# TB Medications: What Nurses Need to Know

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# TB Medications:
## *What Nurses Need to Know*

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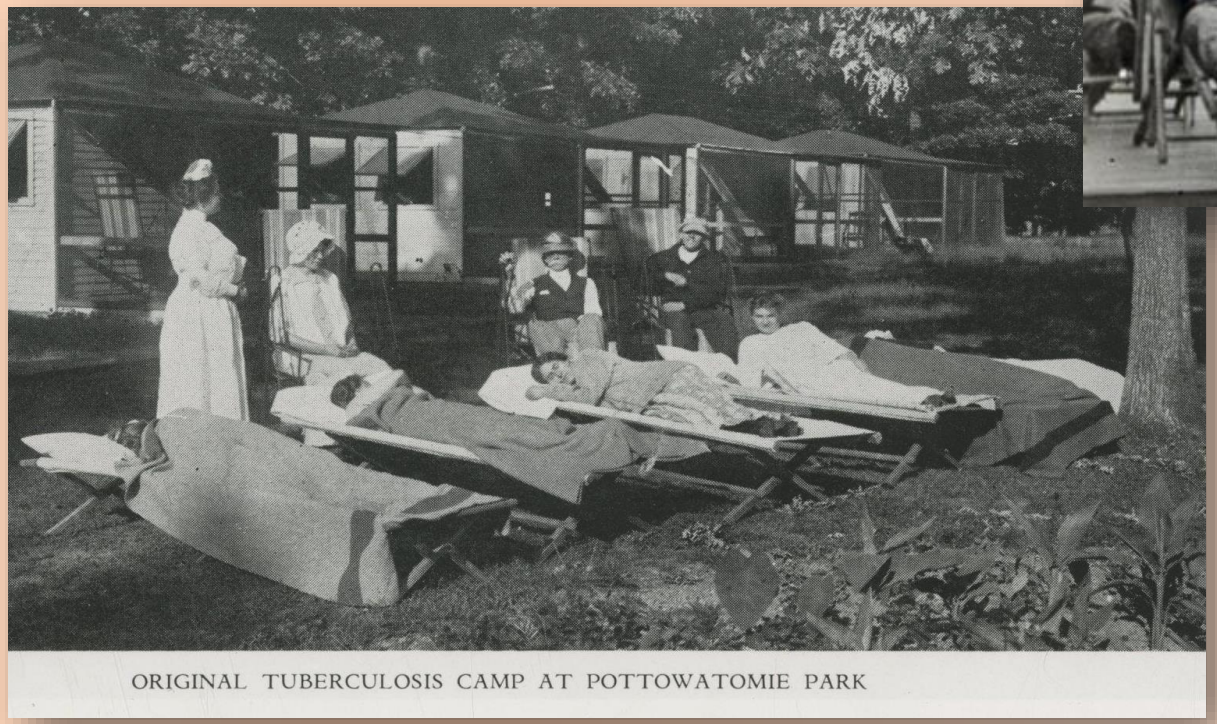
# Objectives:

**First-line Tuberculosis (TB) Medications**

- Medication Dosages
- Side Effects
- Nursing Considerations
- Medication Administration Tips

# TB Treatment before anti-tuberculosis drugs



ORIGINAL TUBERCULOSIS CAMP AT POTTOWATOMIE PARK

**Sanitoriums provided:**

- ✓ Fresh air
- ✓ Sunlight
- ✓ Relaxing surroundings
- ✓ Good nourishment

Rifamycins


Rifampin
Rifabutin
Rifapentine

Isoniazid


Pyrazinamide


Ethambutol

Fluoroquinolones


Moxifloxacin
Levofloxacin

# First-line Tuberculosis Drugs

# *Why use a Multi-Drug Therapy?*

- *Mycobacterium tuberculosis* (MTB) produces resistant mutations during replication
- Multi-drug TB treatments provide cross-coverage against these various mutations
- Different actions of TB drugs
  - Bactericidal
  - Early Bactericidal
  - Bacteriostatic
  - Sterilizing

# Actions of Anti-TB drugs:

**Bactericidal** — Directly kills the bacteria

**Early Bactericidal** — Early reduction in colony forming units found in sputum; **isoniazid** has the highest EBA

**Bacteriostatic** — Prevents multiplication and growth

**Sterilizing** — Kill off "persisters"; **rifampin** has the highest sterilizing activity

# RIFAMPIN

- **Bactericidal** (kills bacteria)
  - Highest sterilizing activity against rapidly dividing and semi-dormant bacteria
- **Dose:**
  - Adult: 10 mg/kg/dose ( usually 600 mg PO)
  - Child: 15-20 mg/kg/dose
  - Infant/Toddler: 20-30 mg/kg/day
  - Renal failure/dialysis: no dose adjustment
- **Rapid absorption**
  - May be decreased by high-fat meals
  - CSF penetration
- **Increases metabolism of many drugs**
  - Hormonal contraception, methadone, anti-seizure medications, anti-coagulants, antiretrovirals


# RIFAMPIN: Side Effects

**Orange Discoloration**

**GI Upset**

**Pruritis**

**Hepatotoxicity**

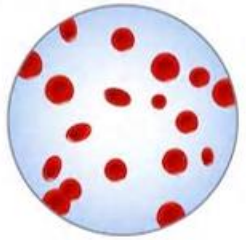
## Less Common Side Effects

**Flu-like symptoms**

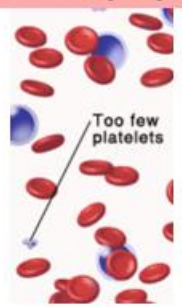
< 1% of patients
Usually 3 – 6 months of starting treatment

**Hyperbilirubinemia**

**Hemolytic Anemia**



**Thrombocytopenia**



# RIFAMPIN

- **Monitoring:**
  - Liver enzymes AST/ALT if there are symptoms of hepatotoxicity
  - Drug concentrations
- **Drug to drug interactions:**
  - Certain rifamycins cannot be given with antiretroviral drugs; be sure to consult with an expert
  - Ensure patient identifies all other medications they are taking as they may interfere with rifampin
- **Patient Education:**
  - Best taken without food, however, can take with a small amount of food for stomach upset

# RIFABUTIN


- Bactericidal (kills bacteria; same mechanism as rifampin)
- Dose:
  - Adult: 5 mg/kg/dose
  - Children: 5-10 mg/kg/day * (no pediatric dose has been established)
  - Renal failure/dialysis: no dose adjustment in mild renal insufficiency
  - Dosage adjustment may be required with anti-retroviral therapy
- Substitute for rifampin for patients receiving antiretrovirals
- Penetrates inflamed meninges
- Well absorbed from the GI tract
- Possible toxicity:
  - Leukopenia (decrease WBC's) thrombocytopenia (decrease PLT's) uveitis (redness, irritation, blurred vision, eye pressure)

# RIFAPENTINE


- Bactericidal activity (kills bacteria; same mechanism as rifampin)
- Approved for treatment of LTBI and more recently for TB disease in a new shorter course treatment regimen; dose varies on treatment regimen
- Adverse effects similar to rifampin

# ISONIAZID

- **Bactericidal** (kills bacteria)
  - Accounts for majority of ***early bactericidal activity;*** greatest early reduction in colony forming units found in sputum
  - Activated by ***katG*** enzyme
- **Dose:**
  - Adult: 5 mg/kg/day (300 mg/daily)
  - Child: 10-15 mg/kg/day
  - Renal failure/dialysis: 300 mg daily or 900 mg thrice weekly
- **Used for treatment of latent TB infection (LTBI) and active disease**


# Isoniazid: Side Effects

**Peripheral Neuropathy**

Numbness or tingling of fingers and toes

**CNS Changes**

Restlessness and insomnia

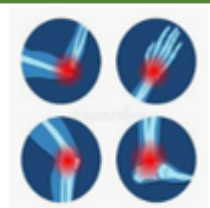
**Hepatotoxicity**

Increase in ALT/AST

**GI Upset**

Diarrhea, cramping, nausea, vomiting

**Arthralgias/ Joint Pain**



Baseline and monthly toxicity screening

**Lupus-like syndrome**

**Flu-like symptoms** <1%

Weakness, rash muscle/joint pain, weight loss

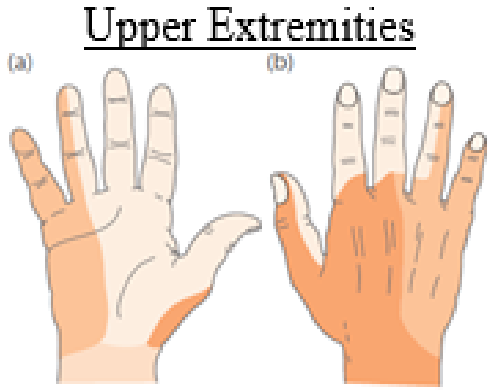
**Hypersensitivity Reactions**

May present with fever or rash

# ISONIAZID:
## Patient Education and Monitoring

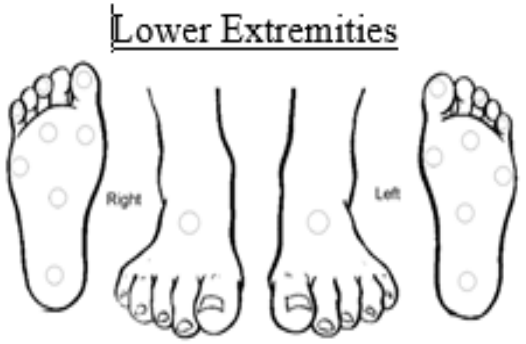

### Patient Education:

- Avoid alcohol
- Do not take antacids within one hour of medication administration
- Some patients may benefit from supplemental Vit B6
- Drug interactions:
  - levodopa, phenytoin, valproic acid, carbamazepine




### Monitor:

- LFTs: baseline and monthly, especially if underlying liver disease exists
- Therapeutic drug monitoring is recommended if you suspect malabsorption or treatment failure



# PYRAZINAMIDE

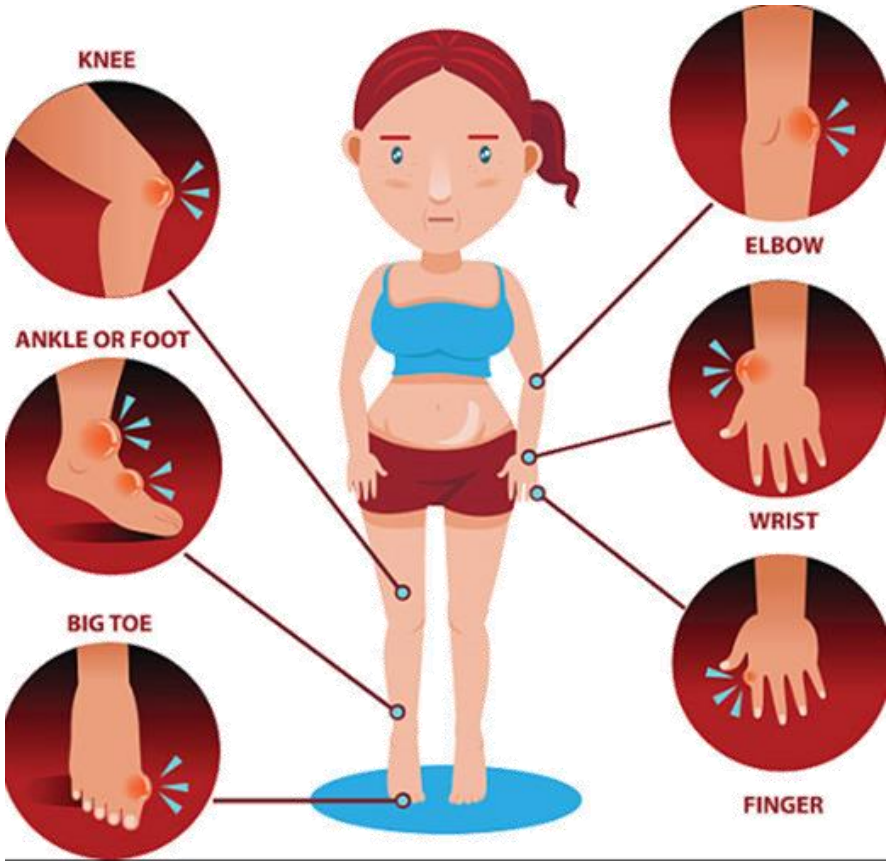

- **Bacteriostatic/sterilizing agent:**
  - Greatest activity against dormant or semi dormant (slow growing) organisms

- **Dose**
  - Adult: 25mg/kg/day
  - Children: 30-40 mg/kg/dose
  - Renal failure: 25 mg/kg/dose 3 times per week (not daily)
    - Cleared by the kidneys; ***dose 3 x week after dialysis***

- **Use in pregnancy/breastfeeding:**
  - In the U.S. PZA is avoided in pregnancy for drug susceptible disease due to lack of data regarding teratogenicity, however
  - Should be used for drug-resistant TB when the isolate is susceptible to PZA
  - When in doubt, please consult with an expert

# PYRAZINAMIDE


- **Adverse Reactions:**
  - Gout (hyperuricemia) and arthralgias
  - Hepatotoxicity
  - Rash
  - Photosensitivity
  - GI upset
- **Monitor**
  - Monitor transaminases and uric acid
- **Patient educations:**
  - May be taken with or without food
  - Limit sun exposure
  - Notify nurse or healthcare worker if they experience severe pain or swelling in joints



# ETHAMBUTOL

- **Bacteriostatic** (prevents multiplication/growth)
  - Bactericidal only at the high end of the dosing range
- **Prevention of rifampin resistance:**
  - Ethambutol protects the emergence of rifmapin resistance when INH resistance may be present
- **Dose**:
  - Adults: 15-25 mg/kg/day
  - Children: 15-25 mg/kg/day
  - Renal failure: 15-25 mg/kg/dose 3 x weekly (not daily)
- Remember: EMB can be discontinued as soon as the results of drug susceptibility studies demonstrate that the isolate is susceptible to INH and RIF

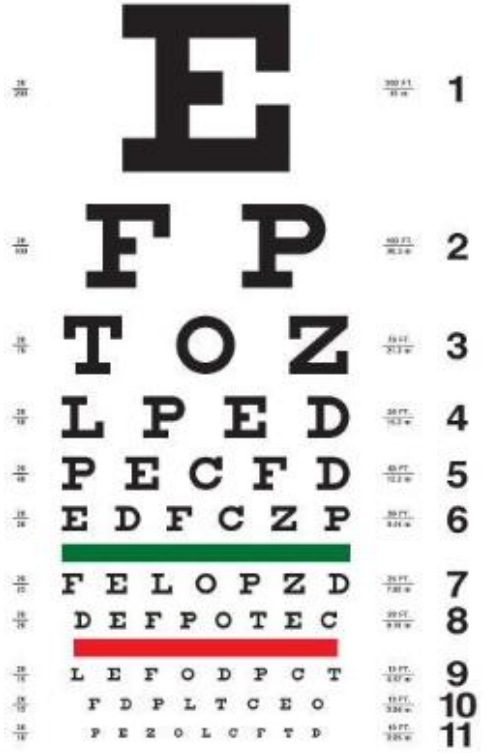
# ETHAMBUTOL

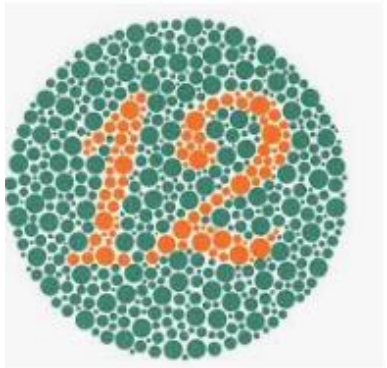
- **Toxicity**
  - Retrobulbar neuritis
    - Can be in one or both eyes
  - Peripheral neuropathy
  - Cutaneous reactions (<1%)

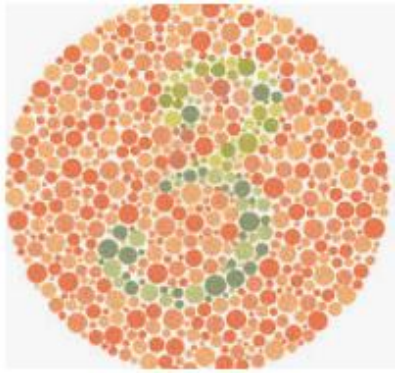
- **Monitor**
  - Baseline and monthly visual acuity (Snellen) and color discrimination (Ishihara) should be performed
  - Monitor blurry vision (squinting during exam or difficulty seeing traffic signs)

STOP If changes from baseline occur, stop medication and refer to ophthalmologist

- **Patient Education:**
  - Counsel patient to report any visual changes





# FLUOROQUINOLONES

## Moxifloxacin


## Levofloxacin

# FLUOROQUINOLONES

| Moxifloxacin |
| --- |
| Bactericidal |
| Metabolized in part by the liver |
| Dose: 400 mg/day; no dose adjustment required with renal insufficiency |

| Levofloxacin |
| --- |
| Bactericidal |
| Excreted unchanged by the kidneys; |
| Dose: 750-1000 mg/day; adjust dose in renal insufficiency (750-1000 mg/dose 3 times weekly for creatinine clearance < 30 mL/min). |

| | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Side Effects** | Abdominal discomfort | Diarrhea | Nausea/ vomiting | Mouth sores | Headache | Dizziness |
| | Skin itching | **QT prolongation** | Blurred vision | **Nervousness** | Anxiety | **Agitation** |

# Fluoroquinolone Toxicity

- Hepatotoxicity (**rare** with levofloxacin)
  - Reversible transaminase elevation
- Tendonitis/Tendon Rupture; **rare**
  - Usually achilles
  - Risk benefit evaluation
- Neurologic effects
  - Insomnia, dizziness, headache, tremors
- ***Patient Education:***
  - Avoid milk-based products or antacids within 2-hours of ingesting medication
  - Avoid vitamin supplements

# Medication Administration Tips for Adults

Crush meds and place in applesauce or in a drink of patient's choice

Drink water before taking medications to lubricate throat

Try to take a couple of pills at a time rather than one by one

# Medication Administration Tips for Children

- Crush medications and mix them into something sweet (contact pharmacy to ensure medication can be crushed)
- Role play medication administration with a stuffed animal
- Medications should be administered within 30 minutes of mixing

# Don’t forget to visit Heartland National TB Center: Products and Tools

HEARTLAND NATIONAL TB CENTER
THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT TYLER

[Products – Heartland National TB Center (heartlandntbc.org)]

## Tips for Treating Latent TB Infection in Children | Including Window Prophylaxis

### Who should be treated?

- **Children with latent tuberculosis (TB) infection (LTBI) -** where LTBI is defined as a positive TB screening test (tuberculin skin test [TST] or interferon gamma release assay [IGRA] blood test) and no evidence of active disease on chest x-ray (CXR) or physical exam.
- **Children in the window period after exposure -** Children <5 years old who have been in contact with an infectious adult or teen in the past 8 weeks and who have a negative TB screening test are still in the window period for test conversion. These children should have a physical exam and CXR. If there is no evidence of active disease, they should be treated with ‘window prophylaxis’ and retested 8-10 weeks after the break in contact with the infectious source.
- **Children who are in contact with a source that has drug resistance -** Whether the infectious source has multidrug-resistant (MDR) or other drug resistant TB, children who are exposed or infected should be treated in consultation with an expert in tuberculosis.

### What are the treatment regimens?

- **3HP** - (isoniazid [INH] and rifapentine [RPT]) is approved for children ≥ 2 years of age. This regimen allows a child to be treated with only 12 weekly doses of medication.
- **4R** - (rifampin [RIF] daily for 4 months) is safe and effective for children that cannot take 3HP.
- **3HR** - (INH and RIF dosed daily for 3 months) though not used as commonly in the United States (US) as in the United Kingdom, is an effective short-course treatment regimen.
- **6H** - (INH dosed daily or twice weekly [BIW]) is effective, but the least desirable, as only 50% of patients are likely to complete the necessary 6 months course.
- Infants who are exclusively breastfed, pregnant teens and children with poor diets or who are immune suppressed should receive pyridoxine (Vitamin B6) 1-2 mg/kg with each dose of INH.

### What are helpful administration tips?

- To help with swallowing pills, children can practice by swallowing similarly sized candies.
- For children who cannot swallow pills, TB medications can be crushed (or capsules opened) and mixed with a small amount of food (syrup, applesauce, etc.).
- Mixing should be done immediately before dosing and discarded if not administered within 30 minutes of mixing.

### What are the monitoring recommendations?

- Medication doses should be adjusted based on weight change, if needed.
- Children tolerate treatment very well. Routine laboratory monitoring is not necessary unless the child takes other medications metabolized through the liver or has liver disease.
- Children taking other medications or who have underlying liver conditions should have a monthly CBC (complete blood count) as well as a metabolic panel that contains liver function tests (LFTs).
- Children with symptoms that suggest medication toxicity (e.g. recurrent vomiting, decreased appetite, abdominal pain) should have their LFTs checked.

- All TB medications have side effects
- Baseline and monthly assessments for visual acuity and color discrimination aid in preventing toxicities
- When changes from baseline occur
  - Hold medications and reassess the patient to find likely cause
- Be creative when medication administration becomes a challenge

*Take home message


*Acknowledgement to Marybel Monreal, RN*