Tuberculosis

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Outline

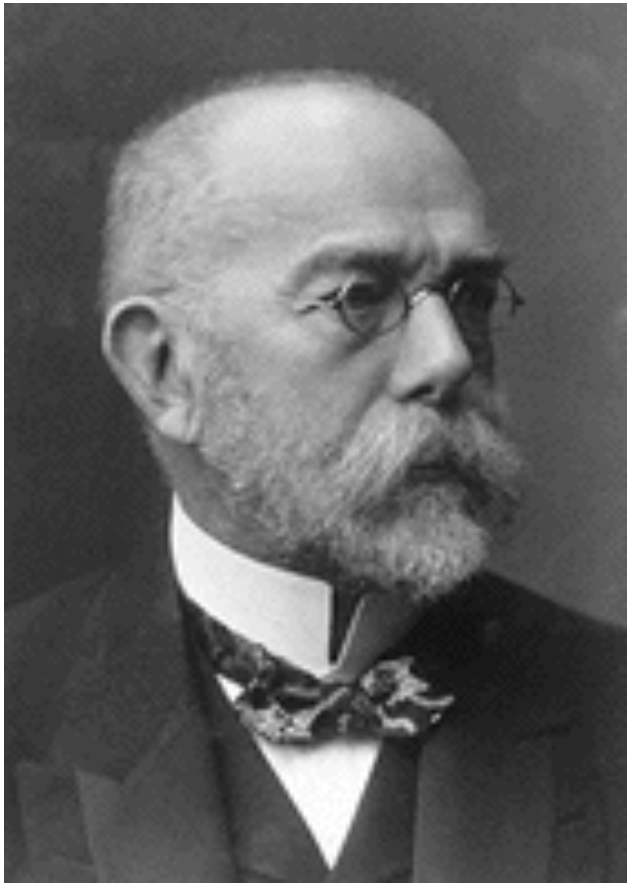
- Microbiology
- Epidemiology
- Transmission
- Pathophysiology
- Symptoms
- Diagnosis
- Treatment

BIG fear

HIV
TB
malaria

- The German doctor Robert Koch

- The first microbiologist to report in 1882 the isolation of the causative agent of tuberculosis

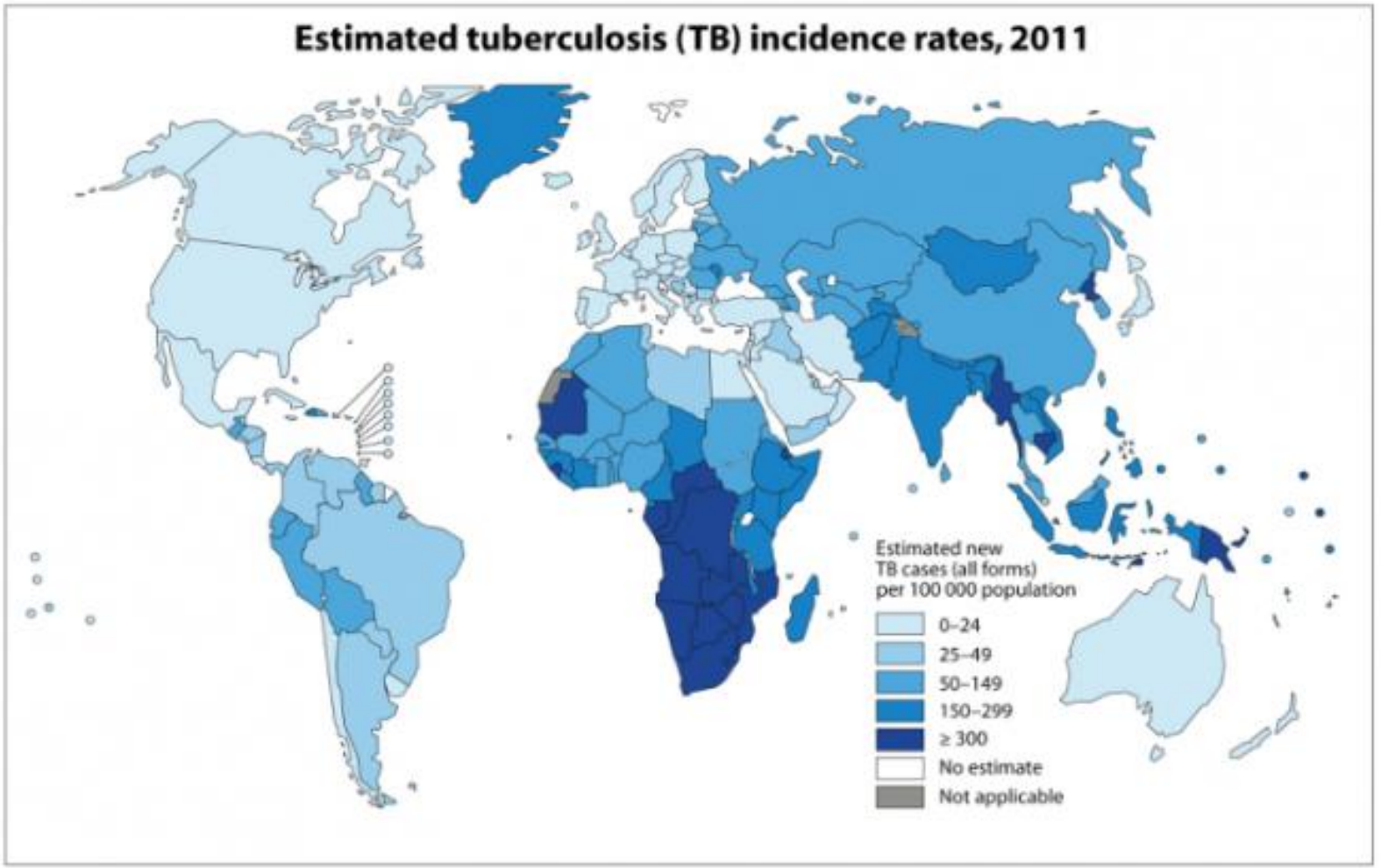


Introduction

- TB is the most common cause of infectious disease–related mortality worldwide
- 2 billion have latent TB
- 3 million die of TB / year
- Increasing in the world
- Drug-resistant TB is also increasing
- Associated with poverty

Epidemiology

Asia
Africa
South America



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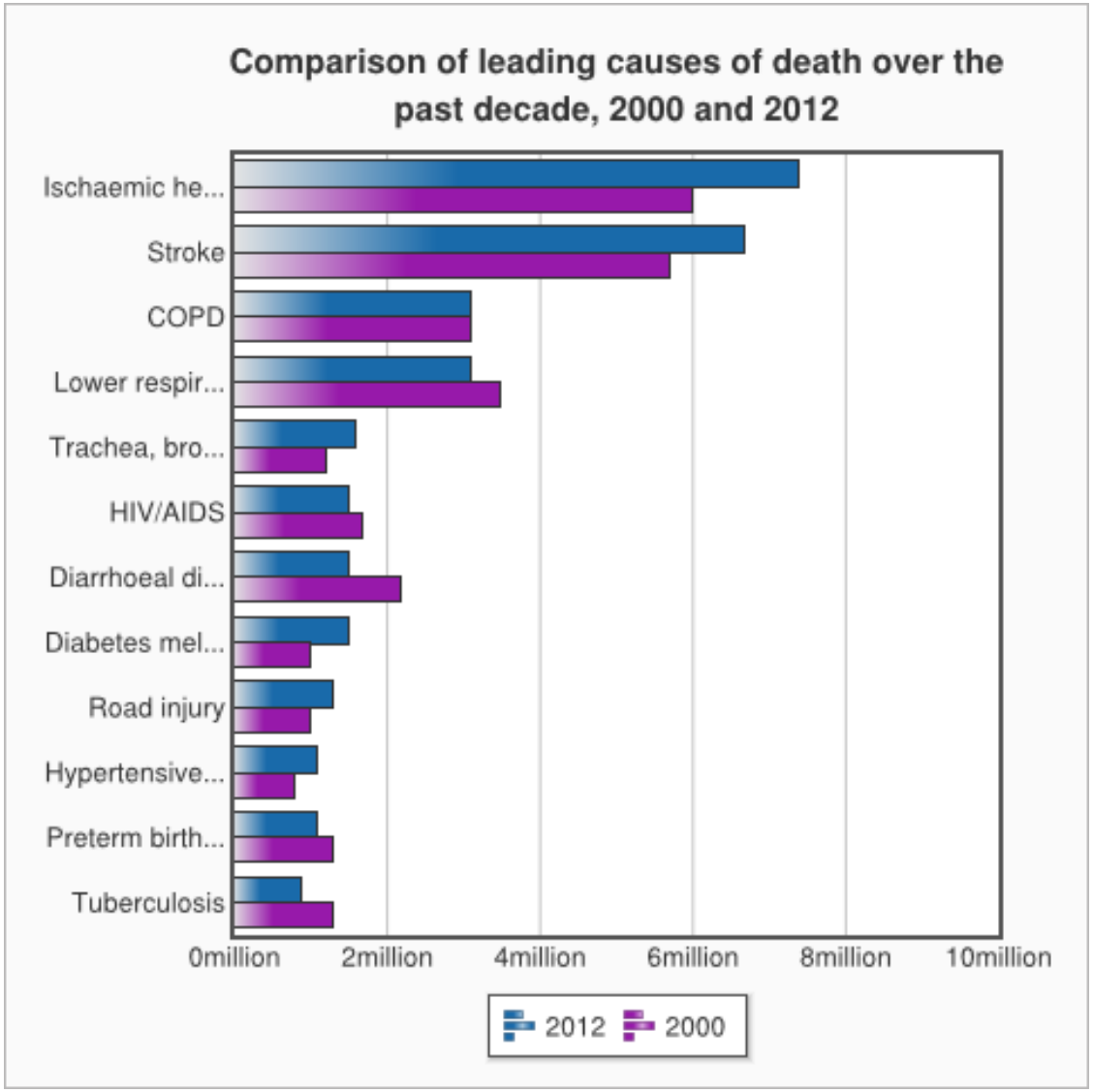
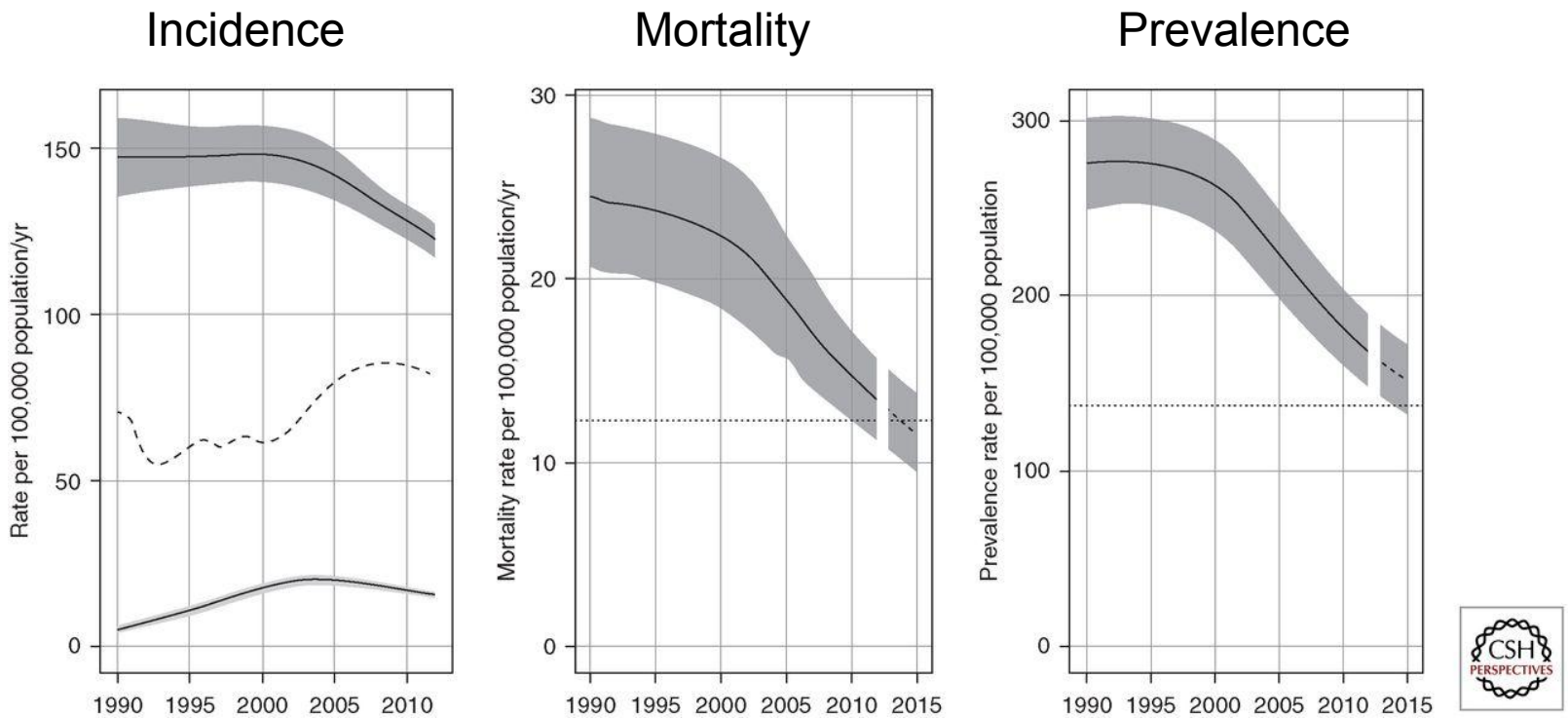
Source: *Global Tuberculosis Report 2012*. WHO, 2012.

World Health Organization

Leading causes of death



Global trends in estimated TB incidence and estimated TB mortality



Global trends in estimated TB incidence and estimated TB mortality. (*Left*) Global trends in estimated incidence including HIV-negative and HIV-positive TB (dark gray, *top*) and estimated incidence of HIV-positive TB (light gray, *bottom*). The dashed line shows global trends in case notification rates (all forms of TB). (*Middle*) Global trends in estimated TB mortality excluding TB-associated AIDS deaths. The dotted line represents the Stop TB Partnership targets of halving mortality by 2015 compared with the level of 1990. (*Right*) Global trends in estimated TB prevalence. The dotted line represents the Stop TB Partnership targets of halving prevalence by 2015 compared with the level of 1990. Shaded areas represent uncertainty bands.

Philippe Glaziou et al. Cold Spring Harb Perspect Med 2015;5:a017798

Epidemiology

now:
3 – 4 / 100,000

- Jordan 7 – 10 / 100,000
- USA: 4.4 / 100,000 (60% are foreigners)

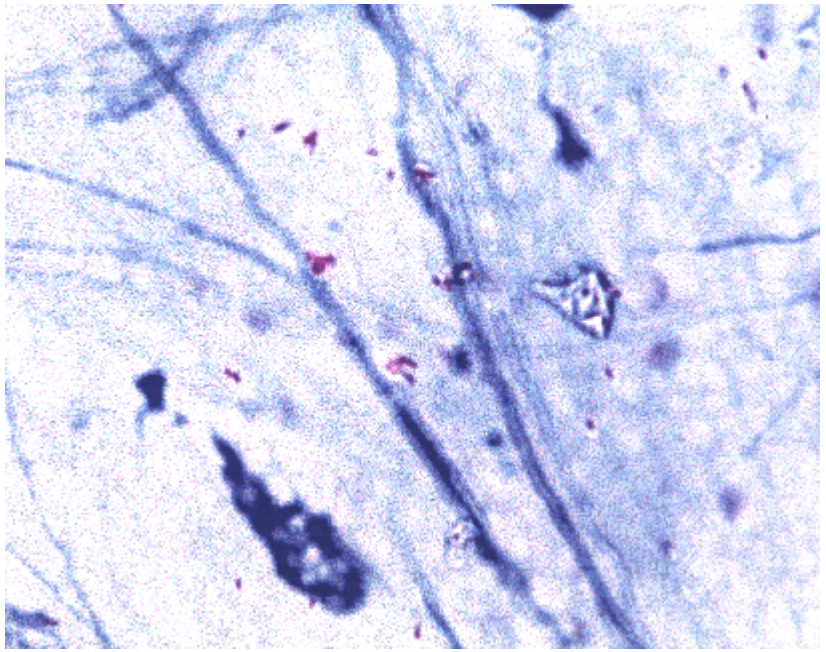
Mortality

- case-fatality was 50% for untreated pts before antibiotics
- now 4%

Microbiology

- *Mycobacterium tuberculosis* → most Common
- *M. bovis*
- *M. microti (rodents)*
- *M. africanum*
- *M. canetti*

} Rare

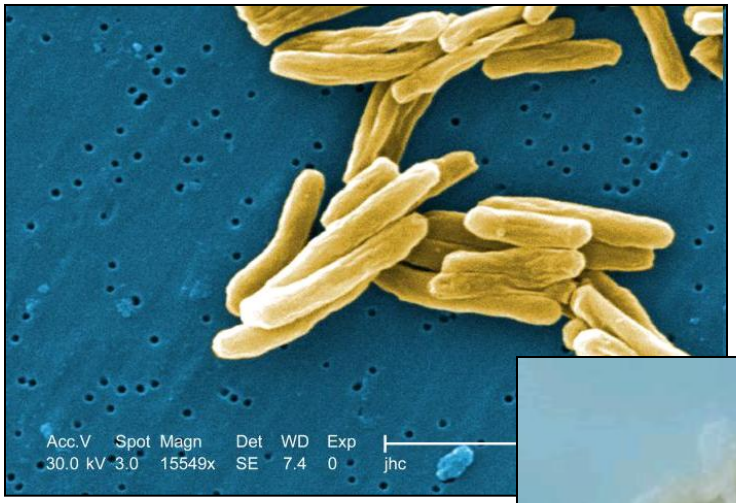


Microbiology

- ***M tuberculosis***
- slow-growing organism
  - 4-8 weeks for visible growth on solid medium
- Acid fast bacilli

- ***M bovis***
  - From cattles Transmitted by Unpasterilized milk

Colori



Transmission

- Airborne

active TB Patient
Can Infect 5-15 People By
Close contact

Pathophysiology

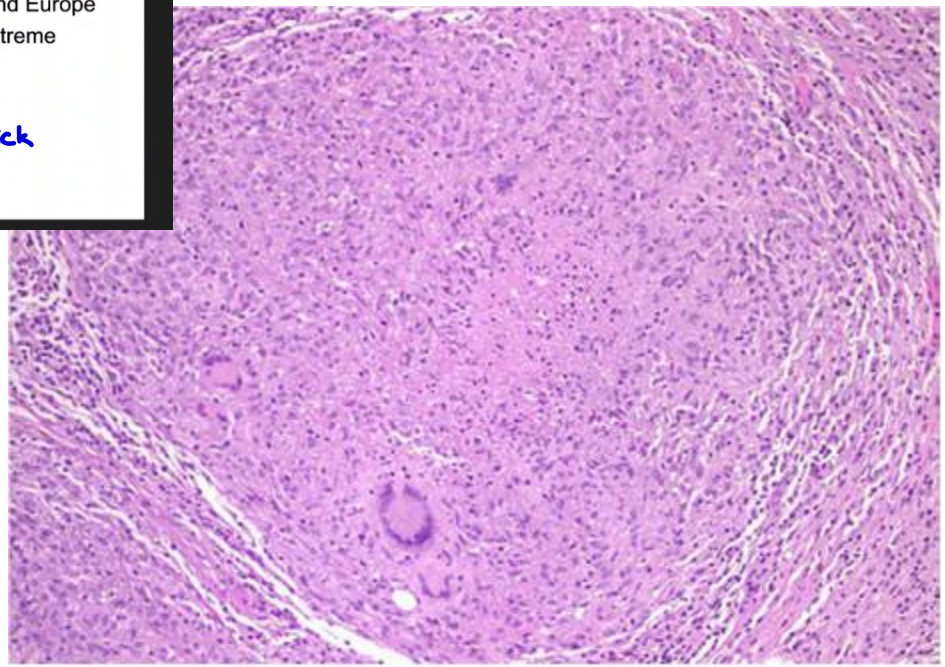
- Humans are the only known reservoir for *Mycobacterium tuberculosis* (MTB)
- Transmission: airborne droplet nuclei

1. When inhaled, droplet nuclei are deposited within the terminal airspaces of the lung
2. macrophages ingest and transport the bacteria to regional lymph nodes
   A. may be killed by the immune system
   B. they may multiply and cause primary TB
   C. may become dormant and remain asymptomatic latent
   D. may proliferate after a latency period (reactivation disease)

Prognosis

- Historical data:
  - left untreated, smear positive TB has a 10-year case mortality bet 53 and 86%, with a mean of **70%**
  - TB killed 1 / 7 people in the USA and Europe
  - Great White Plague" (due to the extreme paleness of those affected)
  - "Captain of all these men of death"
- **Now with treatment**
  - **mortality = 3%**

The Sick Child.



Histological examination: caseous necrotic granuloma

+ Langerhan Giant Cells

symptoms

Pulmonary tuberculosis (TB)

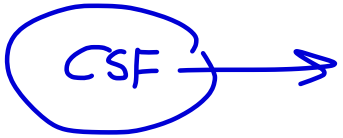
Any Patient with >3 week cough

Should be tested for TB

- cough
- fever
- weight loss
- hemoptysis
- chest pain
- anorexia, fatigue, and night sweats

symptoms

TB meningitis



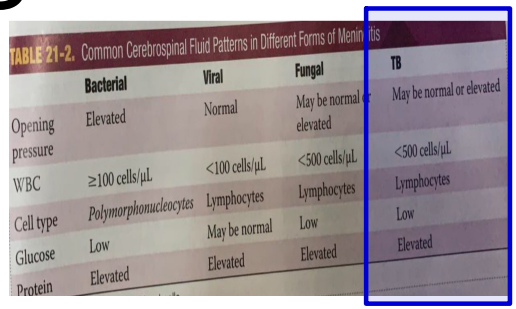


TABLE 21-2. Common Cerebrospinal Fluid Patterns in Different Forms of Meningitis

	Bacterial	Viral	Fungal	TB
Opening pressure	Elevated	Normal	May be normal or elevated	May be normal or elevated
WBC	≥100 cells/μL	<100 cells/μL	<500 cells/μL	<500 cells/μL
Cell type	*Polymorphonucleocytes*	Lymphocytes	Lymphocytes	Lymphocytes
Glucose	Low	May be normal	Low	Low
Protein	Elevated	Elevated	Elevated	Elevated

- Headache that is either intermittent or persistent for 2-3 weeks
- Subtle mental status changes may progress to coma over a period of days to weeks
- Fever may be low-grade or absent

Skeletal TB

Rare

- Most common is the spine (Pott disease)
  - back pain or stiffness
  - Lower-extremity paralysis occurs in 50%
- TB arthritis usually involves one joint

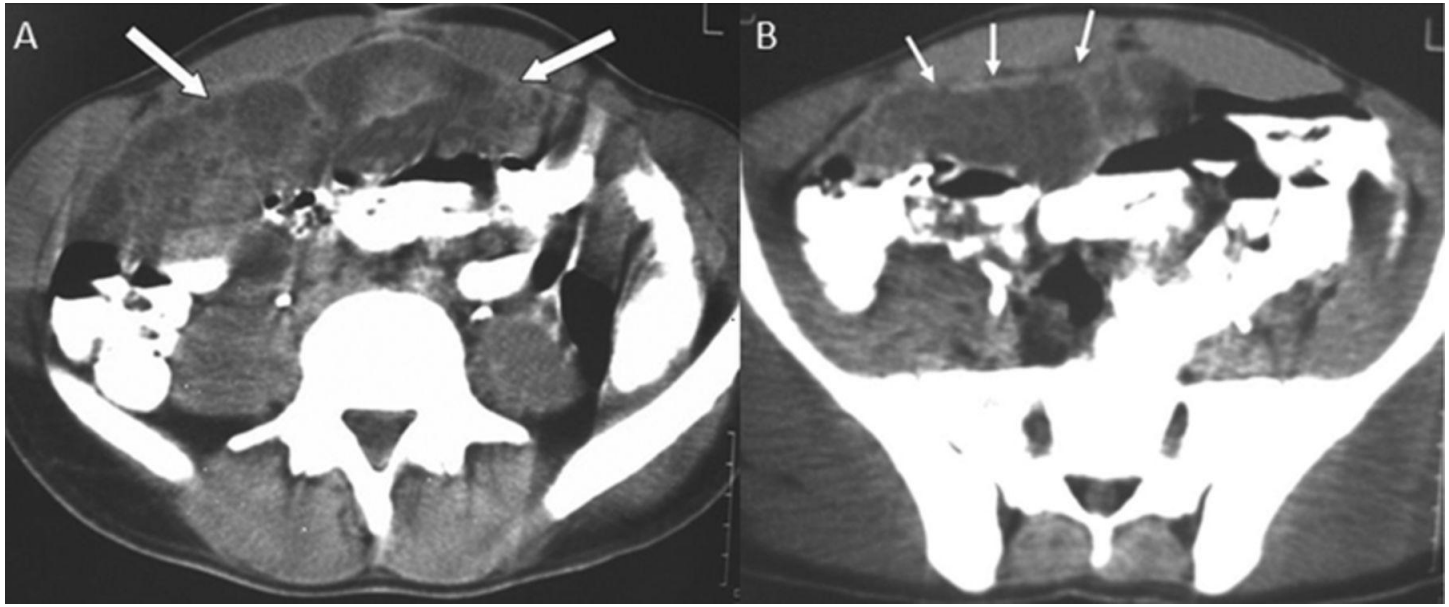
Large Joints

  - the hips and knees are affected most commonly > the ankle > elbow > wrist > and shoulder

Gastrointestinal TB

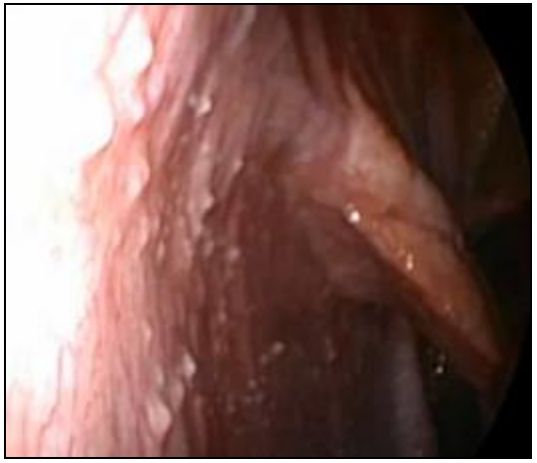
Any site in the GI may become infected:

- non healing ulcers of the mouth or anus
- difficulty swallowing
- abdominal pain mimicking peptic ulcer disease
- malabsorption
- diarrhea
- hematochezia



CT: large amount of loculated viscous fluid (arrows; A) and enhanced diffuse peritoneal thickening (arrows; B). Posteriorly displaced small bowel loops could be seen.

Patient is Complaing from Ascites



A peritoneal laparoscopy showing multiple extensive yellow-white nodules on the peritoneal surface

Other sites

IN Jordan
Most Common Presentations
1. Pulmonary TB
2. LN TB
3. Peritoneal TB

- TB lymphadenitis (scrofula) Common
- Genitourinary TB
- Cutaneous TB

Diagnosis

2 things after sputum is taken: Smear; Culture → need month

First step

- sputum: in the early morning on 3 days (not saliva)
  - every 8 hours (hospital)
  - Children: early-morning gastric aspirate
- bronchoscopy with biopsy and bronchial washing
- bone marrow Bx
- liver Bx
- ± blood cultures (not routinely done)
- PCR on smears → (−) → might have TB still; (+) → this is TB

Diagnosis

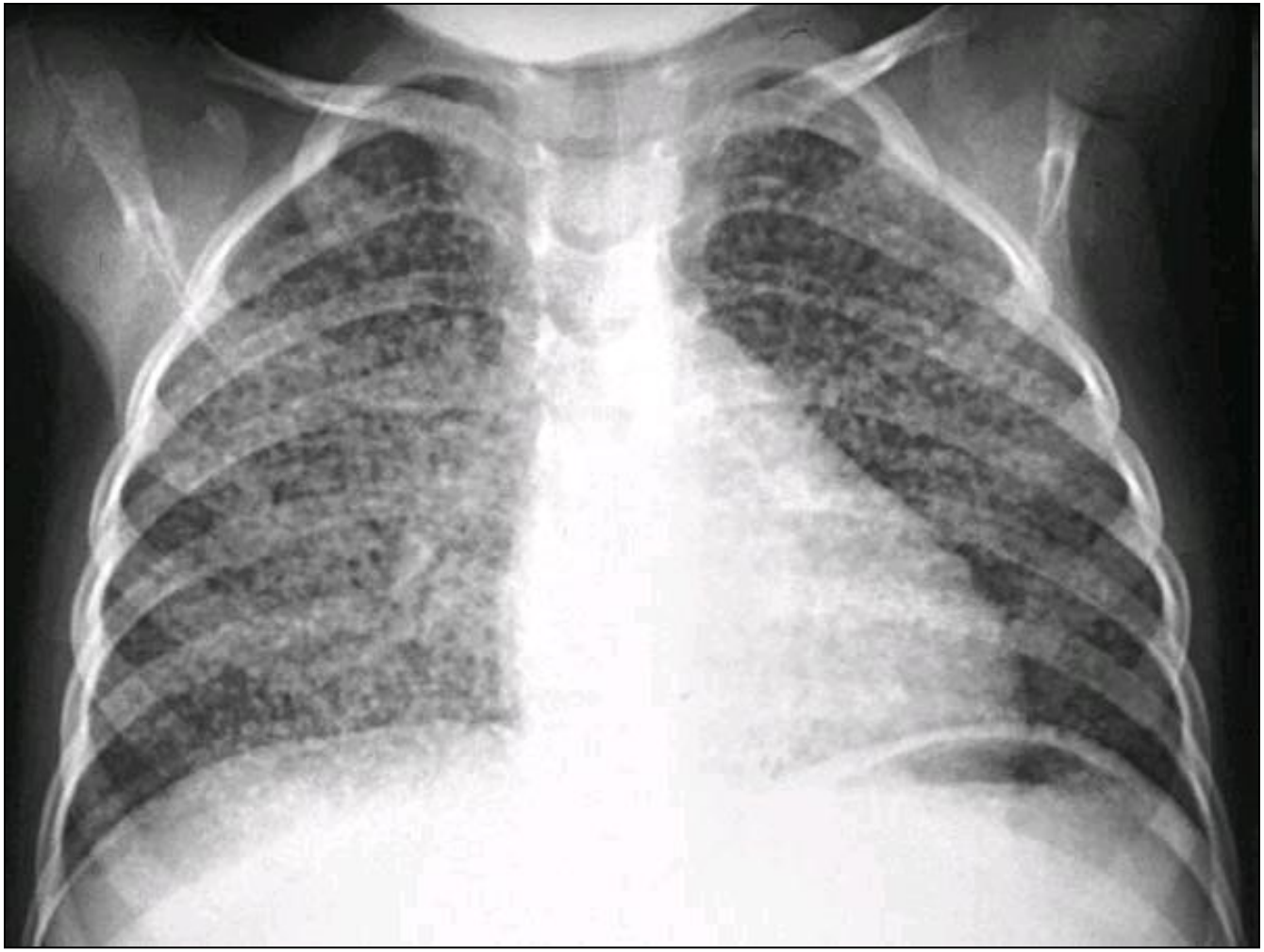
- Obtain HIV in all patients with TB
- CXR
  - may show a patchy
  - nodular infiltrate
  - upper-lobe involvement is most common
  - in any part of the lung
  - cavity: indicates advanced infection
    - high bacterial load
- Miliary TB: appearance of numerous small nodular lesions that resemble millet seeds on CXR

middle and lower lobe → Primary TB

Reactivation TB

+ immune cells is lower in the upper lobe

Miliary TB



PPD

- PPD: tuberculin skin testing (Mantoux test)
  - is the most widely available test for diagnosing TB in the absence of active disease (**Latent infection**)
  - intradermal injection Not Subcatenous
  - 48-72 hours
  - size of induration, not the erythema
  - Booster effect → within 1 week
  - ? Dx role in TB

In Patient Who have the test for the first time in this life

if the Patient is given Booster effect

(+)

Questionable

20% → (-) with miliary TB

Can be (+) and they don't have presentation

PPD

- PPD testing for tuberculosis (TB) is done among persons at **high risk** for the development of TB disease who would benefit from treatment of latent TB infection (LTBI)

- All testing activities should be accompanied by a **plan** for the necessary follow-up medical evaluation and treatment

Groups that should be tested for LTBI

1. Persons at higher risk for exposure to or infection with TB

   - Close contact of a person known or suspected to have TB
   - Residents and employees of high risk settings
   - HCW
   - Low income populations
   - Children exposed to adults in high risk

Groups that should be tested for LTBI …cont

2. Persons at higher risk for TB once infected

   - Illicit drug use
   - Certain medical conditions
   - HIV
   - Recently infected with *M. TB* (2 yrs)

Extra but important

Normal and Critical Findings

Go to:

PPD Skin test Interpretation Based on CDC Guidelines

The result of the PPD test is positive or negative. However, the size of the induration diameter cutoff (5 mm, 10 mm, and 15 mm) for the test to be positive is based on certain risk factors.

As the diameter cutoff increases, the sensitivity of this test declines, and the specificity increases. For instance, the sensitivity of this test for 5 mm diameter cutoff positivity is the highest, whereas, 15 mm diameter cutoff positivity is more specific.

Induration of 5 mm and more is considered positive in: Highly Sensitive

- Immunosuppressed individuals (For example, long term steroids receiving the equivalent of prednisone ≥15 mg/day for ≥1 month, immunosuppressant drugs, etc.)
- HIV infected individuals.
- Recent contact with active TB patients.
- Prior tuberculosis signs on chest radiograph such as fibrotic changes.
- Organ transplant patients

An induration of 10 mm or more is considered positive in:

- Immigrants from endemic/high prevalence countries in the last 5 years.
- High-risk area employees and residents. For example, prisons, nursing homes, and homeless shelters.
- Injection drug abusers.
- Mycobacteriology laboratory professional
- Children less than four years of age.
- Chronic medical conditions that increase the risk of tuberculosis include diabetes, kidney failure, malignancy, etc.
- Infants/Children/adolescents exposed to high-risk categories.

An induration of 15 mm or more is considered positive in: Highly Specific

- Always considered positive in any person. Healthy individuals without any risk factors for TB.
- Patients who do not meet any of the above criteria[8]

Treatment of TB

- Initial empiric treatment of TB
- Start on a 4-drug regimen
  - INH (ioniazid)
  - Rifampin
  - Pyrazinamide
  - Ethambutol or streptomycin
- Prolonged course > 6 months

used for prophylaxis

Infection control in hospital

- Respiratory isolation
  - negative pressure room
  - N95 mask

مرضى الجدري

Pulmonary TB

Pt who has Cough + Sputum

Smear (+) TB

Lareangeal TB → HIGHLY Infectious

Imp

Risk for TB in latent TB

On medicines such as steroids or TNF-a inhibitors

DM

Renal insufficiency

Silicosis

الناس اللي بتاخدهاي الادوية وكانت عندها Latent TB احتمال يصير عندها activation

فبنعمل PPD test عشانه نشوف لو فيه latent disease أو لا

Need treatment (+)

INH for 6-9 months