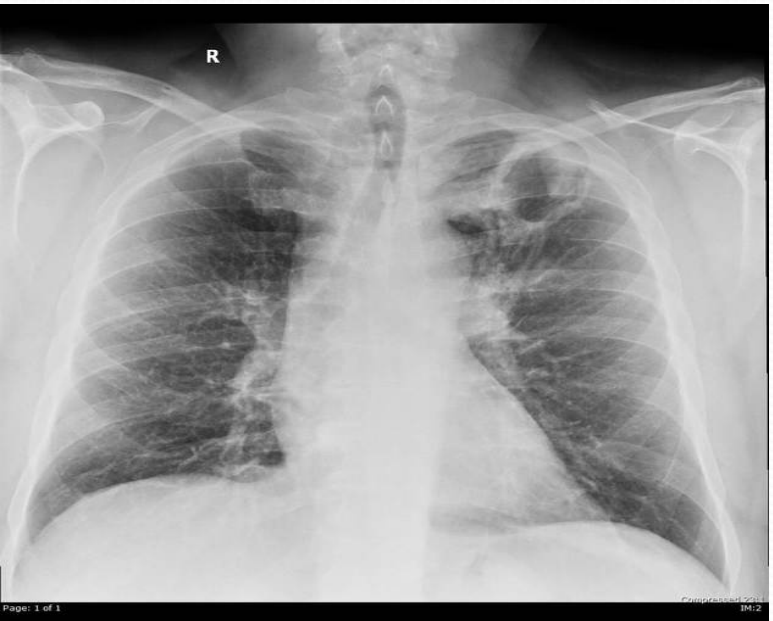
By
PROFESSOR DR-SHOROQ AL-TEMIMI
PhD FOR HISTOPATHOLOGY
Pathology Department
Al-Qadisiyah university

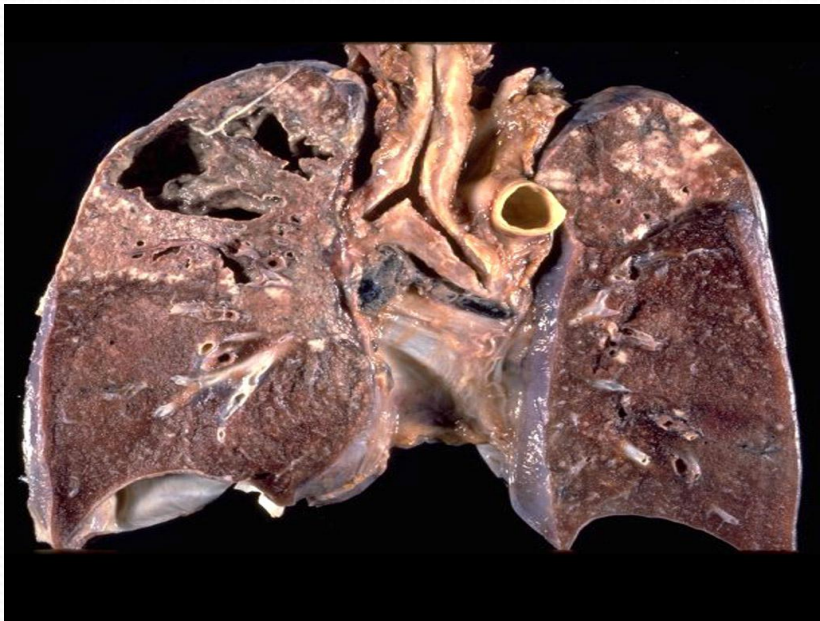
Plan of lecture

1-Diffention of secondary TB
2-Pathogensis of secondary TB
3-Fate of secondary TB
4-Diagnosis of TB
5- Summary for TB

Case -1

A 69-year-old man in the medical clinic for continuing care for his hypertension and adult-onset diabetes (type 2 DM) and presented now with develops weakness, malaise, cough with bloody sputum, and night sweats . A chest X-ray reveals apical densities , which are cavitary and M. tuberculosis is identify in his sputum smear .





Secondary Tuberculosis (Post-primary) (Reactivation Tuberculosis)

Secondary tuberculosis is the pattern of disease that arises in a previously sensitized host and occur in immuno-competent patients and immuno-compromised .

Pathogenesis

Secondary Tuberculosis (Post-primary) occur either reactivation of the dormant primary infection (as in latent TB) or re-exposure to the bacilli in a previously sensitized host (as in endemic areas).

Secondary T.B

reactivation **re-exposure**

-Secondary Tuberculosis at any location may be involved but the lungs are by far the most common site for secondary tuberculosis.

-It may follow shortly after primary tuberculosis (Post-primary) , but more commonly it arises from reactivation of dormant primary lesions many decades after initial infection, particularly when host resistance is weakened.

-In secondary tuberculosis will results in rapid recruitment of defensive reactions and tissue necrosis .

-Secondary tuberculosis occurs when the protection (immunity) offered by the primary infection is weakened.
-Secondary Tuberculosis is symptomatic

-Whatever the source(reactivation or re-exposure) only less than 5% with primary disease subsequently develop secondary tuberculosis.

-Secondary pulmonary tuberculosis is classically localized to the apex of one or both upper lobes. This may relate to high oxygen tension in the apices.

-In secondary pulmonary TB, the infection often produces a friable nodule at the lung apex (Simon focus).

-In secondary tuberculosis because of the pre-existence of hypersensitivity, will results in rapid recruitment of defensive reactions ,and macrophage make wall off the focus of bacilli with tissue necrosis . As a result of this localization, the regional lymph nodes involvement is less prominently than they are in primary tuberculosis.

-Cavitation occurs readily in the secondary form, & is almost present in neglected cases.

-As a result erosion of airways occurs; this converts the patient into a source of infection to others (sputum containing bacilli).

-Secondary Tuberculosis is symptomatic

Fate of secondary TB

1-In favorable cases, the initial localized apical parenchymal damage undergoes progressive healing by fibrosis & eventually represented by fibrocalcific scars. This happy outcome occurs either spontaneously or after therapy.

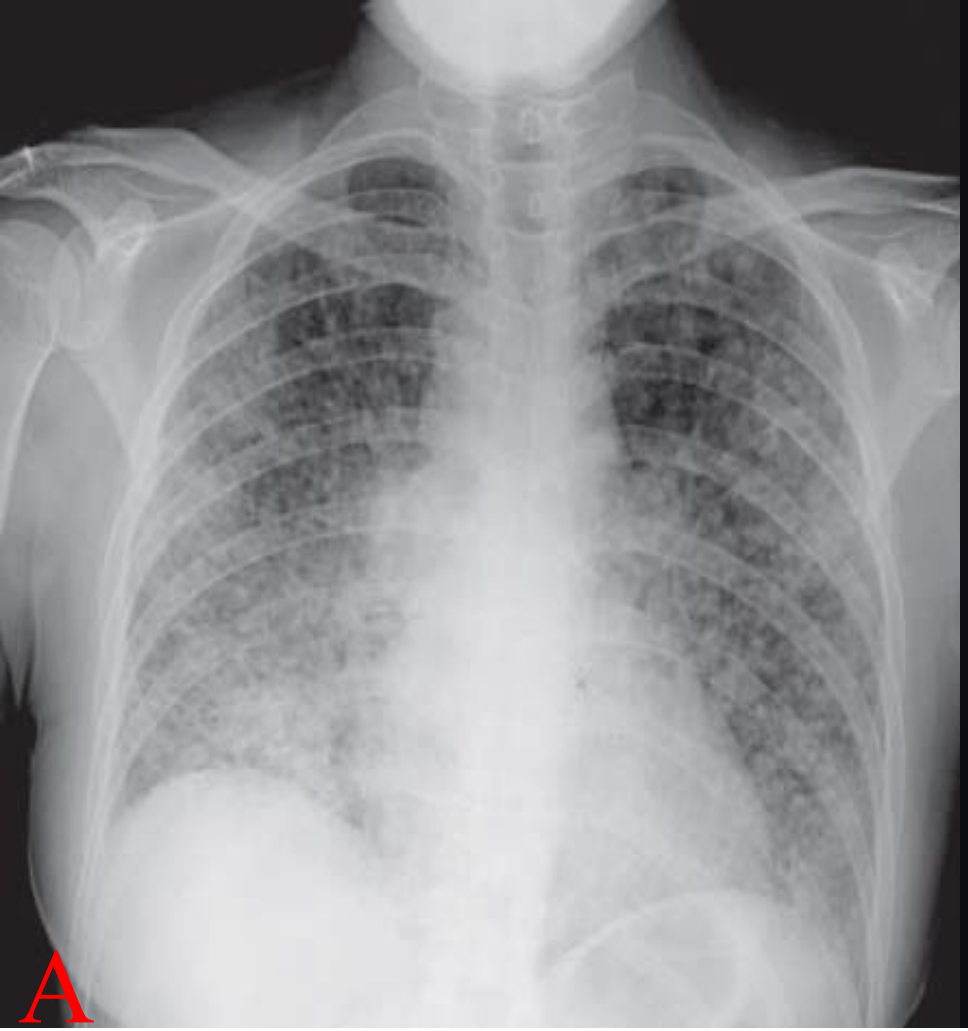
2-Alternatively, the disease may progress and extend along several different pathways:

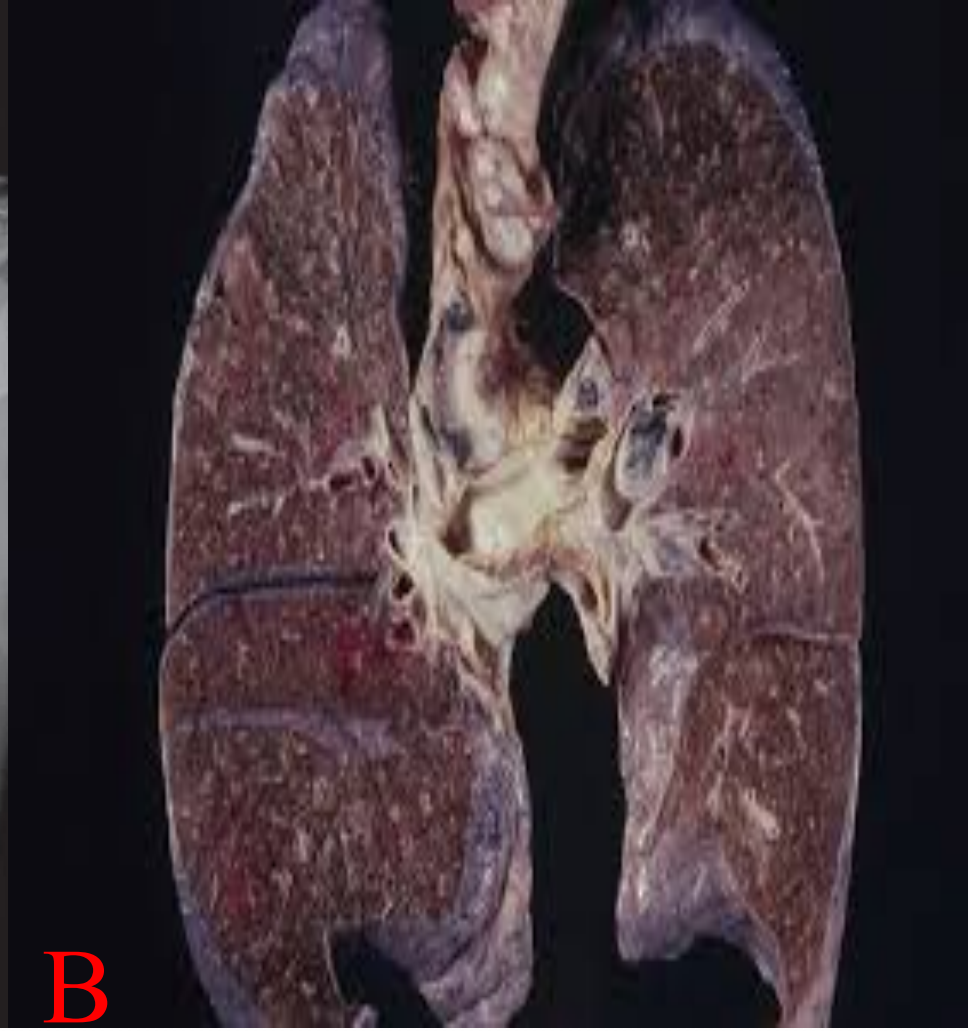
A. Progressive pulmonary tuberculosis: the apical lesion enlarges with expansion of the area of caseation. Erosion of blood vessels results in hemoptysis. The pleural cavity is always involved and serous pleural effusions, tuberculous empyema, or fibrous obliteration may develop.

B. Miliary pulmonary disease may occurs . individual lesions are either microscopic or small (2mm) foci of yellow-white; these scatter diffusely through the lungs (miliary is derived from the resemblance of these foci to millet seeds).

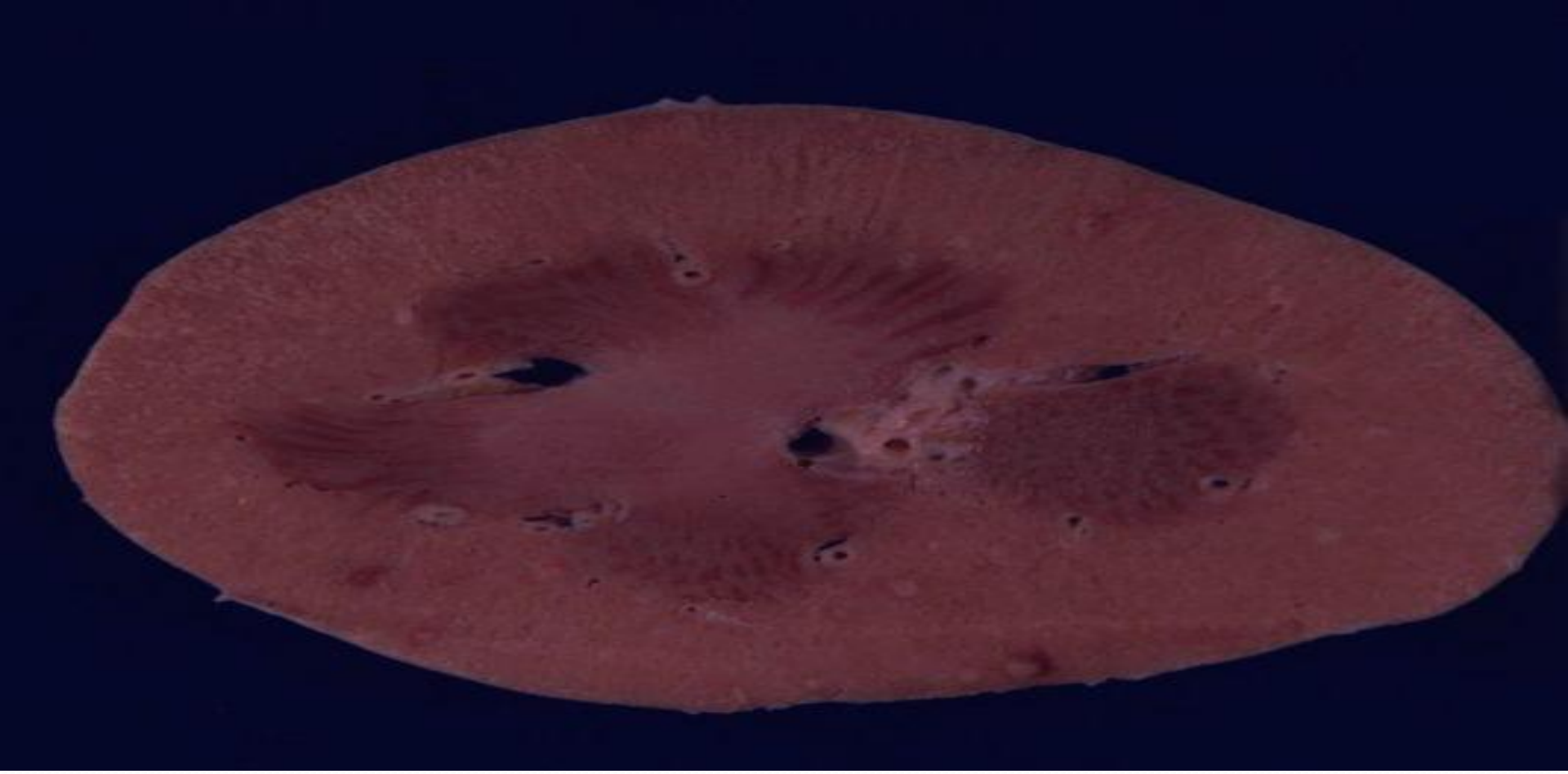
C- Systemic military tuberculosis occurs The appearances are similar to military pulmonary disease.

Miliary tuberculosis is a potentially life-threatening type of tuberculosis that occurs when a large number of the bacteria travel through the bloodstream and spread throughout the body. is a contagious infection caused by the airborne bacteria Mycobacterium tuberculosis.

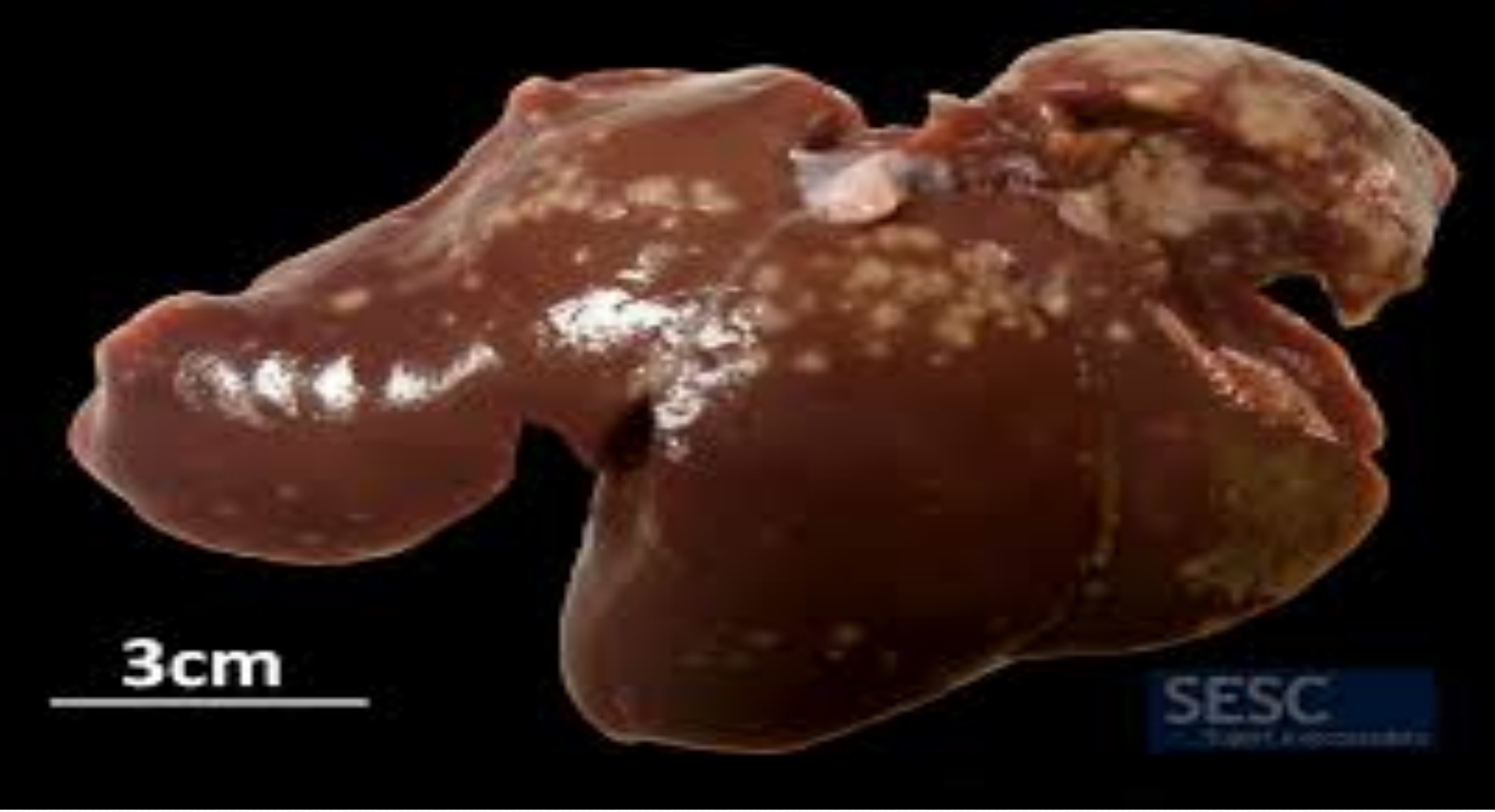




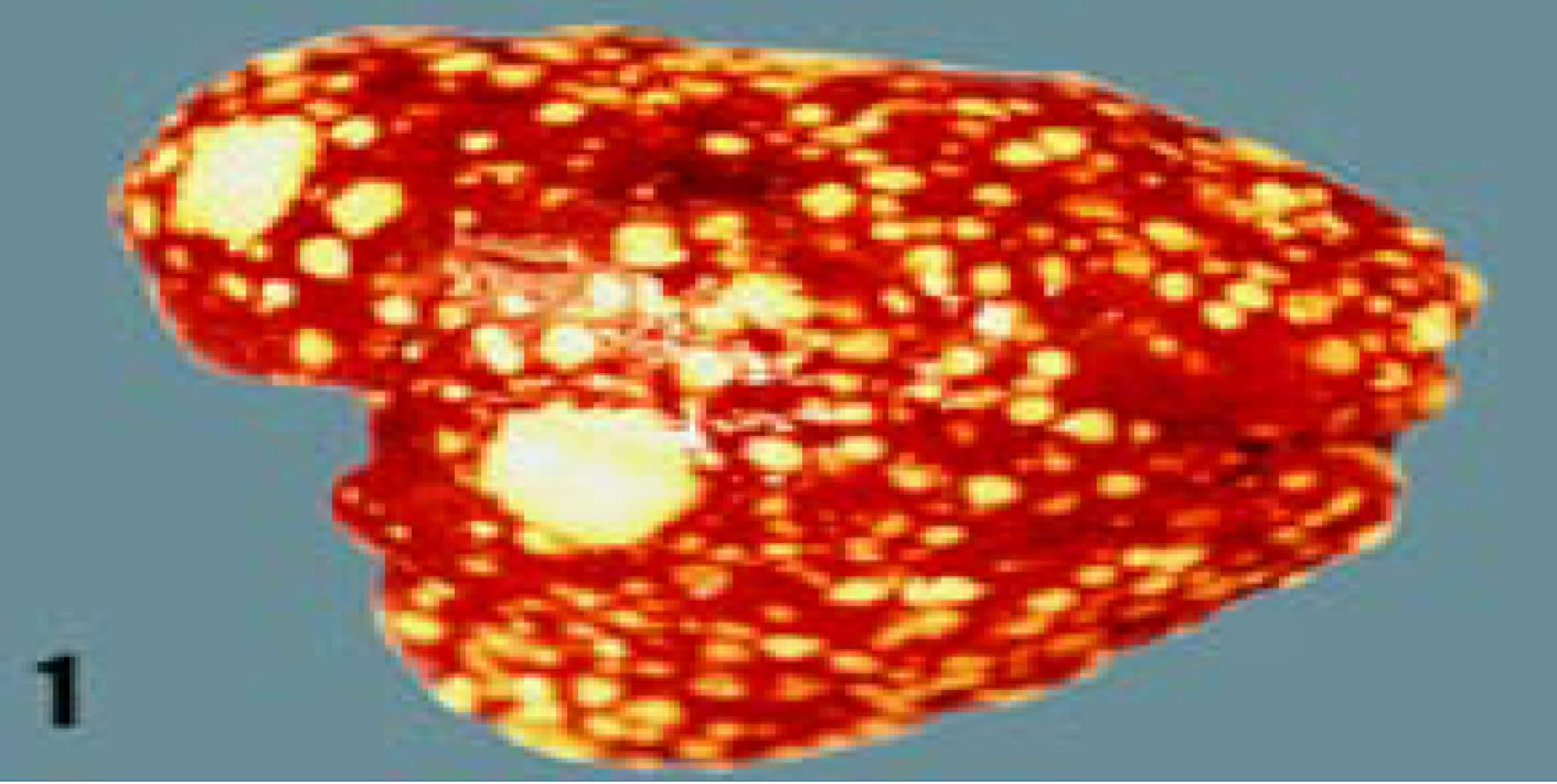
A-Chest x-ray show miliary pulmonary TB .
B-Pulmonary miliary TB / gross , Individual lesions are either microscopic or small (2mm) foci of yellow-white cheesy like ; these scatter diffusely through the lungs



Miliary tuberculosis of the kidney . The cut surface shows , individual lesions are small (2-mm) foci of yellow-white cheesy like ; these scatter diffusely through the kidney .



Miliary tuberculosis of the liver . The gross surface shows, individual lesions are either microscopic or small (2-mm) foci of yellow-white cheesy like ; these scatter diffusely through the liver .



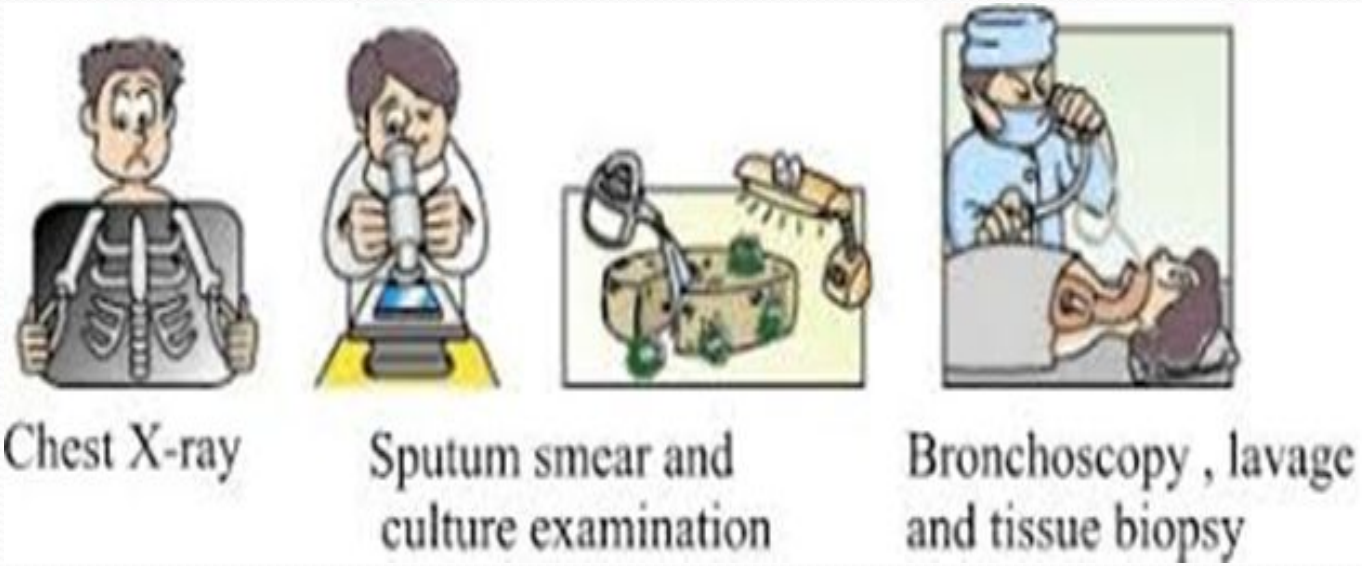
Miliary tuberculosis of the liver . The cut surface shows , individual lesions are small (2-mm) foci of yellow-white cheesy like ; these scatter diffusely through the liver with large 2 lesion of granuloma .

Diagnose of TB

The diagnosis of pulmonary disease is based on:-

1-The history and physical examination .
2-Chest X-rays
radiographic findings of consolidation , LN enlargement or cavitation . However, tubercle bacilli must be identified to establish the diagnosis.

3- Skin test

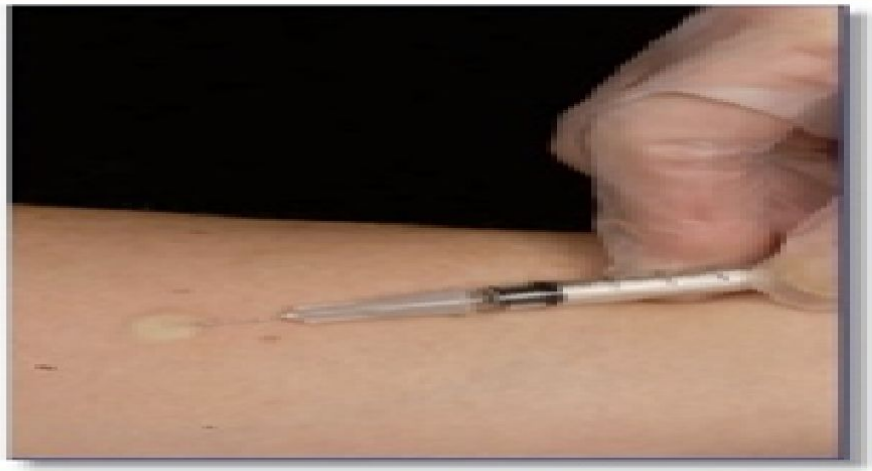


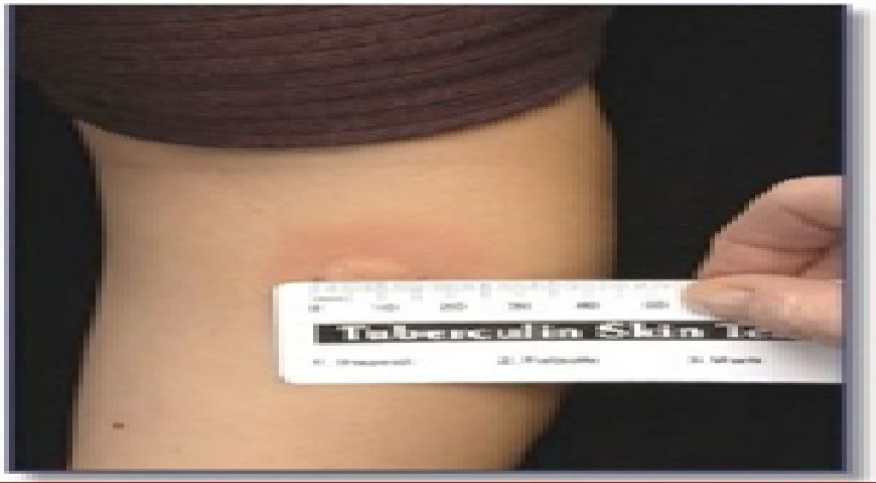
Skin testing

-A Mantoux test is a skin test that is used to detect infection by Mycobacterium Tuberculosis (TB). It is used to determine any immune response in the skin, by any individual who could have been or is being exposed to the bacteria.

-The Mantoux test is a tool for screening for tuberculosis and for tuberculosis diagnosis.

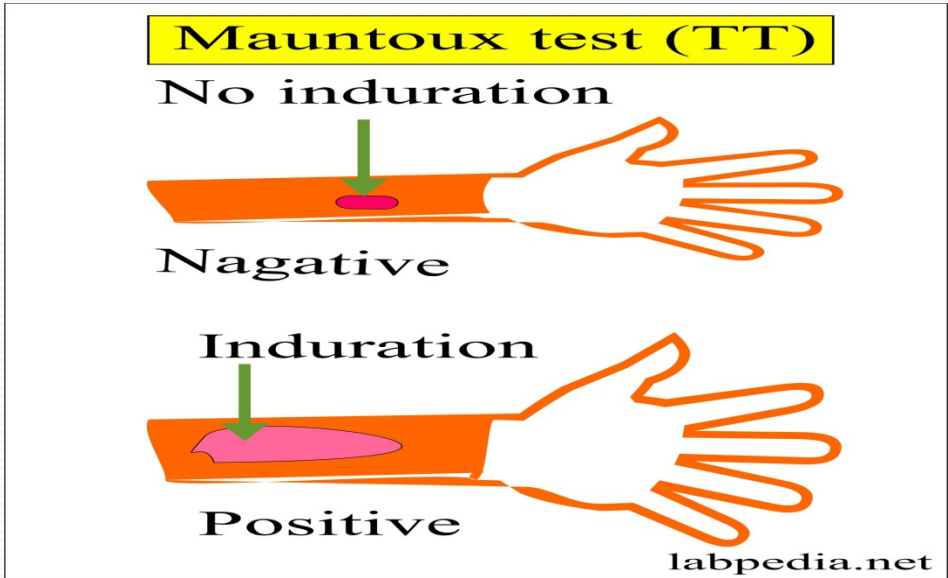
1-Infection with M.tuberculosis typically leads to the development of delayed hypersensitivity (DHS type IV) to M .tuberculosis antigens , which can be detected by the tuberculin (mantoux) test .





2- About 2-4 weeks after infection , intradermally injection of purified protein derivative of M. tuberculosis (PPD) induces a visible and palpable induration (≥10mm) in immunocompetent patients that read after 48-72 hours while in immunocompromised patients induration measured (≥ 5mm) . Color change without induration is not included in the measurement . Tuberculin skin test positivity indicated hypersensitivity to bacterial protein .

Note: A negative tuberculin test does not rule out TB .



4-Microscopic direct smear examination which is the most common method for diagnosis of tuberculosis to demonstration of acid-fast organisms in

A- sputum sample and stain by special stains e.g. Acid-Fast stain(Ziehl - Neelson stain)
; Is an easy and quick procedure ,inexpensive and most protocols require at least three samples of sputum examinations and early in the morning before labeling the case as sputum negative.

B-Bronchoscopy for lavage(cytological examination) sample and tissue biopsy (for histopathological examintion)

5- Conventional cultures for mycobacteria require up to 10 weeks (Mycobacteria slow growing and hence take 2-10 weeks to grow) . Indication of culture for mycobacteria

1-To confirm the diagnosis even in smear negative

2-To detect drug susceptibility and resistance.

3-To detect the bacilli in any specimen in extra-pulmonary tuberculosis .

6-Polymerase chain reaction (PCR) amplification of M. tuberculosis DNA allows for even greater rapidity of diagnosis and is currently approved for use.

PCR assays can detect as few as 10 organisms in clinical specimens, compared with greater than 10,000 organisms required for smear positivity.

However, culture remains the gold standard because it also allows testing of drug susceptibility.

7- Interferon gamma release assays (IGRAs)

The Interferon Gamma Release Assays (IGRAs), are a new type and more accurate TB test.
IGRAs are blood tests that measure a person's immune response to the bacteria that cause TB.
The immune system produces some special molecules called cytokines. These TB tests work by detecting a cytokine called the interferon gamma cytokine.

8-High Resolution Computed Tomography (HRCT)

Why the latent TB Infection Treated?
If patient with latent TB infection but not TB disease, we should be advice to take a drug to kill the TB germs and prevent the patient from developing active TB diseasein up to 90% of cases therefore, plays a crucial role in the prevention of active TB.

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Latent TB may be detected by using the tuberculin skin test (TST) or an interferon-gamma release assay (IGRA)

Important diagram

Primary Infection

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Primary complex
Parenchymal & LN caseation

↙ ↓ ↘

Healed lesion
(non-viable organism)
[scar, calcification]

Latent lesion
(organism dormant)
[pulmonary / extrapulmonary]

Progressive Primary TB

↓

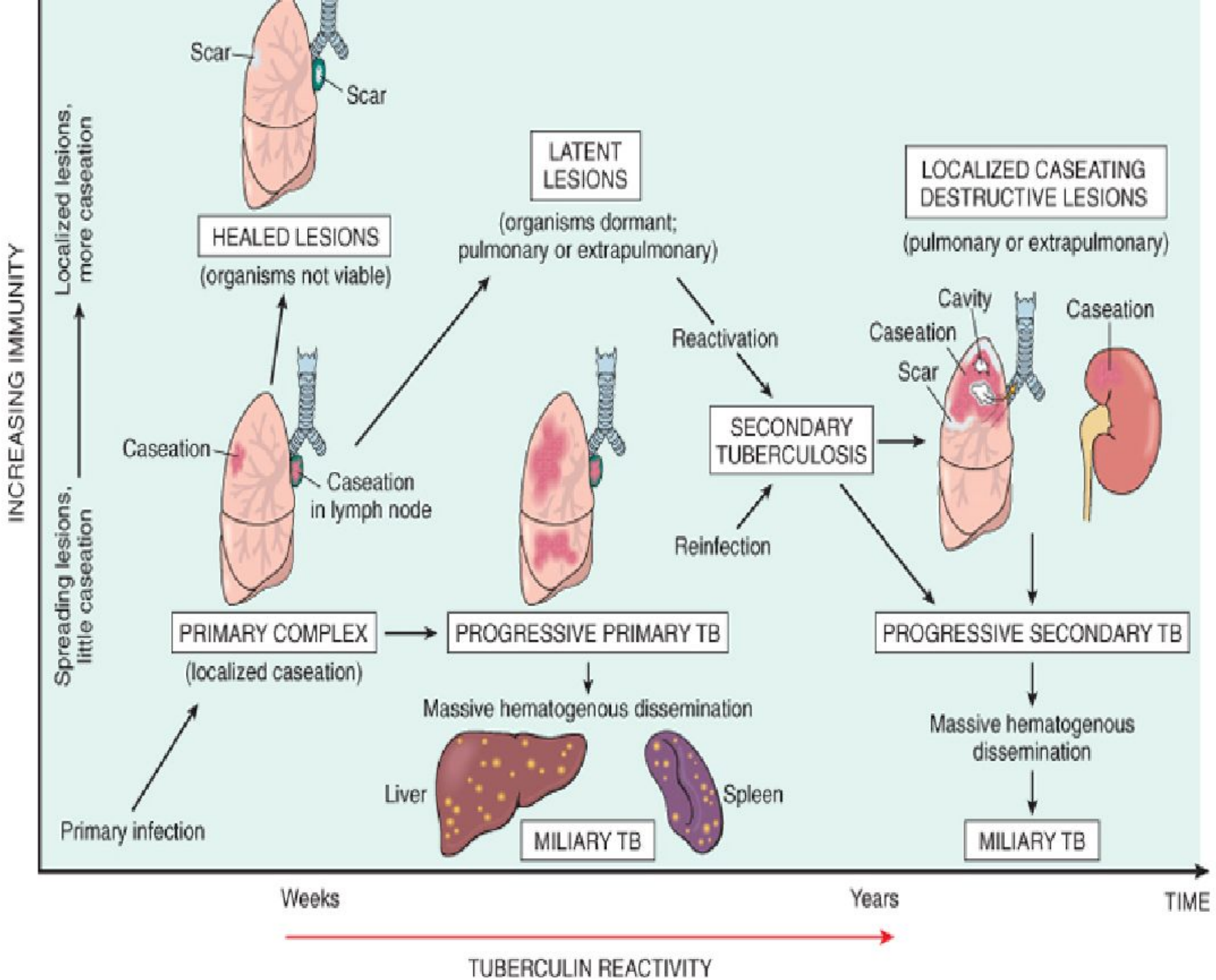
Hematogeneous spread
Miliary TB
Progression with cavitation

↓ Reactivation

Re-infection → Post-primary TB

↓

Cavitation & Fibrosis
Caseation
Miliary
Scar


Scar
Scar
HEALED LESIONS
(organisms not viable)
LATENT LESIONS
(organisms dormant; pulmonary or extrapulmonary)
LOCALIZED CASEATING DESTRUCTIVE LESIONS
(pulmonary or extrapulmonary)
Localized lesions, more caseation
INCREASING IMMUNITY
Spreading lesions, little caseation
Reactivation
Cavity
Caseation
Caseation
Scar
Caseation
Caseation in lymph node
SECONDARY TUBERCULOSIS
Reinfection
PRIMARY COMPLEX
(localized caseation)
PROGRESSIVE PRIMARY TB
PROGRESSIVE SECONDARY TB
Massive hematogenous dissemination
Massive hematogenous dissemination
Liver
Spleen
MILIARY TB
MILIARY TB
Primary infection
Weeks
Years
TIME
TUBERCULIN REACTIVITY

للاطلاع

The treatment of tuberculosis is prolonged due to the slow growth of M. tuberculosis , its concealment in macrophages , and the inability of drugs to easily penetrate its cell wall. Standard treatment includes combination therapy with rifampinn, isoniazid , ethambutol , and pyrazinamide for two months, followed by rifampin

and isoniazid for an additional four months. Patients with suspected LTBI should be tested using the tuberculin skin test (TST) or interferon-γ release assay

Don't forget

to smile.