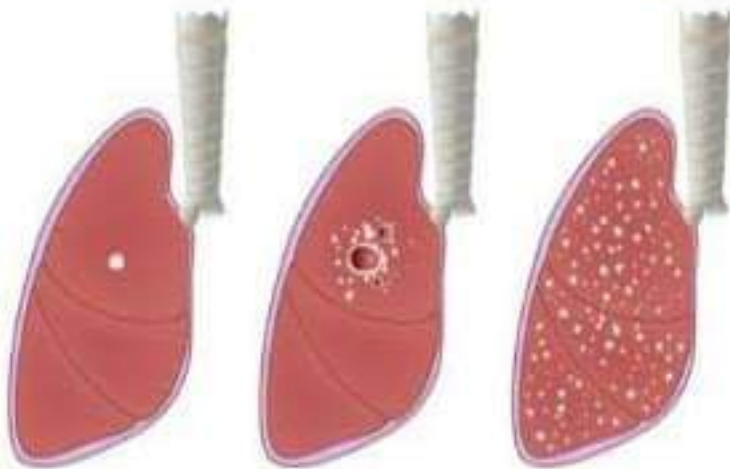


Tuberculosis

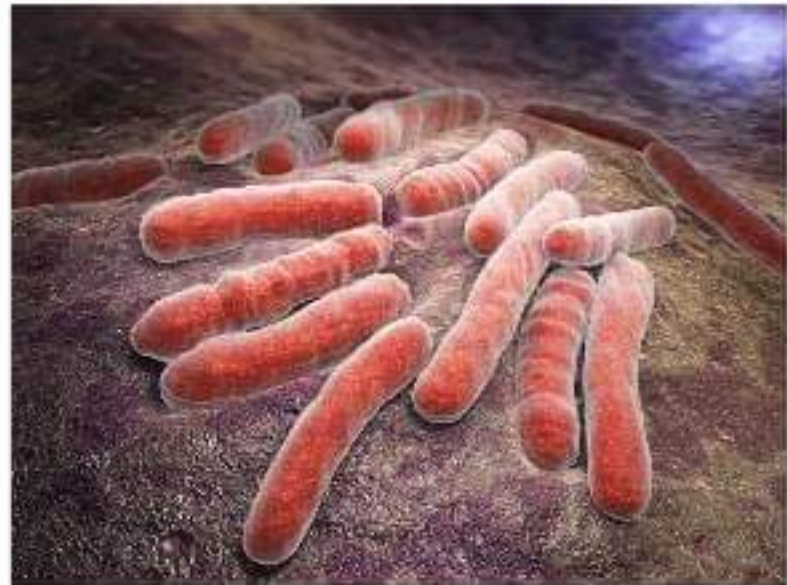
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Latent
infection

Cavitary
tuberculosis

Miliary
tuberculosis



Definition

- **Tuberculosis (TB)** is a potentially fatal contagious disease that can affect almost any part of the body but is mainly an infection of the lungs.

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Neo-latin word :

“Tubercle” - Round nodule/Swelling

“Osis” - Condition

Introduction

- **Tuberculosis (TB)** is a common and deadly infectious disease caused by mycobacteria, mainly *Mycobacterium tuberculosis*.
- Tuberculosis most commonly attacks the lungs (as pulmonary TB) but can also affect the central nervous system, the lymphatic system, the circulatory system, the genitourinary system, bones, joints and even the skin. world health & wellness drx_tonisingh
- Other mycobacteria such as *Mycobacterium bovis*, *Mycobacterium africanum*, *Mycobacterium canetti*, and *Mycobacterium microti* can also cause tuberculosis, but these species do not usually infect healthy adults.
- When someone's immune system is weakened, chances of developing TB are increased. On average, 10 percent of the infected individuals develop the disease during their lifetime.
- If left **untreated**, each person with smear-positive pulmonary TB will infect, on average, between 10 and 15 persons in each year.

Causative Organisms

- *Mycobacterium africanum*
- *Mycobacterium microti*

Non-Mycobacterium Genus

- *Mycobacterium leprae*
- *Mycobacterium avium*
- *Mycobacterium asiaticum*

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Mycobacterium tuberculosis

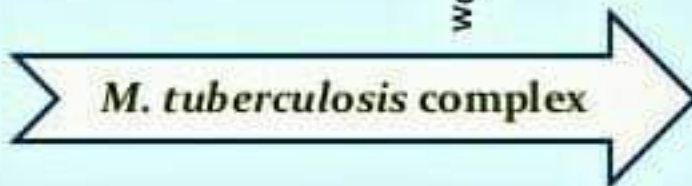


Human

Mycobacterium Bovis



Animals



M.
africanum
M. Bovis
M. Canetti
M. microti

Sources of Infection

- TB bacilli are passed through the air when a person who is sick with TB disease coughs, sings, sneezes, or laughs speaks, or another person breathes the air into their lungs containing the TB bacteria. world health & wellness drx_tonisingh
- Dried bacilli in dust are much less infectious.
- Spread occurs most often among household or other close contacts with infected person's sputum.
- Infection also occurs by ingestion.
- Several other factors- genetic susceptibility , age, stress, nutrition- influence the outcome of infection.



Spread of Tuberculosis

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How is TB spread?

1.



Coughing without covering
the mouth

2.



Crowded places with poor
ventilation

3.



Spitting everywhere

Common Symptoms of TB Disease

- Cough (2-3 weeks or more)
- Coughing up blood
- Chest pains
- Fever
- Night sweats
- Feeling weak and tired
- Losing weight without trying
- Decreased or no appetite

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Mycobacterium tuberculosis-Characteristics

- Gram positive
- Obligate aerobe
- Non-spore-forming
- Non-motile rod
- Mesophile
- 0.2 to 0.6 x 2-4 μ m³
- Slow generation time: 15-20 hours
 - May contribute to virulence³
- Lipid rich cell wall contains mycolic acid—50% of cell wall dry weight³
 - Responsible for many of this bacterium's characteristic properties
 - Acid fast—retains acidic stains
 - Confers resistance to detergents, antibacterials



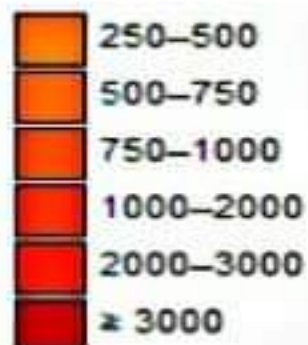
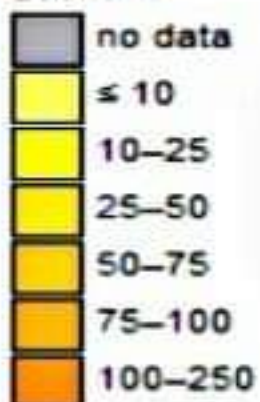
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Epidemiology



Age-standardized death from tuberculosis per 100,000 inhabitants in 2004.^[1]



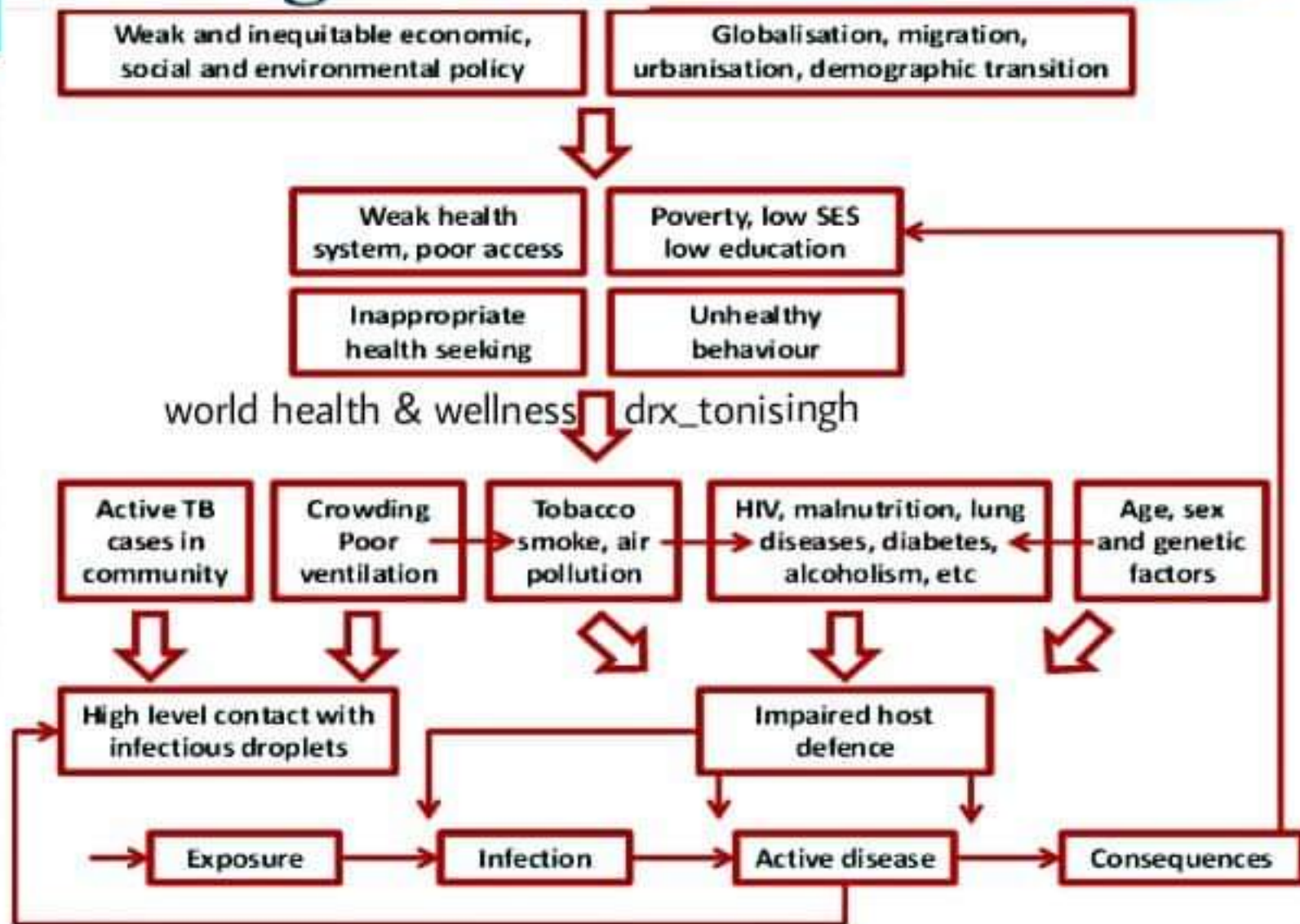
Epidemiology

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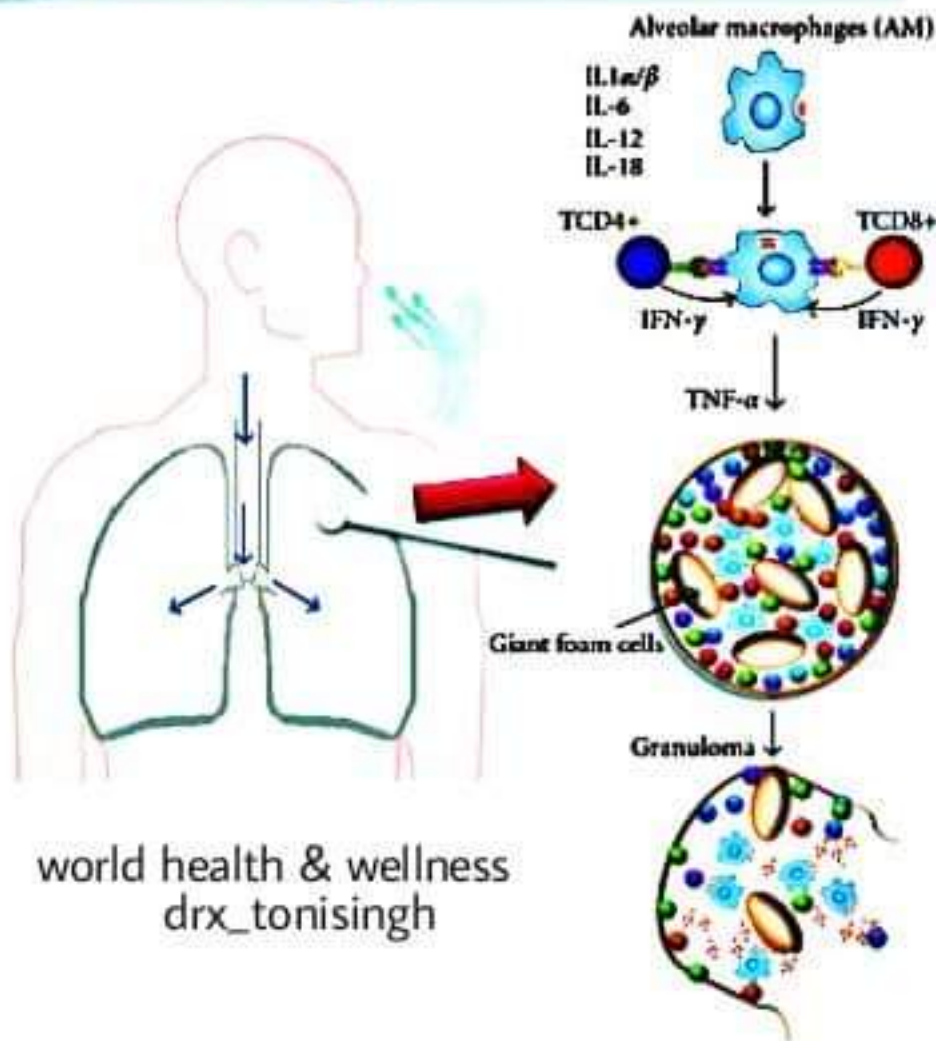
- In 2011, there were an estimated 8.7 million incidence cases of TB globally.
- Its equivalent to 125 cases in 1,00,000 population.

| | |
|-------------------------------|------|
| Asian : | 59% |
| African : | 26% |
| Eastern Mediterranean Region: | 7.7% |
| The European Region : | 4.3% |
| Region of the America : | 3% |

Pathogenesis



Pathogenesis



Inhalation of Mtb

- Phagocytosis of bacilli

Inflammatory cell recruitment

- AM secreted $IL-12$ and $IL-18$
- $IFN-\gamma$ induce bacterial killing
- $TNF-\alpha$ is essential in the control of Mtb growth and granuloma formation

Control of mycobacteria growth

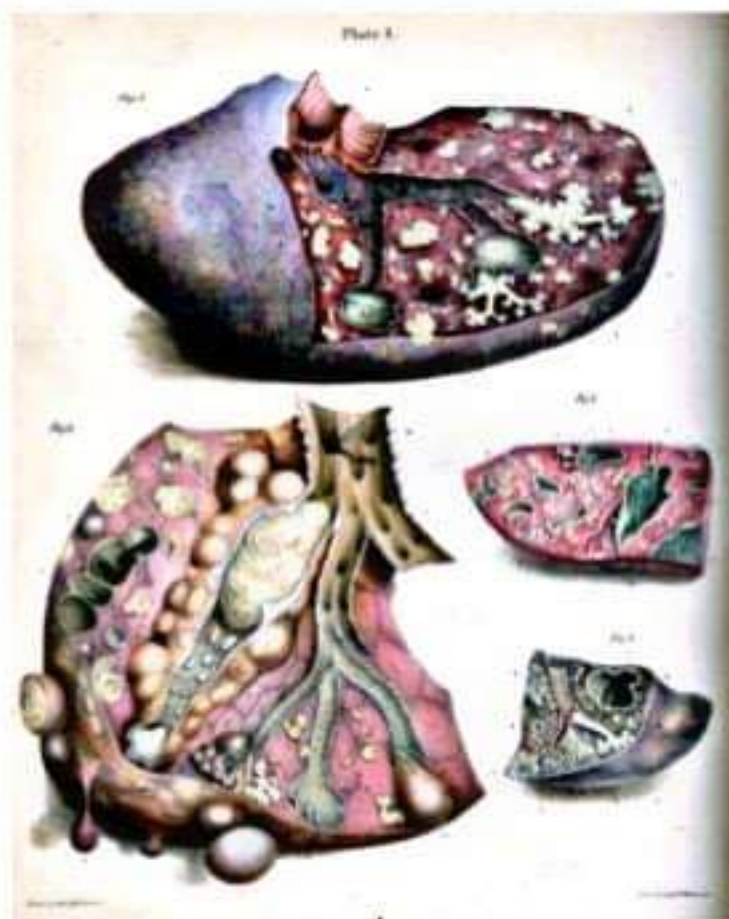
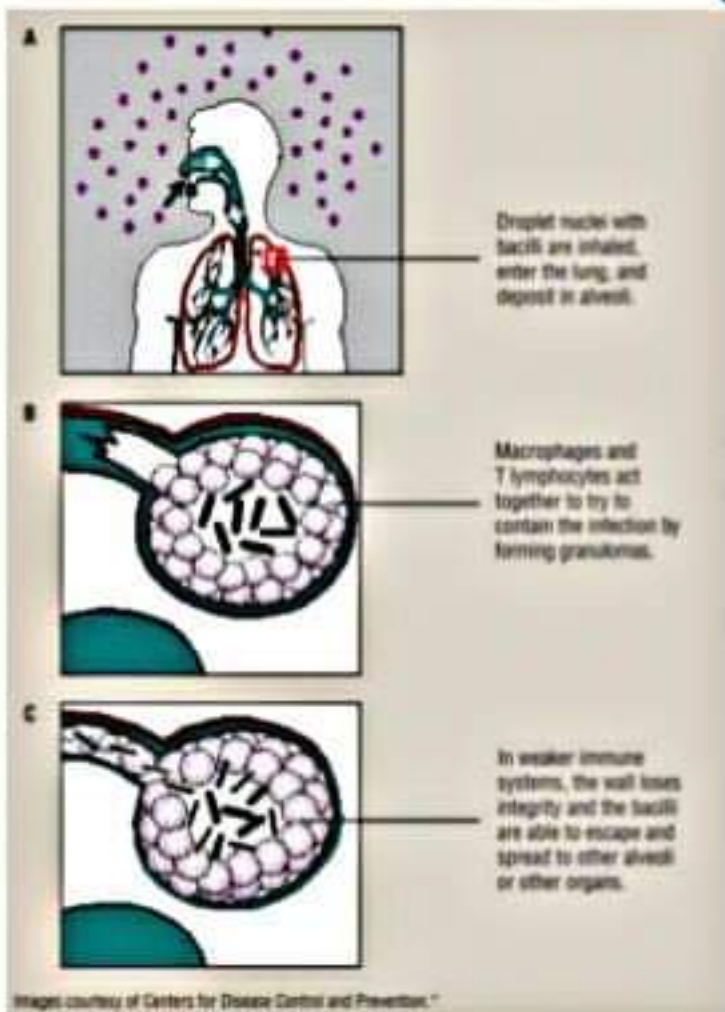
- Stops Mtb proliferation
- Chronic cytokine stimulation
- Granuloma is formed by several cells recruited to the lung. Inside, infected macrophages contain the Mtb preventing their spread.

Postprimary tuberculosis

- Mycobacteria persistence is associated to a failure in the immune-surveillance
- Disease may reactivate
- Damage of nearby bronchi
- Spreading of the Mtb to other areas of the lung

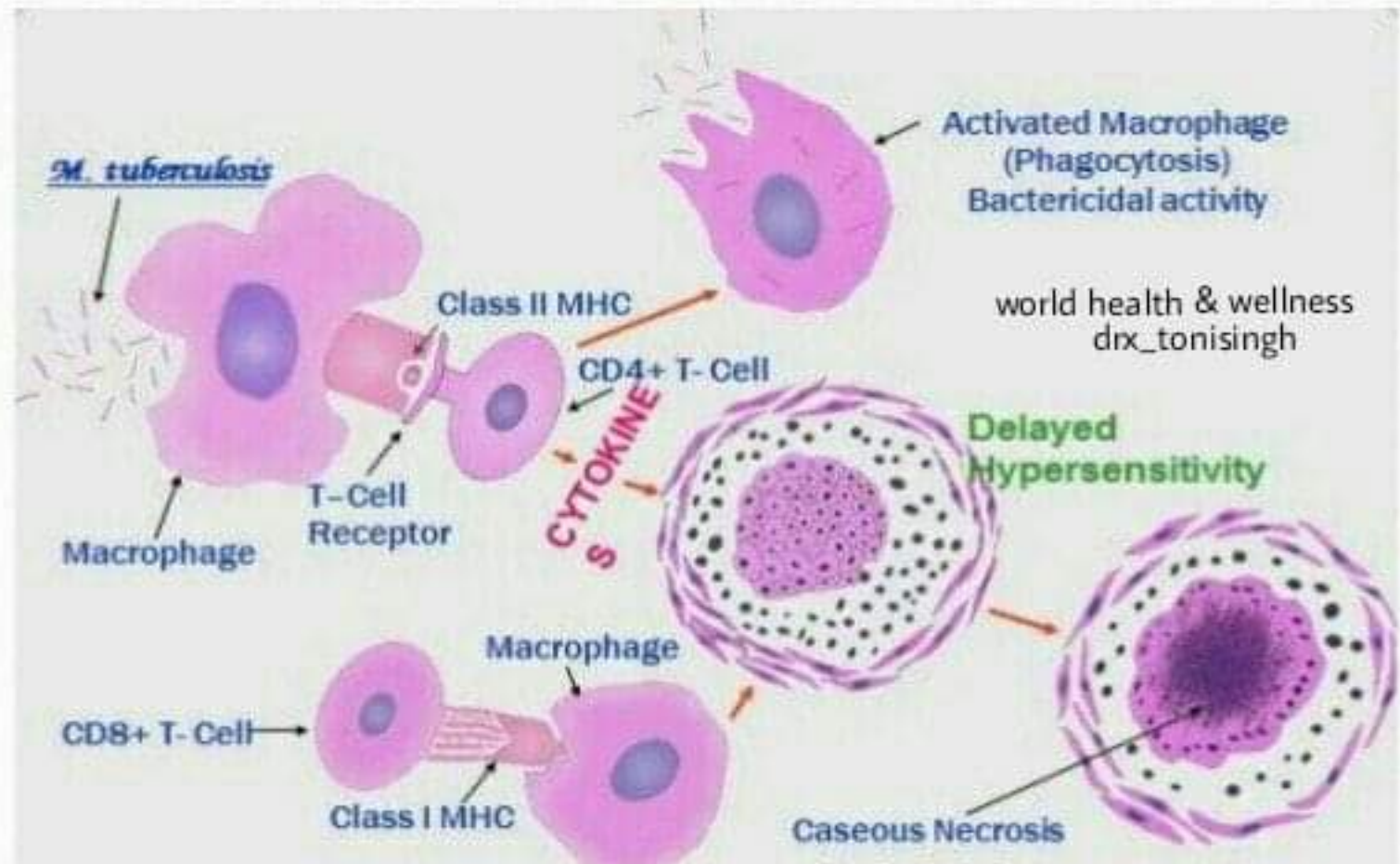
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Pathogenesis



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Immunopathology



Koch's Phenomenon

- Cell mediated immunity develops 2-12 weeks after infection along with delayed hypersensitivity (allergy).
- The result of these determines the course of infection.
- The response of a tuberculous animal to re-infection was originally described by **Koch**.
- Tuberculosis infected Guinea pig if injected with living Tubercle bacilli. world health & wellness drx_tonisingh
- The site around the injection becomes necrotic.
- Koch found the same reaction when injected with old Tuberculin (heated and concentration of the tubercle bacilli)
- It has produced the same reaction.
- This is called as Koch's Phenomenon.

Classification



Pulmonary TB

- Primary Disease
- Secondary Disease

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Extra pulmonary

- i. Lymph node TB
- ii. Pleural TB
- iii. TB of upper airways
- iv. Skeletal TB
- v. Genitourinary TB
- vi. Miliary TB
- vii. Pericardial TB
- viii. Gastrointestinal TB
- ix. Tuberculous Meningitis
- x. Less common forms

Types

A. Pulmonary TB :-

1. Primary Tuberculosis :-

The infection of an individual who has not been previously infected or immunised is called **Primary tuberculosis** or **Ghon's complex** or **childhood tuberculosis**.

Lesions forming after infection is peripheral and accompanied by hilar which may not be detectable on chest radiography.

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2. Secondary Tuberculosis :

The infection that individual who has been previously infected or sensitized is called **secondary** or **post primary** or **reinfection** or **chronic tuberculosis**.

B} Extra Pulmonary TB :-

20% of patients of TB Patient

Affected sites in body are :-

1) Lymph node TB (tuberculous lymphadenitis):-

Seen frequently in HIV infected patients.

Symptoms :- Painless swelling of lymph nodes most commonly at cervical and Supraclavical (Scrofula)

Systemic systems are limited to HIV infected patients.

2) Pleural TB :- world health & wellness drx_tonisingh

Involvement of pleura is common in Primary TB and results from penetration of tubercle bacilli into pleural space.

3) TB of Upper airways :-

Involvement of larynx, pharynx and epiglottis.

Symptoms :- Dysphagia, chronic productive cough

4) Genitourinary TB :-

- 15% of all Extra pulmonary cases.
- Any part of the genitourinary tract get infected.
- Symptoms :- Urinary frequency, Dysuria, Hematuria.

5) Skeletal TB :- world health & wellness drx_tonisingh

- Involvement of weight bearing parts like spine, hip, knee.
- Symptoms :- Pain in hip joints n knees, swelling of knees, trauma.

6) Gastrointestinal TB :-

Involvement of any part of GI Tract.

Symptoms :- Abdominal pain, diarrhea, weight loss

7) TB Meningitis & Tuberculoma :-

5% of All Extra pulmonary TB

Results from Hematogenous spread of 1^o & 2^o TB.

8) TB Pericarditis :-

- 1- 8% of All Extra pulmonary TB cases.
- Spreads mainly in mediastinal or hilar nodes or from lungs.

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9) Miliary or disseminated TB :-

- Results from Hematogenous spread of Tubercle Bacilli.
- Spread is due to entry of infection into pulmonary vein producing lesions in different extra pulmonary sites.

10) Less common Extra Pulmonary TB

uveitis, panophthalmitis, painful Hypersensitivity related phlyctenular conjunctivitis.

Classification of TB

- Depending on the time of infection and types of response, TB may be classified as; **Primary and Secondary.**

1. **Primary Tuberculosis:**

- It is initiated after first contact with tubercle bacilli.
 - Events of Primary complex world health & wellness drx_tonisingh
1. Bacilli are engulfed by Alveolar Macrophages
 2. Multiply and give rise to Sub pleural focus of Tuberculosis Pneumonia, involve lower lobes and lower part of upper lobes called as **Ghon's focus.**
 3. The hilar lymph nodes are also involved.
 4. The Ghon focus together with hilary lymph node consitute the **Primary complex.**

- Ghon's focus with Enlarged lymph nodes appear after 3- 8 weeks after infection.
- Heals in 2 – 6 months calcified,
- Some bacteria remain alive and produce latent infections.
- Infection activated in Immunosuppressed conditions Eg. HIV infections and AIDS
- Can produce Meningitis, Miliary tuberculosis, other disseminated Tuberculosis.

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2. **Secondary Tuberculosis:**

- Mainly occurs due to Reactivation of Latent infection.
- May also due to Exogenous reinfection
- Differs from Primary Infection.
- Leads to –
 Cavitation's of Lungs, Enlargement of Lymph nodes, expectoration of Bacteria laden sputum.
- Dissemination into Lungs and other extra pulmonary areas.

Epidemiology

- According to the World Health Organization (WHO), nearly 2 billion people—one third of the world's population—have been exposed to the tuberculosis pathogen . world health & wellness drx_tonisingh
- Annually, 8 million people become ill with tuberculosis, and 2 million people die from the disease worldwide.
- Death is recorded more in poor countries like India.
- More than 40% Indians are affected.
- **Reason for increase incidence :**
 1. HIV infections and the neglect of TB control programs.
 2. Lack of access to health care
 3. Poverty

Laboratory Diagnosis

- Tests may include:
 - medical history
 - chest X-ray
 - physical examination
 - Radiology
 - Tuberculin skin test
 - microbiological detect of smears and cultures.
 - Blood test.



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Treatment

- **Chemotherapy** has revolutionized the management of tuberculosis.
- Treatment for TB uses antibiotics to kill the bacteria. The two antibiotics most commonly used are **rifampicin** (10 mg/kg) and **isoniazid** (5 mg/kg (300 mg max per day)).
- However, instead of the short course of antibiotics typically used to cure other bacterial infections, TB requires much longer periods of treatment (around 6 to 12 months) to entirely eliminate mycobacteria from the body. world health & wellness drx_tonisingh
- **Multiple-drug therapy** to treat TB means taking several different antitubercular drugs at the same time.
- The standard treatment is to take isoniazid, rifampin, ethambutol, and pyrazinamide for 12 months.
- **Directly Observed Treatment (DOT).**



ANTI-TUBERCULAR DRUG

❑ FIRST LINE DRUG

1. Isoniazid (H)
2. Rifampin (R)
3. Pyrazinamide (Z)
4. Ethambutol (E)
5. Streptomycin (S)

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❑ SECONd LINE DRUG

1. Thiacetazone (Tzn)
2. Paraaminosalicylic acid (PAS)
3. Ethionamide (Etm)
4. Cycloserine (Cys)
5. Kanamycin (Am)
6. Capreomycin (Cpr)

NEWER DRUG

1. Ciprofloxacin
2. Ofloxacin
3. Clarithromycin
4. Azithromycin
5. Rifabutin
6. Bedaquiline (Recently)

Prevention

- For the prevention of TB, general measures such as adequate nutrition, health education, cover the mouth and wear mask, wash your hands frequently are very important measures.
- Intradermal injection of live attenuated vaccine **BCG** (Bacille Calmette-Guerin).
- Immunity lasts for 10-15 years.



Laboratory Diagnosis

- Tests may include:
 - medical history
 - chest X-ray
 - physical examination
 - Radiology
 - Tuberculin skin test
 - microbiological detect of smears and cultures.
 - Blood test.



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Diagnosis

1. Bacteriological test:

- a. Zeihl-Neelsen stain
- b. Auramine stain (fluorescence microscopy)

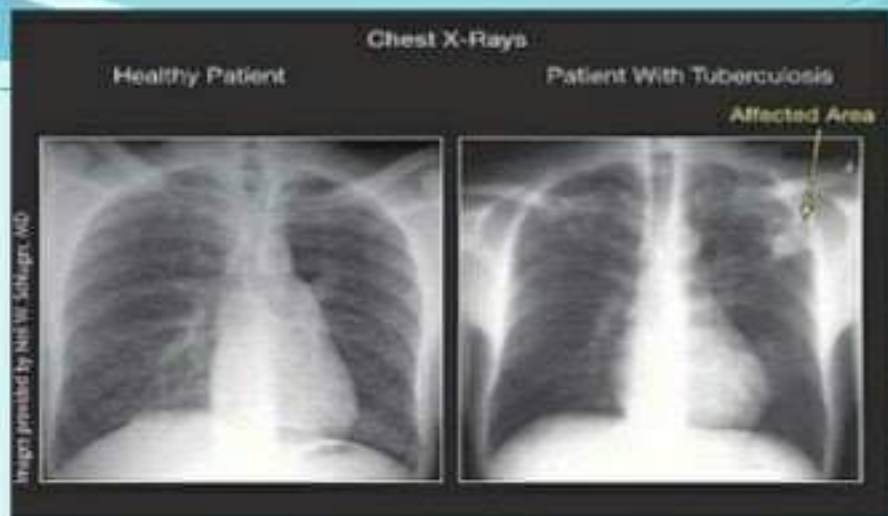
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2. Sputum culture test:

- a. Lowenstein –Jensen (LJ) solid medium: 4-18 weeks
- b. Liquid medium : 8-14 days
- c. Agar medium : 7 to 14 days

3. Radiography:

Chest X-Ray(CXR)



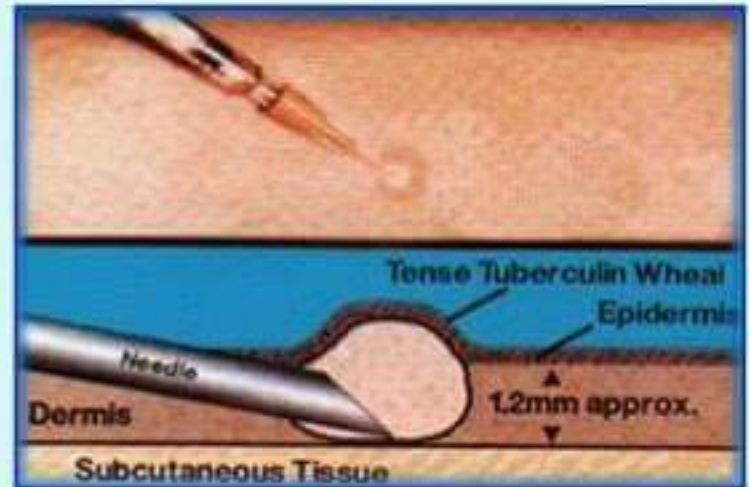
4. Nucleic acid amplification:

- Species identification ; several hours
- Low sensitivity, high cost world health & wellness drx_tonisingh
- Most useful for the rapid confirmation of tuberculosis in persons with AFB-positive sputa
- Utility
 - AFB-negative pulmonary tuberculosis
 - Extra pulmonary tuberculosis

5. Tuberculin skin test (PPD)

- Injection of fluid into the skin of the lower arm.
- 48-72 hours later – checked for a reaction.
- Diagnosis is based on the size of the wheal.

1 dose = 0.1 ml contains 0.04 μ g
Tuberculin PPD.



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Tuberculin test interpretation

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| Diameter of Induration | Interpretation | Action |
|-----------------------------------|---|--|
| Less than 6mm | Negative | Previously unvaccinated individuals may be given BCG provided there are no contraindications |
| 6mm or greater but less than 15mm | Hypersensitive to tuberculin protein. May be due to previous TB infection, BCG or exposure to atypical mycobacteria | Should not be given BCG* |
| $\geq 15\text{mm}$ | Strongly hypersensitive to tuberculin protein Suggestive of TB infection or disease | Should not be given BCG. Refer for further investigation and supervision which may include chemotherapy. |

6. Other biological examinations

- Cell count(lymphocytes)
- Protein(Pandy and Rivalta tests) – Ascites, pleural effusion and meningitis.

DIAGNOSTIC STEPS

1



HISTORY AND CLINICAL EXAMINATION

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“The first rule of TB diagnosis: is to think of TB....”

The physician Include TB in his differential diagnosis when history & symptoms are consistent with TB diagnosis **THEN** he will recommended appropriate diagnostic tests to prove the infection.

DIAGNOSTIC STEPS

2



RADIOGRAPHIC FEATURES

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❑ Chest X-ray

Tuberculosis creates cavities visible in x-rays like this one in the patient's right upper lobe. Abnormalities on chest radiographs may be suggestive, but are **never diagnostic of TB**. However, chest radiographs may be **used to rule out**.



DIAGNOSTIC STEPS

3



BACTERIOLOGIC EVALUATION

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Conventional diagnostic methods
{smear, culture}



Immunologic diagnosis
{tuberculin test , IN gamma assay}



New diagnostic methods
{NNA, BACTEC, MGIT}



Conventional diagnostic methods {smear, culture}

Specimen:

Fresh Sputum ,Gastric Washing , Urine, Pleural Fluid , Cerebrospinal Fluid , Biopsy Material , Blood.

Decontamination & concentration of specimens :

Sputum Specimens (Non Sterile) Should Be :

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- ☐ **Liquefied** with N-acetyl-L-cysteine.
- ☐ **Decontaminated** with NaOH.
- ☐ **Neutralized** with buffer.
- ☐ **Concentrated** By Centrifugation.

Specimens processed in this way can **be used for acid fast stains and for culture.**





Immunologic diagnosis
{tuberculin test , IN gamma assay}

Tuberculin skin Test

Purified Protein Derivative (PPD) : world health & wellness drx_tonisingh

Is a concentrated filter of broth in which tubercle bacilli have grown for 6 weeks(old).

- ☐ Measuring The Size Of Induration 48-72 Hours.
- ☐ Positive If ≥ 10 mm Induration Size.
- ☐ Standard Method For Screening & Measuring Of A Person's Cellular Response.





Immunologic diagnosis
{tuberculin test , IN gamma assay}

γ -Interferon release assays (GIRA)

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- ❑ Test Rely On The Fact That **T-Lymphocytes Will Release γ -interferon** When Exposed To Specific Antigens. These Tests Are Mostly Developed For The Field Of Tuberculosis Diagnosis, But **In Theory**, May Be Used In The Diagnosis Of Other Diseases Which Rely On Cell-mediated Immunity.

Treatment

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- Immunity lasts for 10-15 years.



Tuberculosis Prevention

Personal Hygiene



Immunization



Healthy Lifestyle and Environment

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BCG vaccine

- Bacille Calmette Guerin (BCG).
- First used in 1921.
- Only vaccine available today for protection against tuberculosis.
- It is most effective in protecting children from the disease.
- Given 0.1 ml intradermally.
- Duration of Protection 15 to 20 years
- Efficacy 0 to 80%.

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- Should be given to all healthy infants as soon as possible after birth unless the child presented with symptomatic HIV infection.



Management

First-line drugs

Isoniazid
Rifampin
Rifapentine
Rifabutin*
Ethambutol
Pyrazinamide

Second-line drugs

Cycloserine
Ethionamide
Levofloxacin*
Moxifloxacin*
Gatifloxacin*
p-Aminosalicylic acid
Streptomycin
Amikacin/kanamycin*
Capreomycin

* Not approved by the Food and Drug Administration for use in the treatment of tuberculosis.

ANTI-TUBERCULAR DRUG

❑ FIRST LINE DRUG

1. Isoniazid (H)
2. Rifampin (R)
3. Pyrazinamide (Z)
4. Ethambutol (E)
5. Streptomycine (S)



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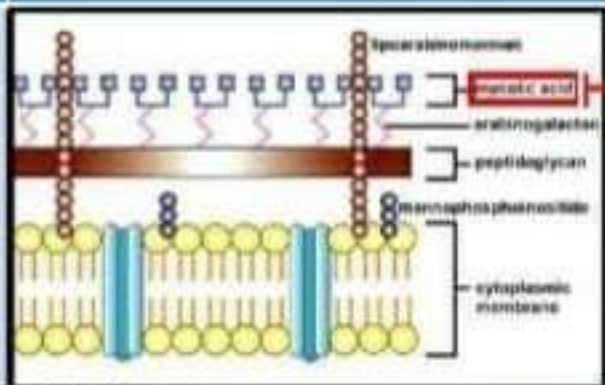
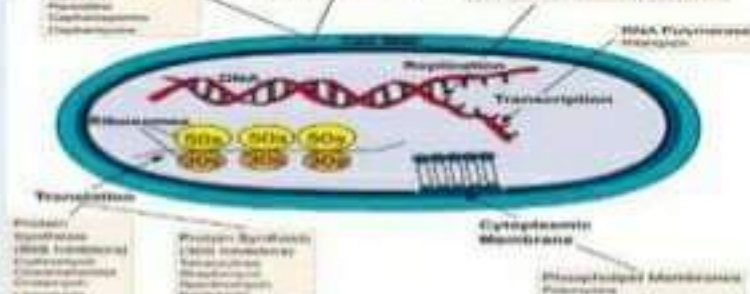
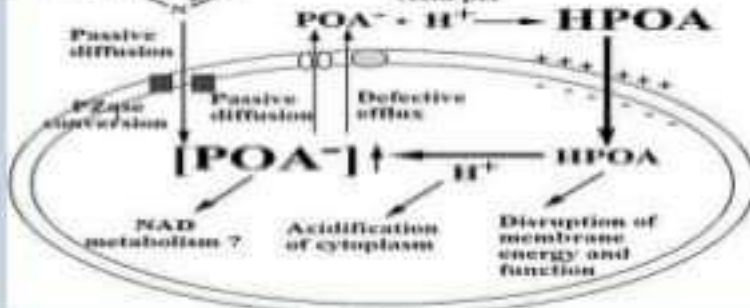


❑ SECOUND LINE DRUG

1. Thiacetazone (Tzn)
2. Paraaminosalicylic acid (PAS)
3. Ethionamide (Etm)
4. Cycloserine (Cys)
5. Kanamycine (Am)
6. Capriomycine (Cpr)

NEWER DRUG

1. Ciprofloxacin
2. Ofloxacin
3. Clarithromycine
4. Azithromycine
5. Rifabutine
6. Bedaquiline(Recently)

| Drugs | MOA | Diagram |
|--------------|--|---|
| Isoniazid | Inhibits mycolic acid synthesis. world health & wellness drx_tonisingh |  <p>The diagram illustrates the mechanism of Isoniazid. It shows a cross-section of the cell wall and cytoplasmic membrane. Isoniazid is shown entering the cell and inhibiting the synthesis of mycolic acid, which is a key component of the cell wall. The cell wall layers shown are arabinogalactan, peptidoglycan, and mycolic acid. The cytoplasmic membrane is also depicted. A label 'Isoniazid' points to the drug molecule entering the cell.</p> |
| RIFAMPICIN | Blocks RNA synthesis by blocking DNA dependent RNA polymerase |  <p>The diagram shows a cross-section of a bacterial cell. Rifampicin is shown entering the cell and blocking RNA polymerase, which is responsible for transcription. The diagram labels various cellular components: Cell Wall Synthesis (peptidoglycan, teichoic acid, lipoteichoic acid, N-acetylmuramic acid), Cell Wall Integrity (proteins), DNA Synthesis (DNA polymerase, RNA polymerase), RNA Polymerase, Transcription, Translation, Cytoplasmic Membrane, and Phospholipid Membrane. Rifampicin is shown blocking the RNA polymerase enzyme.</p> |
| PYRAZINAMIDE | Bactericidal-slowly metabolizing organism within acidic environment of Phagocyte or caseous granuloma. |  <p>The diagram illustrates the mechanism of Pyrazinamide (PZA) in an acidic environment. PZA enters the cell via passive diffusion. Inside the cell, it is converted to POA⁻ (Pyrazinoyl anion) by the enzyme PZAse. POA⁻ then enters the cell via passive diffusion. The diagram shows the chemical structure of PZA and the reaction: $\text{PZA} + \text{H}^+ \rightarrow \text{POA}^- + \text{H}^+$. POA⁻ is then converted to HPOA (Pyrazinoyl acid) by the reaction: $\text{POA}^- + \text{H}^+ \rightarrow \text{HPOA}$. HPOA is shown to be toxic to the cell, leading to NAD metabolism, acidification of the cytoplasm, and disruption of membrane energy and function. The diagram also shows the chemical structure of PZA and the reaction: $\text{PZA} + \text{H}^+ \rightarrow \text{POA}^- + \text{H}^+$.</p> |

| Drugs | MOA | Diagram |
|--------------|---|---|
| ETHAMBUTOL | <ul style="list-style-type: none"> • Bacteriostatic • Inhibition of Arabinosyl Transferase <p>world health & wellness drx_tonisingh</p> | <p>Drug action: Ethambutol (EMB)</p> <p>The first-line antibiotic drug ethambutol (EMB) interferes with cell-wall biosynthesis in <i>Mycobacterium tuberculosis</i>. EMB inhibits the action of arabinosyl transferase (EmbA). EmbA is a membrane-associated enzyme involved in the synthesis of arabinogalactan; arabinogalactan is an essential structural component of the mycobacterial cell wall.</p> <p>immunopaedia.org</p> |
| STREPTOMYCIN | Inhibition of Protein synthesis by disruption of ribosomal function | <p>50S subunit</p> <p>wrong amino acid</p> <p>near match</p> <p>30S subunit</p> <p>mRNA</p> <p>aminoglycoside</p> <p>codon 1 (Start)</p> <p>codon 2 (Lys)</p> <p>codon 3 (Gly)</p> <p>codon 4 (Ser)</p> <p>codon 5 (Pro)</p> <p>codon 6 (Thr)</p> <p>codon 7 (Stop)</p> |

ADRs and its Management

TABLE 149-3 *Monitoring Side Effects of Common Antituberculous Drugs*

| Drug | Side Effect | Management |
|-------------------------------------|-----------------------------|---|
| Rifampin | Rash | Observe patient/stop drug if significant |
| | Liver dysfunction | Monitor AST/limit alcohol consumption/monitor for hepatitis symptoms |
| | Flulike syndrome | Administer at least twice weekly/limit dose to 10 mg/kg (adults) |
| | Red-orange urine | Reassure patient |
| | Drug interactions | Consider monitoring levels of other drugs affected by rifampin, especially with contraceptives, anticoagulants, and digoxin/avoid use with protease inhibitors |
| Isoniazid | Fever, chills | Stop drug |
| | Hepatitis | Monitor AST/limit alcohol consumption/monitor for hepatitis symptoms/educate patient/stop drug at first symptoms of hepatitis (nausea, vomiting, anorexia, flulike syndrome) |
| | Peripheral neuritis | Administer vitamin B ₆ |
| | Optic neuritis | Administer vitamin B ₆ /stop drug |
| | Seizures | Administer vitamin B ₆ |
| Pyrazinamide | Hepatitis | Monitor AST/limit daily dosage to 15–30 mg/kg/discontinue with signs or symptoms of hepatitis |
| | Hyperuricemia | Monitor uric acid level only in cases of gout or renal failure |
| Ethambutol | Optic neuritis | Use 25 mg/kg daily only for first 2 months (except in drug-resistant tuberculosis), then use lower daily dose (15 mg/kg) when possible/monitor visual acuity (eye chart) and red-green color vision (Ishihara Color Book) at baseline and with any visual complaint/educate patient/stop drug at first change in vision, get ophthalmologic evaluation |
| Streptomycin, amikacin, capreomycin | Ototoxicity, renal toxicity | Limit dose and duration of therapy as much as possible/avoid daily therapy in patients >50 years old/monitor BUN and serum creatinine levels and possibly conduct audiometry before and as needed during therapy/question patient regularly about tinnitus, dizziness, vertigo, and decreased hearing/measure serum drug levels if possible/educate patient/stop drug at first development of adverse effect (usually tinnitus) |

Dosage regimen

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- Intensive phase + continuation phase
- HREZ (2 months) + HRE (4 months)

TABLE 150-2 Recommended Dosage for Initial Treatment of Tuberculosis in Adults^a

| Drug | Dosage | |
|-------------------------|----------------------|---------------------------------|
| | Daily Dose | Thrice-Weekly Dose ^b |
| Isoniazid | 5 mg/kg, max 300 mg | 15 mg/kg, max 900 mg |
| Rifampin | 10 mg/kg, max 600 mg | 10 mg/kg, max 600 mg |
| Pyrazinamide | 20–25 mg/kg, max 2 g | 30–40 mg/kg, max 3 g |
| Ethambutol ^c | 15–20 mg/kg | 25–30 mg/kg |

Treatment regimen according to WHO

ISONIAZID (H)

RIFAMPICIN (R)

PYRAZINAMIDE (Z)

ETHAMBUTOL (E)

STREPTOMYCIN (S)

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| Indication | Initial phase | | Continuation phase | |
|--|-------------------|--|--------------------|---------|
| | Duration (months) | Drugs | Duration (months) | Drugs |
| New smear- or culture-positive cases | 2 | H, R, Z, E | 4 | H, R |
| New culture-negative cases | 2 | H, R, Z, E | 2 | H, R |
| Pregnancy | 2 | H, R, E | 7 | H, R |
| Failure and relapse | | | | |
| Resistance (or intolerance) to H | Throughout 6 | | R, Z, E | |
| Resistance to H+R | Throughout 12–18 | Z, E, Q + S (or another injectable agent) | | |
| Resistance to all first-line drugs | Throughout 24 | One injectable agent + three of these four: ethionamide, cycloserine, Q, PAS | | |
| Standardised re-treatment (susceptibility testing unavailable) | 3 | H, R, Z, E, S | 5 | H, R, E |
| Drug intolerance to R | Throughout 12 | H, Z, E | | |
| Drug intolerance to Z | 2 | H, R, E | 7 | H, R |

DOTS

DOTS - Directly observed treatment, short-course

- DOT means that a trained health care worker or other designated individual provides the prescribed TB drugs and watches the patient swallow every dose.

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- ❑ DOTS is the name given to the tuberculosis control strategy recommended by the World Health Organization.
- ❑ According to WHO, “The most cost-effective way to stop the spread of TB in communities with a high incidence is by curing it. The best curative method for TB is known as DOTS.
- ❑ DOTS is an interventional strategy developed by Dr. Karel Styblo and is recommended by the WHO as the strategy that ensures cure of TB.
- ❑ A DOT Lay Worker meets with clients to help with TB medication, and provide support and education. Watching clients swallow each dose of anti-TB medication.

Multi-Drug Resistance TB

- TB caused by strains of *Mycobacterium tuberculosis* that are resistant to at least isoniazid and rifampicin, the most effective anti-TB drug.
- Globally, 3.6% are estimated to have MDR-TB.
- Almost 50% of MDR-TB cases worldwide are estimated to occur in China and India.

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Extensively drug resistance TB

- Extensively drug-resistant TB (XDR-TB) is a form of TB caused by bacteria that are resistant to isoniazid and rifampicin (i.e. MDR-TB) as well as any fluoroquinolone and any of the second-line anti-TB injectable drugs (amikacin, kanamycin or capreomycin).

Tuberculosis and HIV

- Worldwide the number of people infected with both HIV and TB is rising.
- The HIV virus damages the body's immune system and accelerates the speed at which TB progresses from a harmless infection to a life threatening condition.
- The estimated 10% activation of dormant TB infection over the life span of an infected person, is increased to 10% activation in one year, if HIV infection is superimposed.
- It is the opportunistic infection that most frequently kills HIV-positive people.

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Epidemiological Impact

- **Reactivation of latent infection-** People who are infected with both HIV and TB are 25 to 30 times more likely to develop TB again than people only infected with TB.
- **Primary Infection-** New tubercular infection in people with HIV can progress to active disease very quickly.
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- **Recurring infection-** in people who were cured of TB.

Diagnosis of TB in people with HIV

- HIV positive people with pulmonary TB may have a higher frequency of having sputum negative smears.
- The tuberculin test often fails to work, because the immune system has been damaged by HIV; It may not even show a response even though the person is infected with TB. world health & wellness drx_tonisingh
- Chest Xray will show less cavitation.
- Cases of Extra pulmonary TB are more common.

| Category | Type of Patient | Regimen | Duration in months |
|-------------------------------------|--|--------------------------|--|
| Category I | New Sputum Positive , | 2 (HRZE) ₃ , | 6 |
| Color of box: RED | Seriously ill sputum negative, Seriously ill extra pulmonary, | 4 (HR) ₃ | world health & wellness drx_tonisingh |
| Category II | Sputum Positive relapse, | 2 (HRZES) ₃ , | 8 |
| Color of box: BLUE | Sputum Positive failure | 1 (HRZE) ₃ | |
| | Sputum Positive treatment after default | 5 (HRE) ₃ | |

H: Isoniazid (300 mg), R: Rifampicin (600 mg), Z: Pyrazinamide (1500 mg),
E: Ethambutol (1000 mg), S: Streptomycin (1000 mg)

1. Patients who weigh 60kg or more receive additional Rifampicin 150mg.
2. Patients who are more than 50 years old receive Streptomycin 500mg.
3. Patients who weigh less than 30kg receive drugs as per Paediatric weight band boxes according to body weight.

DOTS

1. Standardised treatment throughout the duration of treatment

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2. Diagnosis by microscopy

3. Reliable supply of a limited number of reliable first-line drugs

4. Continuous evaluation of patient notifications, smear results, and outcome

5. Commitment from the local government

DOTS PLUS

1. Individualised treatment regimens when mycobacterial culture and anti-tuberculosis drug sensitivity reports become available

2. Diagnosis by DSC

3. Provision of a wide-range of second-line anti-tuberculosis drugs.

4. Three monthly culture and anti-tuberculosis drug susceptibility testing and more extensive programmatic reviews

5. Additional support from external governments and agencies.

THE BEST ADVICE...

Save money every week! It doesn't matter how much. Just save!

**Listen to your parent's advice..
at the end of the day, they are the only ones who want the best for you.**

Choose your friends wisely as you are the product of your environment.

**Learn to be alone and independent.
It's a skill few master.**

Educate yourself - read, read, read.

Be healthy & look after your body.

**Don't wait for someone to love you;
learn to love YOURSELF first.**

You'll be okay.