NCLEX-RN · 2026 TEST PLAN · PHARMACOLOGY / INFECTION CONTROL · CLINICAL JUDGMENT TIER I

Antimycobacterial *Agents.*

First-line weapons against Mycobacterium tuberculosis — four drugs, one regimen, countless ways to miss the priority question. This is the complete high-yield breakdown.

RIPE REGIMEN | DOT REQUIRED | AIRBORNE ISOLATION | ⚠ HEPATOTOXICITY RISK | 6–9 MONTH THERAPY

R I P E

The Four Horsemen of Active TB

Rifampin · **I**soniazid (INH) · **P**yrazinamide · **E**thambutol — given together for the **first 2 months** (intensive phase), then Rifampin + INH for **4 more months** (continuation). Single-drug therapy = resistance.

SECTIONS

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02 Mechanism of Action
03 Therapeutic Effects
04 Side Effects
05 Priority Nursing
06 Labs & Diagnostics
07 Administration
08 Patient Education
09 NCLEX Traps
10 Memory Boosters
+ Drug Comparison
! Clinical Judgment

01 Drug Overview — Why We Give These

INDICATIONS

Active Tuberculosis (TB)

- → Pulmonary & extrapulmonary TB confirmed by **AFB sputum culture** + chest x-ray
- → Symptoms: night sweats, weight loss, hemoptysis, productive cough >3 wk, low-grade fever
- → Always treated with **4-drug combination** to prevent resistance

Latent TB Infection (LTBI)

- → Positive PPD/QuantiFERON-TB Gold *without* active disease
- → Treated with **Isoniazid monotherapy × 6–9 months** (or shorter regimens: INH + rifapentine × 12 wk)
- → Goal: prevent reactivation

Multi-Drug Resistant TB (MDR-TB)

- → Resistant to INH *and* Rifampin
- → Requires **second-line agents**: streptomycin, fluoroquinolones, bedaquiline, linezolid
- → Treatment: 18–24 months under DOT

Post-Exposure Prophylaxis

- → Close contacts of active TB patients (esp. HIV+, immunocompromised, children < 5)
- → **INH × 6–9 months** even if PPD negative in high-risk populations
- → Healthcare workers with PPD conversion

02 Mechanism of Action — How They Kill the Bug

PATHWAYS

I Isoniazid (INH)

Activated by mycobacterial catalase → Inhibits *mycolic acid* synthesis → Cell wall breakdown → Bactericidal (replicating bugs only)

R Rifampin

Binds bacterial DNA-dependent RNA polymerase → Blocks mRNA synthesis → No bacterial proteins → Bactericidal (all phases)

P Pyrazinamide (PZA)

Converted to pyrazinoic acid in acidic environment → Disrupts membrane transport → Kills dormant bacilli inside macrophages

E Ethambutol

Inhibits *arabinosyl transferase* → Blocks arabinogalactan in cell wall → Bacteriostatic (stops replication)

S Streptomycin (2nd-line)

Binds 30S ribosome → Misreads mRNA → Faulty protein synthesis → Bactericidal aminoglycoside

03 Therapeutic Effects — How You Know It's Working

EVALUATION

Clinical Improvement

- → Resolution of **night sweats** and fever
- → Weight gain (reversal of cachexia)

Sputum Conversion

- → **3 consecutive negative AFB sputum cultures** = no longer infectious

Radiographic Response

- → Chest x-ray shows decreased infiltrates, cavitary lesions

- → Decreased cough, less hemoptysis
- → Improved energy, appetite
- → Typically seen in **2–4 weeks**

- → Usually occurs within **2–3 months** of adherent therapy
- → Permits release from airborne isolation
- → Required before returning to work/school

- → May *worsen* briefly early in treatment (paradoxical reaction) — do NOT discontinue
- → Full resolution can take 6+ months

Laboratory Trends

- → Decreasing ESR, CRP
- → Normalization of WBC
- → Gradual improvement in albumin/nutrition

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04 Side Effects & Adverse Reactions

TOXICITIES

○ COMMON

- **INH:** GI upset, mild rash, transient ↑ LFTs
- **Rifampin:** *Orange/red discoloration* of urine, sweat, tears, saliva — HARMLESS, stains soft contacts permanently

⚠ SERIOUS / LIFE-THREATENING

⚠ **HEPATOTOXICITY** — INH, Rifampin, PZA (stacking risk): jaundice, dark urine, RUQ pain, N/V, ↑ AST/ALT >3× baseline

⚠ **INH Peripheral Neuropathy** — numbness, tingling (prevent with Vitamin B6/pyridoxine 25–50 mg)

- **Pyrazinamide:** Photosensitivity, arthralgia, N/V, anorexia
- **Ethambutol:** Headache, mild GI upset, dizziness
- **Streptomycin:** Pain at IM site
- Fatigue, malaise (all agents)

⚠ **INH Hypertensive Crisis** — MAO-I effect + tyramine foods (aged cheese, cured meats, wine)

⚠ **Ethambutol Optic Neuritis** — ↓ visual acuity, red-green color blindness (dose-dependent, reversible if caught early)

⚠ **PZA Hyperuricemia** → acute gout flare

⚠ **Streptomycin Ototoxicity** — irreversible hearing loss, vestibular damage

⚠ **Streptomycin Nephrotoxicity** — ↑ creatinine, decreased urine output

⚠ Rifampin-induced *thrombocytopenia*, flu-like syndrome

05 Priority Nursing Considerations

ACTIONS

→ Assess Before Giving

→ Baseline **LFTs** (AST, ALT, bilirubin) before starting

→ Baseline **vision** + color discrimination (ethambutol)

→ Baseline **audiogram** + creatinine (streptomycin)

→ Monitor During Therapy

→ **LFTs monthly** (or sooner if symptoms)

→ Vision exam monthly with ethambutol

→ Hearing + renal function q2–4 wk with streptomycin

→ Uric acid with PZA (q month)

→ Adherence via DOT — gold standard

→ Drug Interactions (HIGH-YIELD)

→ **Rifampin = potent CYP450 inducer** → decreases effectiveness of: *oral contraceptives, warfarin, protease inhibitors, methadone, digoxin, phenytoin, azoles*

→ **INH:** avoid tyramine foods, alcohol, acetaminophen overuse

- → Pregnancy status (streptomycin = *ototoxic to fetus*)
- → Alcohol use (stacks with hepatotoxicity)
- → Current meds for **CYP450 interactions** (rifampin)

- → Weight, nutrition, mood (depression with INH)

- → Avoid antacids with INH (decreases absorption)
- → INH + phenytoin → ↑ phenytoin levels (seizure risk)

→ Contraindications

- → **Severe hepatic disease** → INH, RIF, PZA
- → **Optic neuritis** or children unable to report vision → EMB
- → **Pregnancy** → avoid streptomycin (fetal ototoxicity); PZA controversial (avoid in U.S. if possible)
- → **Acute gout** → avoid PZA
- → **Renal failure** → dose-adjust EMB, avoid streptomycin

⏸ HOLD & NOTIFY PROVIDER

- ⏸ AST/ALT > **3× upper limit** with symptoms (or 5× without)
- ⏸ Jaundice, dark urine, RUQ tenderness
- ⏸ New vision changes on ethambutol
- ⏸ New tinnitus or hearing loss on streptomycin
- ⏸ Numbness/tingling unrelieved by B6

📣 IMMEDIATE NURSING PRIORITIES

- 📣 Place in **airborne isolation** (negative pressure room)
- 📣 Staff wear **N95 respirator** (fit-tested)
- 📣 Patient wears **surgical mask** when leaving room
- 📣 Collect **3 early-morning sputum specimens** for AFB smear/culture
- 📣 Notify public health department (reportable disease)

- Severe rash, SJS, DRESS syndrome
- Acute gout flare on PZA

- Contact tracing of household members

06 Labs & Diagnostics — Numbers You Must Know

VALUES

LAB	CRITICAL / TARGET	MEANING / ACTION
AST / ALT	`> 3× ULN w/ sx` `> 5× ULN asx`	Hepatotoxicity — **HOLD INH/RIF/PZA**, notify provider. Baseline, then monthly.
Bilirubin	`> 3 mg/dL`	Hepatic dysfunction. Watch for **jaundice, scleral icterus**.
Uric Acid	`> 7 mg/dL (M)` `> 6 mg/dL (F)`	PZA hyperuricemia — may trigger **gout flare**. Assess joint pain.
Creatinine / BUN	`Cr > 1.3 mg/dL` `or ↑ 0.5 from baseline`	Nephrotoxicity — **streptomycin**. Adjust dose or hold.
AFB Sputum Culture	`3 negatives needed`	Confirms **non-contagious** status. Can D/C airborne isolation.

PPD (Mantoux)	`≥5 mm: HIV, immunosupp.`
	`≥10 mm: high-risk`
	`≥15 mm: low-risk`
		Read **48–72 hours**. Measure *induration*, not redness.

QuantiFERON-TB Gold	`Positive / Negative`	Blood test — not affected by prior BCG vaccine.
CBC — Platelets	`< 100,000/mm³`	Rifampin-induced **thrombocytopenia** — bleeding risk.
Visual Acuity	`Any ↓ or red-green change`	Ethambutol **optic neuritis** — STOP drug.

ROUTE · TIMING

07 Administration & Safety

Route & Timing

- → **Most agents: PO**, once daily
- → INH & Rifampin: **empty stomach**, 1 hr before or 2 hr after meals
- → If GI upset intolerable → take with food (decreases absorption but improves adherence)
- → Streptomycin: **IM only** (not absorbed PO)
- → Give all 4 drugs *together* as single daily dose when possible

Directly Observed Therapy (DOT)

- → Gold standard — prevents resistance from non-adherence
- → Healthcare worker **watches patient swallow** each dose
- → Often 2–3× weekly dosing regimens under DOT
- → Free through public health departments in U.S.
- → Reduces treatment failure, relapse, and MDR-TB

Isolation Precautions

- → **Airborne precautions**: negative pressure room, door closed
- → Staff: **N95 respirator** (fit-tested, not a surgical mask)
- → Patient: surgical mask when outside room
- → Limit transport; patient wears mask during transport
- → Discontinue isolation only after **3 negative AFB cultures** + clinical improvement

Treatment Duration

- → **Intensive phase:** RIPE × 2 months
- → **Continuation phase:** INH + RIF × 4 months
- → **Total: 6 months minimum** for drug-susceptible TB
- → Longer (9–12 months) for HIV+, cavitary disease, slow response
- → MDR-TB: 18–24 months

08 Patient Education

TEACHING

What the Patient MUST Know

RX

ADHERENCE & LIFESTYLE

- ✓ Take **every single dose** — even when feeling better
- ✓ Stopping early = drug resistance, relapse
- ✓ **Strict alcohol avoidance** — hepatotoxicity stacking
- ✓ Take INH with **Vitamin B6 (pyridoxine)** to prevent neuropathy

WARNING SIGNS — CALL PROVIDER

- ✗ **Yellowing skin/eyes, dark urine, RUQ pain** → hepatotoxicity
- ✗ **Blurred vision or color changes** → stop ethambutol
- ✗ **Ringing in ears, hearing loss, dizziness** → streptomycin
- ✗ **Numbness or tingling in hands/feet** → INH neuropathy

- ✓ Wear sunscreen with PZA (photosensitivity)
- ✓ Schedule monthly labs without fail
- ✗ **Severe joint pain** → PZA gout
- ✗ Unusual bruising/bleeding → platelets

RIFAMPIN SPECIFICS

- ✓ Urine, sweat, tears, saliva will turn **orange/red** — harmless
- ✓ Will **permanently stain soft contact lenses** — switch to glasses
- ✓ **Oral contraceptives will NOT work** — use backup barrier method
- ✓ Notify ALL prescribers — interacts with many drugs

INFECTION CONTROL AT HOME

- ✓ Cover mouth/nose when coughing or sneezing
- ✓ Sleep alone, well-ventilated room, until cultures negative
- ✓ **Household contacts** need screening (PPD/QuantiFERON)
- ✓ Hand hygiene; dispose of tissues carefully
- ✓ May return to work after 3 negative sputum cultures + provider clearance

PITFALLS

09 NCLEX Test Traps
⚠ *Where students lose points.*

Tap any card to reveal the correct answer & reasoning.

TRAP 01 · RIFAMPIN

Patient reports orange-red urine. What is the priority action?

REVEAL ANSWER ▾

TRAP 02 · INH + CONTRACEPTION

Female patient on rifampin states she uses oral contraceptives. Priority teaching?

REVEAL ANSWER ▾

TRAP 03 · INH NEUROPATHY

Patient on INH develops tingling in feet. What does the nurse anticipate?

REVEAL ANSWER ▾

TRAP 04 · ETHAMBUTOL

Patient reports difficulty distinguishing red from green. Action?

REVEAL ANSWER ▼

TRAP 05 · HEPATOTOXICITY

Patient on RIPE reports fatigue, nausea, and dark urine. First action?

REVEAL ANSWER ▼

TRAP 06 · MONOTHERAPY

Why is TB never treated with a single drug?

REVEAL ANSWER ▼

TRAP 07 · TYRAMINE

INH patient eating aged cheese reports severe headache, BP 210/115. What happened?

REVEAL ANSWER ▼

TRAP 08 · ISOLATION DISCONTINUATION

When can airborne precautions be discontinued?

REVEAL ANSWER ▼

TRAP 09 · PPD READING

A homeless patient has a 12 mm PPD induration. Positive or negative?

REVEAL ANSWER ▼

TRAP 10 · MASK SELECTION

Nurse entering a TB patient's room — surgical mask or N95?

REVEAL ANSWER ▼

TRAP 11 · BCG VACCINE

Patient from a country that uses BCG vaccine has a positive PPD. Next step?

REVEAL ANSWER ▼

TRAP 12 · PREGNANCY

Pregnant patient needs TB treatment. Which drug is CONTRAINDICATED?

REVEAL ANSWER ▼

10 Memory Boosters

MNEMONICS

RIPE

THE 4-DRUG REGIMEN

Rifampin
Isoniazid (INH)
Pyrazinamide
Ethambutol

INH

"IN A HEP"

Injures Nerves (neuropathy → B6)
Needs pyridoxine
Hepatotoxic
+ Tyramine crisis

Red-Orange Pee

= RIFAMPIN

All body fluids turn red-orange
Think: **R**ifampin = **R**ed
Stains contacts permanently
Ruins oral contraceptives

Eyes

ETHAMBUTOL

Ethambutol = **E**yes
Optic neuritis
Red-green color loss
Baseline + monthly vision

Purines ↑

PYRAZINAMIDE

Pyrazinamide = **P**urines (uric acid)
Hyperuricemia → gout
Photosensitivity
Hepatotoxic

SOS

STREPTOMYCIN

Stops hearing (ototoxic)
Only IM route
Skip in pregnancy
+ Nephrotoxic

2 + 4 = 6

TREATMENT DURATION

2 mo intensive (RIPE)
4 mo continuation (RI)
6 months total
Longer if HIV+ or cavitary

3 Negatives

END ISOLATION

3 consecutive negative AFB sputum cultures
+ clinical improvement
= discontinue airborne precautions
= return to work/school

N95 ≠ Mask

PPE RULE

NURSE: N95 (fit-tested)
PATIENT: surgical mask when out of room
Negative pressure room
Door stays CLOSED

Most Tested Drugs in This Class

COMPARE

DRUG	KEY MOA	SIGNATURE ADVERSE EFFECT	MONITOR	NCLEX PEARL
Isoniazid INH · NYDRAZID	Blocks mycolic acid synthesis	**Peripheral neuropathy** + hepatotoxicity + tyramine HTN crisis	LFTs monthly; give Vit B6	Only TB drug used as **monotherapy** (for latent TB)
Rifampin RIF · RIFADIN	Inhibits RNA polymerase	**Orange-red body fluids** (harmless) + CYP450 induction + hepatotoxicity	LFTs, CBC, platelets	**Makes OCPs fail** — teach barrier method
Pyrazinamide PZA	Pyrazinoic acid disrupts acidic environment in macrophages	**Hyperuricemia → gout** + hepatotoxicity + photosensitivity	Uric acid, LFTs	Avoid in acute gout; wear sunscreen
Ethambutol EMB · MYAMBUTOL	Inhibits arabinosyl transferase	**Optic neuritis** — red/green color loss, ↓ acuity	Baseline + monthly vision	Avoid in children too young to report vision changes
Streptomycin AMINOGLYCOSIDE · 2ND-LINE	Binds 30S ribosome → faulty protein synthesis	**Ototoxicity** (irreversible) + nephrotoxicity	Creatinine, audiogram	**IM only**; contraindicated in pregnancy
Rifapentine PRIFTIN	Same as rifampin (longer half-life)	Similar to rifampin; less frequent dosing	LFTs	Used with INH in **12-week LTBI regimen** (3HP)
Bedaquiline SIRTURO · MDR-TB	Inhibits mycobacterial ATP synthase	**QT prolongation** + hepatotoxicity	ECG, LFTs	Used for **MDR-TB**; black box warning

Clinical Judgment Snapshot

NCJMM

⚡ THE THREE QUESTIONS THAT PASS NCLEX

Prioritize. Recognize. Act.

#1 PRIORITY RISK

HEPATOTOXICITY. INH, Rifampin, and Pyrazinamide are *all* hepatotoxic — three strikes stacking on the same organ. Silent liver injury can progress to fulminant hepatic failure. Alcohol compounds it.

WHAT HARMS THE PATIENT FIRST

Non-adherence → drug resistance → MDR-TB. Patients stop when they feel better. Nurses stop watching once cultures turn. The failure mode is *quiet* — no symptoms until relapse months later with untreatable disease.

FIRST NURSING ACTION

AIRBORNE ISOLATION + N95. Before any drug is given, before labs are drawn — protect the healthcare team and other patients. *Negative-pressure room, door closed, N95 fit-tested respirator on every entry.*

HEPATOTOXICITY RED FLAGS

Jaundice · dark urine · RUQ pain · anorexia · persistent nausea · AST/ALT >3× ULN with symptoms. **Hold hepatotoxic drugs** and notify provider immediately.

VISION CHANGES ON EMB

Any new blurred vision or *red-green color discrimination loss* = **STOP ethambutol immediately**. Reversible early, permanent if ignored.

THE CONTRACEPTION TRAP

Rifampin induces CYP450 → OCPs fail. Every reproductive-aged woman on rifampin needs **barrier contraception** teaching on day one.

Miss this and pregnancy is the complication.

Keep going, Student **. One section at a time.**

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