
62ND ANNUAL
Denver
TB Course
(Hybrid Event)
MARCH 25-27, 2026
National Jewish Health


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Denver
TB Course
(Hybrid Event)
LTBI Treatment and BCG Vaccine
Stephanie Wienkers, PharmD, BCACP
March 26, 2026
National Jewish Health

Disclosures

- Stephanie Wienkers
- I have no relevant financial relationships with commercial interests pertaining to the content presented in this program.

Objectives

Understand the clinical definition of latent tuberculosis infection (LTBI)

Understand the advantages/disadvantages of current LTBI treatment options in the U.S.

Understand how to communicate about tuberculosis in a culturally considerate manner

Understand the role of vaccination in preventing active tuberculosis (TB)

TB Prevention:
LTBI Screening and Treatment

Candidates for Screening

- Close contact to infectious (pulmonary) tuberculosis
- Lived (born or traveled >1 month) to a country where TB is common
- Live in or have lived in high-risk congregate settings
- Current or planned immunosuppression

Jonas DE, Riley SR, Lee LC, et al. Screening for Latent Tuberculosis Infection in Adults: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA*. 2023;329(17):1495–1509.

Diagnosis of LTBI

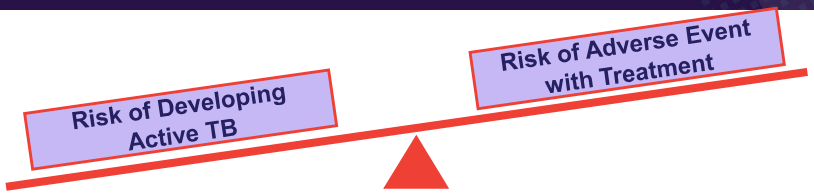
+

Laboratory Criteria
A positive tuberculin skin test (TST)
OR
A positive interferon-gamma release assay (IGRA)

Clinical Criteria
No signs or symptoms of active TB
AND
Normal CXR, or abnormal imaging with negative microbiologic testing

Rutgers Global Tuberculosis Institute. Diagnosis and Treatment of Latent Tuberculosis Infection (LTBI) in Adults. Published 2021.

Who to Treat



Risk Factors for Progression
Recent contacts and infections
Children • Highest risk < 2 years old, higher risk up to 5 years old
Weakened immune system • HIV infection • Organ transplant recipients • Immunosuppressive agents   • Steroids, TNF-α inhibitors • Substance use disorder • Diabetes • Severe renal disease • Head or neck cancer • Silicosis • Low body weight

Risk Factors for Adverse Events
Older age
Concomitant medications
Personal or family history of adverse reactions

Deciding when to treat latent TB infection. Tuberculosis. https://www.cdc.gov/tb/topic/treatment/decideltbi.htm. Published March 13, 2018.

Treatment – Shared Decision Tool

Habits

Cigarette smoker (≥1 Pack Per Day)

TB Exposure

Casual contact	Recent immigration
Close contact	Occupational risk

Cancer

Head and neck	Hodgkin's lymphoma
Lung cancer	Non-Hodgkin's lymphoma

Immune-compromised

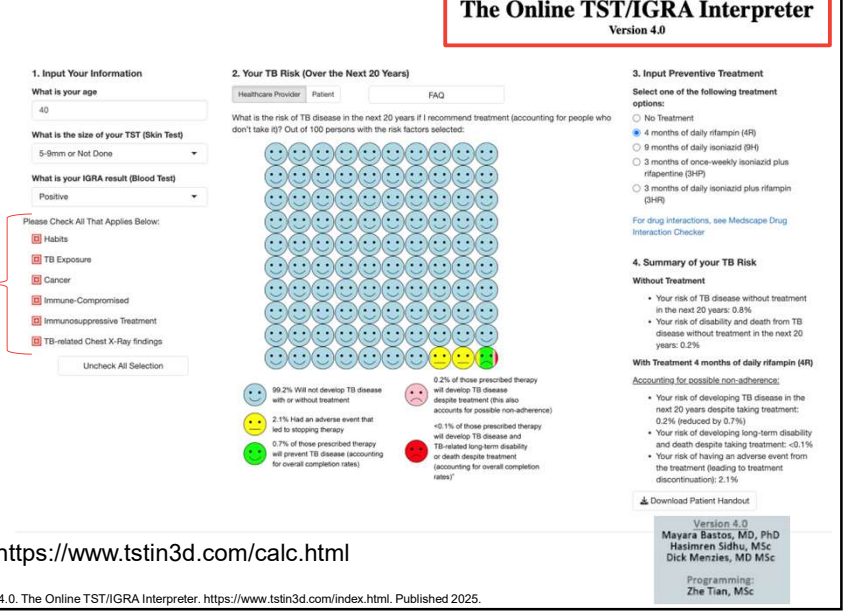
HIV on effective ART	CKD on dialysis
Silicosis	Diabetes any type
Liver transplant	Kidney transplant

Immunosuppressive Treatment

Steroids (at least 10 mg prednisone daily)
TNF-alpha inhibitors

TB-related chest X-Ray findings

Fibronodular disease
Granuloma



https://www.tstin3d.com/calc.html

Bastos M, Sidhu H, Menzies D, Tian Z. The online TST/IGRA interpreter version 4.0. The Online TST/IGRA Interpreter. https://www.tstin3d.com/index.html. Published 2025.

LTBI Treatment Options
History of Treatment
Advantages and Disadvantages of Options

Isoniazid

Bethel District, Alaska

1957: 8% average annual infection rate

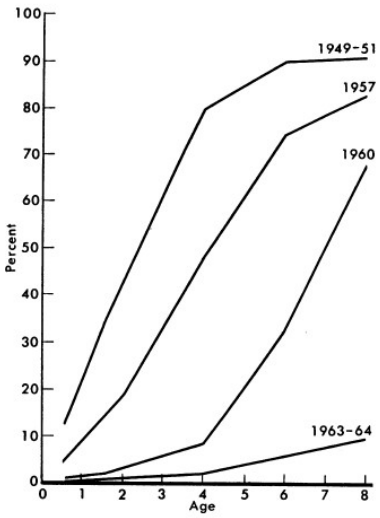
RCT 1957-1959

- 12 months of isoniazid v placebo
- 69% reduction in TB incidence

1963

- Community wide prophylaxis
- 12 months isoniazid for all

TST sensitivity in children 0-9 years



Hanson ML, Comstock GW, Haley CE. Community isoniazid prophylaxis program in an underdeveloped area of Alaska. *Public Health Rep (1896)*. 1967;82(12):1045-1056.
Salazar-Austin N, Dowdy DW, Chaisson RE, Golub JE. Seventy Years of Tuberculosis Prevention: Efficacy, Effectiveness, Toxicity, Durability, and Duration. *Am J Epidemiol.* 2019;188(12):2078-2085.

Isoniazid

Efficacy of Various Durations: 5-years of Follow Up of IUAT Study

- 27,830 tuberculin positive persons with fibrotic lesions
- 115 dispensaries in 7 European countries
- Isoniazid vs placebo for 12, 24 or 52 weeks

	Risk reduction	
Group	Intention to treat	Completers/compliers
Placebo	Ref	Ref
3 months INH	21%	31%
6 months INH	65% *	69%
12 months INH	75% *	93%

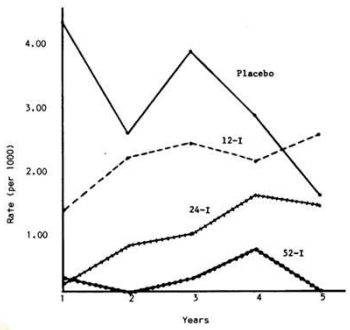


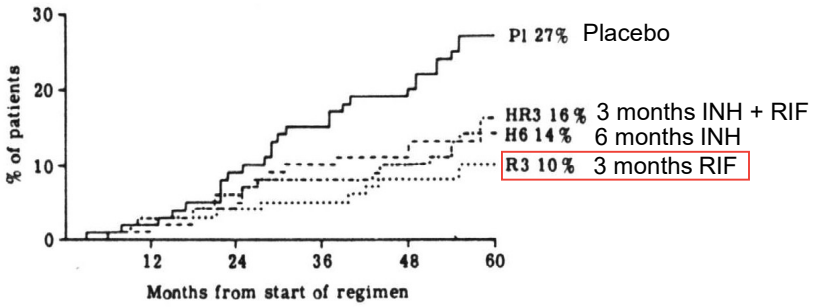
Fig. 2. Annual incidence of culture-positive tuberculosis: "completer-compliers", by regimen.

International Union Against Tuberculosis Committee on Prophylaxis. Efficacy of various durations of isoniazid preventive therapy for tuberculosis: five years of follow-up in the IUAT trial. International Union Against Tuberculosis Committee on Prophylaxis. *Bull World Health Organ.* 1982;60(4):555-564.
Salazar-Austin N, Dowdy DW, Chaisson RE, Golub JE. Seventy Years of Tuberculosis Prevention: Efficacy, Effectiveness, Toxicity, Durability, and Duration. *Am J Epidemiol.* 2019;188(12):2078-2085.

Rifampin

A Double-blind Placebo-controlled Clinical Trial of Three Antituberculosis Chemoprophylaxis Regimens in Patients with Silicosis in Hong Kong

- 679 patients with silicosis + LTBI in Hong Kong



Why 4 months rifampin?

3 months RIF ~ 6 months INH

\+

9 months INH = SOC

=

4 months rifampin recommended

A double-blind placebo-controlled clinical trial of three antituberculosis chemoprophylaxis regimens in patients with silicosis in Hong Kong. Hong Kong Chest Service/Tuberculosis Research Centre, Madras/British Medical Research Council. *Am Rev Respir Dis.* 1992;145(1):36-41. doi:10.1164/ajrccm/145.1.36

4R v 9H

Four Months of Rifampin or Nine Months of Isoniazid for Latent Tuberculosis in Adults

- Multicenter, open-label, randomized, non-inferiority trial
  - 6,063 patients randomized

	Isoniazid	Rifampin	Difference (95% CI)	P Value
Treatment Completed (%)	63.2%	78.8%	15.1 (12.7-17.4)	<0.001
Within allowed time	57.8%	70.7%	12.1 (9.6-14.6)	<0.001
Adverse event, with trial drug stopped permanently – no. of patients (%)	153 (5.4)	74 (2.6)	-2.9 (-3.9 to -1.9)	<0.001
Grade 3-5 (non-pregnancy) AE	62 (2.2)	22 (0.8)	-1.4 (-2.1 to -0.8)	<0.001
Grade 3 or 4 hepatotoxic event	50 (1.8)	8 (0.3)	-1.5 (-2.0 to -1.0)	<0.001
No. of confirmed or clinically diagnosed cases of active TB per 100 person-yr (95% CI)	0.11 (0.05 to 0.27)	0.09 (0.04 to 0.22)	-0.02 (-0.30 to 0.26)	0.77

4 months rifampin non-inferior to 9 months isoniazid

Menzies D, Adjobimey M, Ruslami R, et al. Four Months of Rifampin or Nine Months of Isoniazid for Latent Tuberculosis in Adults. *N Engl J Med.* 2018;379(5):440-453. doi:10.1056/NEJMoa1714283

Rifampin + Isoniazid

Rifampicin and isoniazid prophylactic chemotherapy for tuberculosis

- Children at high risk of TB in Blackburn England Health District

	Duration of daily rifampin-isoniazid used	% of children in total notifications of tuberculosis
1981-1983	9 months	24.9%
1984-1986	6 months	9.4%
1987-1988	4 months	4.7%
1989-1992	3 months	6.2%
1993-1996	3 months	4.3%

Duration reduced without loss of effect

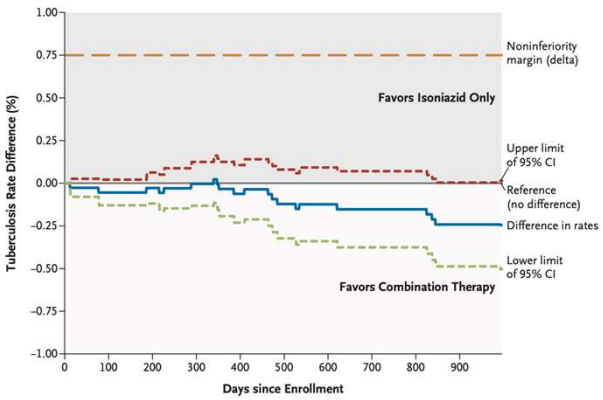
3 months daily rifampin + isoniazid

Ormerod LP. Rifampicin and isoniazid prophylactic chemotherapy for tuberculosis. *Arch Dis Child.* 1998;78(2):169-171.

3HP (DOT)

Three Months of Rifapentine and Isoniazid for Latent Tuberculosis Infection

- Multicenter, open-label, randomized, non-inferiority trial
  - 7,731 patients from US, Canada, Brazil and Spain
  - Compared to 9 months self administered isoniazid



3 months once weekly rifapentine + isoniazid non-inferior to 9 months daily isoniazid

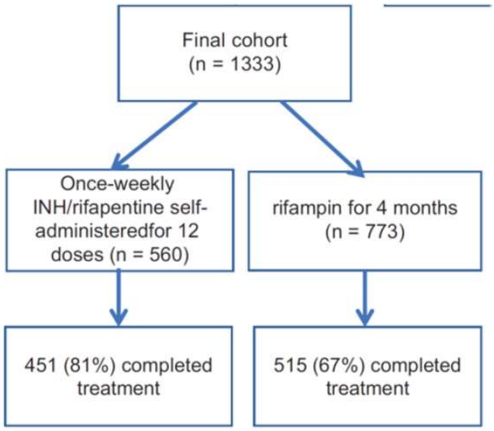
Trend toward superior effectiveness by 33 months of follow up

Sterling TR, Villarino ME, Borisov AS, et al. Three months of rifapentine and isoniazid for latent tuberculosis infection. *N Engl J Med.* 2011;365(23):2155-2166. doi:10.1056/NEJMoa1104875

4R v 3HP (SAT)

Higher Completion Rates With Self-administered Once-weekly Isoniazid-rifapentine Versus Daily Rifampin in Adults With Latent Tuberculosis

- Retrospective cohort study in U.S. TB clinic
  - Regimen largely patient choice



Treatment Completion

- Most common reason for not completing treatment = lost to follow up
  - Most lost between initial visit and first follow up

Adverse Effects

- Most reported within first month of treatment

Haas MK, Aiona K, Erlandson KM, Belknap RW. Higher completion rates with self-administered once-weekly isoniazid-rifapentine versus daily rifampin in adults with latent tuberculosis. *Clin Infect Dis.* 2021;73(9):e3459-e3467.

4R v 3HP

Completion, safety, and efficacy of tuberculosis preventive treatment regimens containing rifampicin or rifapentine: an individual patient data network meta-analysis

- To compare 3HP and 4R
  - Eligible studies compared 3HP or 4R to 6H or 9H
  - 17,572 participants from 14 countries in 6 trials

Treatment Completion	Treatment Related Adverse Events Leading to Treatment Discontinuation	Incidence of TB
More likely with 3HP	Higher risk with 3HP	Similar rate

Winters N, Belknap R, Benedetti A, et al. Completion, safety, and efficacy of tuberculosis preventive treatment regimens containing rifampicin or rifapentine: an individual patient data network meta-analysis. Lancet Respir Med. 2023;11(9):782-790.

4R v 3HP

Factors Associated With the Discontinuation of Two Short-Course Tuberculosis Preventive Therapies in Programmatic Settings in the United States

- To investigate timing and risk factors for discontinuation of treatment
  - 993 patients started treatment - 80% 4R and 20% 3HP (DOT)

Risk of Discontinuation Greater with 4R	
4R	3HP
31%	14%

On average patients discontinued treatment within 4 weeks of initiation

Factors Associated with Discontinuation	
More likely to	**Less likely to**
3HP	
• Latino • Experienced an AE	• Non-US born
4R	
• Self-identified as white • Experiencing substance misuse • History of homelessness or incarceration	• Age 25-44, 45-65 (than 0-24 years)

Asare-Baah M, Salmon-Trejo LAT, Venkatappa T, et al. Factors Associated With the Discontinuation of Two Short-Course Tuberculosis Preventive Therapies in Programmatic Settings in the United States. Open Forum Infect Dis. 2024;11(6):ofae313. Published 2024 Jun 6.

Safety in Age >65 years

Higher Completion Rates With Self-administered Once-weekly Isoniazid-rifapentine Versus Daily Rifampin in Adults With Latent Tuberculosis

- 20% of cohort ≥50 years of age
- 3HP-SAT loss to follow up lower in patients aged ≥50
  - 18-49 years old: 12.1% lost to follow up
  - >50 years old: 6.3% lost to follow up

Adverse events in adults with latent tuberculosis infection receiving daily rifampicin or isoniazid: post-hoc safety analysis of two randomised controlled trials

- 3,205 isoniazid patients, 3,280 rifampin
- Multivariable analysis of incidence of grade 1-2 rash or grade 3-5 adverse events
  - Adjusted odds ratio of events increase with age in patients receiving isoniazid
  - Age was <u>not</u> associated with adverse events in **rifampin** patients
- Patients age ≥65 years with grade 3-4 hepatotoxicity
  - 6% of isoniazid patients
  - 0% of rifampin patients

Evidence supports safety of use of 3HP and 4R in age >65 years

Campbell JR, Trajman A, Cook VJ, et al. Adverse events in adults with latent tuberculosis infection receiving daily rifampicin or isoniazid: post-hoc safety analysis of two randomised controlled trials. *Lancet Infect Dis.* 2020;20(3):318-329.
Haas MK, Aiona K, Erlandson KM, Belknap RW. Higher completion rates with self-administered once-weekly isoniazid-rifapentine versus daily rifampin in adults with latent tuberculosis. *Clin Infect Dis.* 2021;73(9):e3459-e3467.

CDC Treatment Recommendations

	DRUG	DURATION	FREQUENCY	TOTAL DOSES	DOSE AND AGE GROUP
Preferred	ISONIAZID† AND RIFAPENTINE†† (3HP)	3 months	Once weekly	12	**Adults and children aged ≥12 yrs** INH: 15 mg/kg rounded up to the nearest 50 or 100 mg; 900 mg maximum RPT: 10–14.0 kg; 300 mg 14.1–25.0 kg; 450 mg 25.1–32.0 kg; 600 mg 32.1–49.9 kg; 750 mg ≥50.0 kg; 900 mg maximum
					Children aged 2–11 yrs INH†: 25 mg/kg; 900 mg maximum RPT††: See above
	RIFAMPIN§ (4R)	4 months	Daily	120	**Adults:** 10 mg/kg; 600 mg maximum
					Children: 15–20 mg/kg†; 600 mg maximum
	ISONIAZID† AND RIFAMPIN§ (3HR)	3 months	Daily	90	**Adults** INH†: 5 mg/kg; 300 mg maximum RIF§: 10 mg/kg; 600 mg maximum
					Children INH†: 10-20 mg/kg*; 300 mg maximum RIF§: 15-20 mg/kg; 600 mg maximum
Alternative	ISONIAZID† (6H/9H)	6 months	Daily	180	**Adults** Daily: 5 mg/kg; 300 mg maximum Twice weekly: 15 mg/kg; 900 mg maximum
			Twice weekly¶	52	
		9 months	Daily	270	**Children** Daily: 10-20 mg/kg*; 300 mg maximum Twice weekly: 20–40 mg/kg*; 900 mg maximum
			Twice weekly¶	76	

Sterling TR, et al. MMWR Recomm Rep. 2020;69(1):1-11.

Choosing Regimen

- Adverse Effects
- Drug Interactions
- Cost
- Duration
- Administration

Isoniazid Hepatotoxicity

Severe Isoniazid-Associated Liver Injuries Among Persons Being Treated for Latent Tuberculosis Infection — United States, 2004–2008

- 17 patients
- 5 transplants, 5 deaths
- All monitored according to guidelines
- Symptom onset 1-7 months after initiation
- **80% continued taking INH for more than a week after symptom onset**

- 7 studies with 18,610 patients
- 115 cases of hepatotoxicity
- Rate of hepatotoxicity higher aged ≥35 years

Age-related risk of hepatotoxicity in the treatment of latent tuberculosis infection: a systematic review

Hepatotoxicity induced by isoniazid in patients with latent tuberculosis infection: a meta-analysis

- 35 studies with 22,193 participants
- Overall average frequency of INH-ILI 2.6%
- Mortality associated with INH-DILI 0.02%

CDC. MMWR 2010;59:224–9.
Kunst H, Khan KS. Age-related risk of hepatotoxicity in the treatment of latent tuberculosis infection: a systematic review. *Int J Tuerc Lung Dis.* 2010;14(11):1374-1381.
Oscanoa TJ, Vidal X, Luque J, I. Julca D, Romero-Ortuno R. Hepatotoxicity induced by isoniazid in patients with latent tuberculosis infection: a meta-analysis. Gastroenterol Hepatol Bed Bench 2023;16(1):448-457

Monitoring

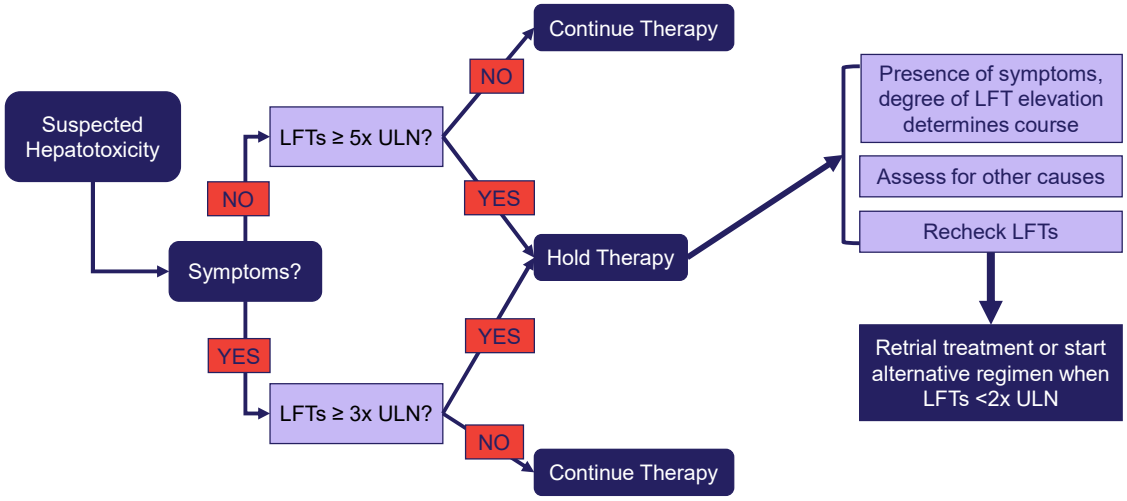
Starting treatment check baseline ALT, AST and CBC

Age >35 for isoniazid, >50 for rifampin
HIV-positive
History of liver disease
Regular alcohol use
Pregnant or post-partum (3 months)
Current use of injection drugs
Concurrent hepatotoxic medications

Follow up tests monthly or when clinically indicated if:

Abnormal baseline or prior labs
Continued daily or heavy alcohol use
Signs or symptoms of hepatotoxicity • Anorexia, nausea, vomiting, weight loss, abdominal pain, jaundice, dark urine
Concurrent hepatotoxic medications

Monitoring



Shah M, Dupont O, Ahamed N, Khilal A, Lardizabal A, Patrawalla A. Latent TB Infection (LTBI) Assist: Interactive decision support for current CDC TB guidelines. Rutgers Global Tuberculosis Institute. Clinical Policies and Program Manual. Bureau of Tuberculosis Control, New York City Department of Health and Mental Hygiene. Published February 2022; Fifth Edition.

Adverse Effects

	Rate of Adverse Effects		
	Rifapentine	Rifampin	Isoniazid
Cardiovascular	Chest pain (3-6%), edema (1%)		Vasculitis (rare)
Dermatologic	Rash (3-4%), pruritus (<3%), maculopapular (<2%)	Pruritus, skin rash (<1%)	Hair loss (uncommon), rash (<1%)
Endocrine	Hypoglycemia (5-10%), hyperglycemia (1-4%)		Hyperglycemia, metabolic acidosis (<1%)
Gastrointestinal	Anorexia (3-4%), nausea/vomiting (<3%), constipation (1-2%), abdominal pain or diarrhea (<3%), hepatotoxicity/transaminitis (1-7%)	Nausea, vomiting, and other GI disturbances (<1%), hepatotoxicity (<1%)	Anorexia (>10%), nausea/vomiting (1%), mild transaminitis (10-20%), severe hepatitis (<1%)
Hematologic	Neutropenia (6-13%), lymphopenia (3-13%), anemia (2-11%)	Hemolytic anemia, neutropenia, thrombocytopenia (<1%)	
Immunologic	Hypersensitivity (<5%)	Hypersensitivity (0.1%)	Fever, DRESS (<1%)
Other	Back pain (4-7%), arthralgia (<5%), headache (<4%)	Myalgia (0.1%), fatigue (0.1%), headache (0.1%), interstitial nephritis	Fatigue/weakness (>10%), arthralgias (<1%), neuropathy (<1% at 5 mg/kg; 10-20% higher doses)

Shah M, Dupont O, Ahamed N, Khilal A, Lardizabal A, Patrawalla A. Rutgers Global Tuberculosis Institute.

Adverse Effects

Rate of Adverse Effects			
	Rifapentine	Rifampin	Isoniazid
Dermatologic	Rash (3-4%), pruritus (<3%), maculopapular (<2%)	Pruritus, skin rash (<1%)	Hair loss (uncommon), rash (<1%)

Evaluation and Assessment
Alternative cause?
Presentation • Stevens-Johnson Syndrome (INH, RIF) • Toxic epidermal necrolysis (INH, RIF) • Urticaria (RIF, INH) • Acne (INH) • Exfoliative dermatitis (INH, RIF) • Purpura (INH, RIF) • Systemic lupus erythematosus-like syndrome (INH)

Management
Minor rash • Oral antihistamines, topical steroids • Continue treatment, monitor closely
Generalized erythematous rash • Discontinue • Dermatology evaluation • Check CBC
Petechial rash • Check CBC • Discontinue if thrombocytopenia

Shah M, Dupont O, Ahamed N, Khilal A, Lardizabal A, Patrawalla A. Rutgers Global Tuberculosis Institute.

Adverse Effects

Rate of Adverse Effects			
	Rifapentine	Rifampin	Isoniazid
Gastrointestinal	Anorexia (3-4%), nausea/vomiting (<3%), constipation (1-2%), abdominal pain or diarrhea (<3%), hepatotoxicity/transaminitis (1-7%)	Nausea, vomiting, and other GI disturbances (<1%), hepatotoxicity (<1%)	Anorexia (>10%), nausea/vomiting (1%), mild transaminitis (10-20%), severe hepatitis (<1%)

Presentation and Evaluation
Early in treatment, often improves
Consider checking LFTs (DILI)

Management
Non-pharmacological: • Change timing of administration • Light snack
Pharmacological: • Antacids • Antiemetics

Shah M, Dupont O, Ahamed N, Khilal A, Lardizabal A, Patrawalla A. Rutgers Global Tuberculosis Institute.

Adverse Effects

Rate of Adverse Effects			
	Rifapentine	Rifampin	Isoniazid
Immunologic	Hypersensitivity (<5%)	Hypersensitivity (0.1%)	Fever, DRESS (<1%)
Other	Back pain (4-7%), arthralgia (<5%), headache (<4%)	Myalgia (0.1%), fatigue (0.1%), headache (0.1%), interstitial nephritis	Fatigue/weakness (>10%), arthralgias (<1%), neuropathy (<1% at 5 mg/kg; 10-20% higher doses)

Hypersensitivity (Flu-Like Syndrome)
More common with intermittent rifamycin regimens
Timing • Occurs after 3-4 doses • Presents about 4 hours after dose • Resolves within 24 hours
Management • Mild/moderate reactions → can continue, close follow up • Severe (syncope/hypotension) → STOP

Management of pain, headache and fatigue
Pain: ibuprofen use
Headache: ibuprofen use, increase water intake
Fatigue: adjust timing of medication

Shah M, Dupont O, Ahamed N, Khilal A, Lardizabal A, Patrawalla A. Rutgers Global Tuberculosis Institute.

Drug Interactions

Contraceptives

	Rifampin	Rifapentine	Isoniazid
Hormonal Contraceptives	✗	✗	✓

✗ Contraindicated

⚠ Caution/ Monitor

✓ Ok to use

Aboujaoude E, et al. Rifamycin Drug-Drug Interactions: A Guide for Primary Care Providers Treating Latent Tuberculosis Infection. California Department of Public Health, Rutgers Ernest Mario School of Pharmacy, Rutgers Global Tuberculosis Institute, and the Curry International Tuberculosis Center; 2022.

Drug Interactions

Anticoagulation

	Rifampin	Rifapentine	Isoniazid
Apixaban	✕	✕	✓
Rivaroxaban	✕	✕	✓
Dabigatran	✕	✕	✓
Warfarin	⚠	⚠	⚠

✕ Contraindicated

⚠ Caution/ Monitor

✓ Ok to use

Aboujaoude E, et al. Rifamycin Drug-Drug Interactions: A Guide for Primary Care Providers Treating Latent Tuberculosis Infection. California Department of Public Health, Rutgers Ernest Mario School of Pharmacy, Rutgers Global Tuberculosis Institute, and the Curry International Tuberculosis Center; 2022.

Drug Interactions

Chronic Disease Management Medications and Rifampin

Hypertension	Efficacy
Losartan	↓
Valsartan	↑
Amlodipine	↓
Metoprolol	↓

Diabetes	Efficacy
Linagliptin	↓
Sulfonylureas	↓
Pioglitazone	↓
Canagliflozin	↓

Monitor at follow-up

Not an all-inclusive list

Aboujaoude E, et al. Rifamycin Drug-Drug Interactions: A Guide for Primary Care Providers Treating Latent Tuberculosis Infection. California Department of Public Health, Rutgers Ernest Mario School of Pharmacy, Rutgers Global Tuberculosis Institute, and the Curry International Tuberculosis Center; 2022.

Advantages v Disadvantages

INH

Advantages	Disadvantages
Lowest cost	Increased hepatotoxicity
Few drug interactions	Longer duration

4R

Advantages	Disadvantages
Lower hepatotoxicity	Drug-drug interactions
Adherence	
Lower pill burden	

3HR

Advantages	Disadvantages
Short duration	Drug-drug interactions
	Hepatotoxicity > 4R
	Pill burden > 4R, 6H

3HP

Advantages	Disadvantages
Short duration	Highest cost
Fewest total doses	Large pill burden
	Drug-drug interactions

Treatment Completion

To be considered treated:

	Completion
4R	120 doses within 6 months
3HP	12 doses within 16 weeks
3HR	90 doses within 4 months
6H	180 doses within 9 months

Switching Regimens

Count doses taken of initial regimen	→	Calculate proportion of regimen remaining	→	Multiply % of first regimen not given by number of total doses of second regimen	→	Number of doses of second regimen needed to complete treatment
1 month of rifampin taken	→	75% remaining	→	0.75 * 12 doses of 3HP	→	9 doses of 3HP needed

Testing and Treatment of Latent Tuberculosis Infection in the United States: Clinical Recommendations — A Guide for Health Care Providers and Public Health Programs. National Society of Tuberculosis Clinicians; Published November 2023; Updated August 2024; Third Edition.

Potential Future LTBI Treatment Options

1HP

One Month of Rifapentine plus Isoniazid to Prevent HIV-Related Tuberculosis

- Multicenter, open-label, randomized, non-inferiority trial
  - 3,000 patients from 45 sites in 10 countries for 3 years
  - Diagnosis of LT TB prevalence
  - Compared to 9
  - Primary endpoi TB, death from TB, or death from unknown cause

1HP non-inferior to 9H

	1HP (n=1,488)	9H (n=1,498)	Difference (95% CI)
Primary Endpoint Occurred Incidence Rate	2% (32) 0.65	2% (33) 0.67	-0.02 (-0.35-0.30)
Active TB	91% (29)	79% (26)	
Death from TB	3	3	
Death from unknown cause	3	7	

Swindells S, Ramchandani R, Gupta A, et al. One month of Rifapentine plus isoniazid to prevent HIV-related tuberculosis. *NEJM*. 2019;381(11). doi:10.1056/nejmc1908492

1HP

One Month of Rifapentine plus Isoniazid to Prevent HIV-Related Tuberculosis

- Multicenter, open-label, randomized, non-inferiority trial
  - 3,000 patients from 45 sites in 10 countries for 3 years
  - Diagnosis of LTBI OR living in areas of high TB prevalence
  - Compared to 9 months isoniazid
  - Prim… rom TB, or d…

Characteristic	1-Month Group (N=1496)	9-Month Group (N=1504)	All Patients (N=3000)
Tuberculin skin test — no. (%)			
Positive	311 (21)	324 (22)	635 (21)
Negative	1033 (69)	1021 (68)	2054 (68)
Not done	152 (10)	159 (11)	311 (10)
IGRA for tuberculosis — no. (%)§			
Positive	36 (2)	37 (2)	73 (2)
Negative	1 (<1)	2 (<1)	3 (<1)
Not done	1459 (98)	1465 (97)	2924 (97)

			ference (95% CI)
Primary E… Inci…			02 (-0.35-0.30)
Death from unknown cause	3	7	

Public Health Approach in High Burden Settings

Swindells S, Ramchandani R, Gupta A, et al. One month of Rifapentine plus isoniazid to prevent HIV-related tuberculosis. *NEJM*. 2019;381(11). doi:10.1056/nejmc1908492

1HP

One-month daily and three-month weekly rifapentine plus isoniazid are comparable in completion rate and safety for latent tuberculosis infection in non-HIV Population: a randomized controlled trial

- Multicenter, open-label, randomized
- Compared to 3HP
- Population diagnosed with LTBI
- Primary endpoint = Incidence rate of systemic drug reactions

Study did NOT look at efficacy

			value
Completed treatment	208 (82.9%)	202 (84.5%)	0.621
Systemic drug reaction occurred	32 (12.7%)	26 (10.9%)	0.522
Flu-like syndrome (FLS)	13 (40.6%)	25 (96.2%)	<0.001
FLS without cutaneous reaction	4 (12.5%)	21 (80.8%)	<0.001
Pure urticaria	19 (59.4%)	1 (3.8%)	<0.001

Huang H-L, Lee M-R, Lee C-H, et al. One-month daily and three-month weekly rifapentine plus isoniazid are comparable in completion rate and safety for latent tuberculosis infection in non-HIV population: A randomized controlled trial. *CMI*. 2024;30(11):1410-1417. doi:10.1016/j.cmi.2024.06.024

Drug-Resistant LTBI

Fluoroquinolones for MDR-LTBI

	VQUIN MDR			TB-CHAMP		
Location	Vietnam			South Africa		
Trial Design	Randomized, double-blind, placebo controlled			Community-based, double blind, cluster-randomized, placebo-controlled		
Population	Household contacts of any age of persons with bacteriologically confirmed rifampicin-resistant or MDR TB Levofloxacin (n=1,023) v Placebo (n=1,018)			Children with household exposure to an adult with bacteriologically confirmed MDR pulmonary TB Levofloxacin (n=453) v Placebo (n=469)		
Efficacy End Point	Bacteriologically confirmed TB within 30 months			Incident TB (including death from TB) by week 48		
Result	Levofloxacin	6 (0.6%)	IRR 0.55 (95% CI 0.19-1.62)	Levofloxacin	5 (1.1%)	HR 0.44 (95%CI 0.15-1.25)
	Placebo	11 (1.1%)		Placebo	11 (2.3%)	
Safety End Point	Participants with grade 3 or 4 adverse events			se events		
Result	Levofloxacin	29 (3.0%)	RD 1.0 (95% CI -0.3-2.4)	Levofloxacin	4 (0.9%)	HR 0.52 (95% CI 0.16-1.71)
	Placebo	19 (2.0%)		Placebo	8 (1.7%)	

NOT statistically significant

Hesseling AC, Purchase SE, Martinson NA, et al. Levofloxacin preventive treatment in children exposed to MDR tuberculosis. *NEJM*. 2024;391(24):2315-2326. doi:10.1056/nejmoa2314318
Fox GJ, Nhung NV, Cam Binh N, et al. Levofloxacin for the prevention of Multidrug-resistant tuberculosis in Vietnam. *NEJM*. 2024;391(24):2304-2314. doi:10.1056/nejmoa2314325

Fluoroquinolones for MDR-LTBI

A Meta-Analysis of Levofloxacin for Contacts of Multidrug-Resistant Tuberculosis

Analyses*	Levofloxacin n with end point /N	Placebo n with end point /N	Relative Difference in Cumulative Incidence (95% CI/CrI)§
Microbiogically confirmed or clinically defined TB by 54 weeks (primary end point)			
Overall: IPD meta-analysis	8/1474	21/1483	0.41 (0.18 to 0.92), P=0.03
VQUIN: standard analysis	3/1023	9/1018	0.34 (0.09 to 1.25)
VQUIN: Bayesian analysis†	3/1021	9/1015	0.41 (0.18 to 0.95)
TB-CHAMP: standard analysis	5/451	12/465	0.44 (0.16 to 1.26)
TB-CHAMP: Bayesian analysis†	5/448	12/464	0.38 (0.16 to 0.95)

Levofloxacin associated with approximately 60% relative reduction in TB

Safety Analysis by Trial	Levofloxacin	Placebo	Estimated Risk Ratio (95% CI†)	P Value for Overall Treatment Effect
Discontinuation of treatment due to adverse events of any grade				
VQUIN	71 (7.4%)	11 (1.1%)	6.43 (3.42 to 12.09)	
TB-CHAMP	6 (1.3%)	1 (0.2%)	5.25 (0.64 to 43.13)	
Overall	77	12	6.32 (3.43 to 11.63)	<0.001
Musculoskeletal adverse event of any grade				
VQUIN	220 (22.9%)	32 (3.3%)	7.02 (4.67 to 10.56)	
TB-CHAMP	6 (1.3%)	4 (0.9%)	1.35 (0.36 to 5.06)	
Overall	226	36	6.36 (4.30 to 9.42)	<0.001

Levofloxacin associated with greater risk of discontinuation due to AE and musculoskeletal AE

Duong T, Brigden J, Simon Schaaf H, et al. A meta-analysis of levofloxacin for contacts of multidrug-resistant tuberculosis. *NEJM Evidence*. 2024;4(1). doi:10.1056/evidoa2400190

Patient Education and Communication

Highlights to Review with Patients

Administration	• Take rifampin capsules together • Components of 3HP taken on same day of week

Side Effects/ Monitoring	• Rifampin and rifapentine fluid discoloration
	• Seek medical attention
	  • Pinpoint rash (rifampin thrombocytopenia)
	  • Jaundice, fatigue, abdominal pain, nausea/vomiting

Follow Up	• Highest risk of discontinuation in first month • Encourage patients to outreach

DENVER HEALTH
REFUGEE | IMMIGRANT | NEWCOMER HEALTH SERVICES

Collection of grant-funded programs that support RIN communities

- Refugee health screenings
- Quality improvement initiatives
- System-wide cultural consultation
- Culturally and linguistically responsive patient navigation

Refugee Immigrant Newcomer Health Services multicultural, multilingual navigation team provides cultural consultation for research and patient care efforts

RIN Navigation team collectively speak Amharic, Arabic, English, French, Karen, Kikongo, Lingala, Maay Maay, Somali, Spanish, and Swahili.

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Tuberculosis (TB) Tip Sheet for Care Teams

How to talk about TB in culturally responsive ways with non-English speaking patients

When talking about this...	Say this...	Cultural Considerations
Blood test for TB	*"TB test" or "test for TB infection"*	Saying "blood test" could lead patients to assume ALL of their blood is bad and infected with TB and is more stigmatizing.
Describing TB	*"Tuberculosis (TB) is an infection that floats in the air that can infect the lungs and sometimes other organs too and is more common in some communities and countries than others. We recommend all patients born in [name patient's country of origin] get tested for TB if they haven't before."*	Using descriptive and less formal language helps both the interpreter and the patient better understand.
Describing active TB	*"Some people have active TB, which means the germs are affecting your lungs and other parts of your body and can spread to friends and family members very easily."*	• Use "loved ones and friends" or "friends and family" when discussing the contagious nature of active TB. Being close to "people" does not resonate as much. • Replace "can spread to other people very easily" with "can spread to your loved ones and friends very easily" for example.

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Tuberculosis (TB) Tip Sheet for Care Teams

How to talk about TB in culturally responsive ways with non-English speaking patients

When talking about this...	Say this...	Cultural Considerations
Describing latent TB	*"Most people who test positive for this infection have latent TB, which means the germs are sleeping, aren't making you feel sick, and you cannot spread it to others. Once we have TB in our bodies it can sleep for months to years before causing symptoms."*	The concept of "latent" can be hard to understand so using this sleeping analogy can be very helpful.
Communicating that TB infection is treatable	*"Both types need treatment but are cured with medications."*	• In some countries, a positive TB diagnosis is a death sentence and hearing this news can cause significant emotions, fear and worry. • **Hearing that in the US both types of TB (active and latent) are treatable and curable is a key message.**
Addressing concerns that TB is more common in some communities than in others	Important to include: *"We recommend all patients born in [name patient's country of origin] get tested for TB if they haven't before.*	• Mentioning a patient's country of origin tends to build rapport rapidly and ease a patient's mind, especially if you ask them a quick question about it (e.g., *What's the weather like there? What do you miss most about your country? What is the main dish there?*). • Suggest Clerk, Medical Assistant, or other team member make a note of patient's country of origin for the clinician. • Reassure patients they are not alone or being targeted as a community.

To Access Resource

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Tuberculosis (TB) Tip Sheet for Care Teams

How to talk about TB in culturally responsive ways with non-English speaking patients

BCG Vaccine

History of BCG Vaccine

Bacillus Calmette-Guérin

- 13 years of development
  - Live attenuated *M bovis* strain
  - Derived by serial passage (231 times during 1906-1919) until less virulent in animals
- First dose given to newborn baby in Paris, 1921

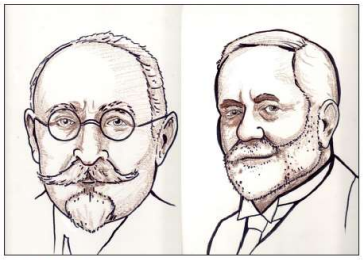


Figure 1: The founders of BCG
Jean-Marie Camille Guérin (1872–1961), left, and Léon Charles Albert Calmette (1863–1933), right.

Among 8,075 vaccinated children mortality was only 4.6% vs among non-vaccinated children it was at least 16%

Finding suggested that BCG also substantially reduced all-cause infant mortality not just tuberculosis specific-mortality

Lange C, et al. 100 years of mycobacterium bovis bacille Calmette-Guérin. Lancet Infect Dis. 2022; 22: e2–12

Benefits of BCG Vaccine

Protective effect of BCG inversely associated with age at vaccination

Neonatal vaccination affords greater protection than vaccination of older children, adults

High Efficacy in Children Preventing Complications

73% effective in preventing TB meningitis (95% CI: 67-79%)

77% in preventing miliary TB (95% CI: 58-87%)

Lange C, et al. 100 years of mycobacterium bovis bacille Calmette-Guérin. Lancet Infect Dis. 2022; 22: e2–12
WHO consolidated guidelines on tuberculosis. Module 1: prevention – tuberculosis preventive treatment. Geneva: World Health Organization; 2020.
WHO weekly epidemiological record BCG vaccines: WHO position paper. 2018; No 8, 93:73-96.
Trunz BB, Fine P, Dye C. Effect of BCG vaccination on childhood tuberculous meningitis and miliary tuberculosis worldwide: a meta-analysis and assessment of cost-effectiveness. *Lancet*. 2006;367(9517):1173-1180.

Use of BCG Vaccine

Countries follow different schedules

US does not routinely offer BCG vaccination

BCG World Atlas

- 156 of 194 countries recommend mass BCG vaccination for all neonates

Contraindications

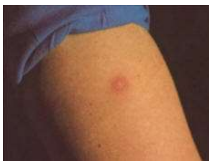
Recent HIV exposure

Recent HIV positivity

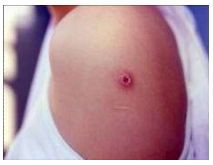
Pregnant patients

Immunosuppressed patients

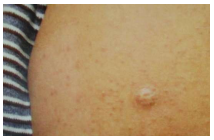
Papule at 2-3 weeks



Ulceration at 6-8 weeks



Scar by 3 months



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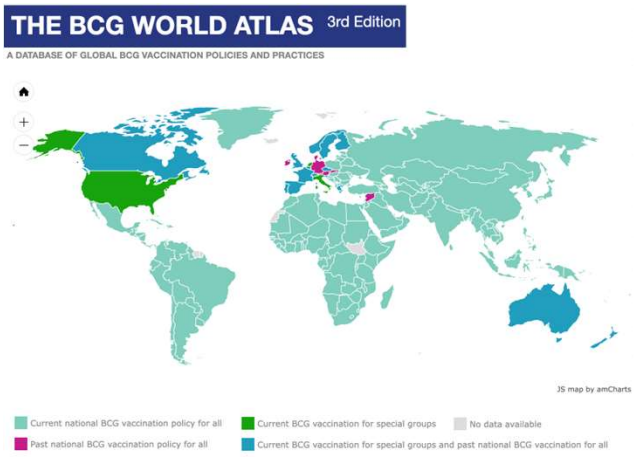
Lange C, et al. 100 years of mycobacterium bovis bacille Calmette-Guérin. Lancet Infect Dis. 2022; 22: e2–12
World Health Organization. Module 5: Children and Adolescents, Management of tuberculosis in children and adolescents: 3. Prevention of TB in children and adolescents 3.2 BCG Vaccination 3.2.1. Recommendations from the WHO BCG position paper 3.2.1.4. Adverse reactions. WHO TB Knowledge Sharing Platform: Operational Handbooks. 2025.

Use of BCG Vaccine



Region	Is TST done post BCG?
Income group (World Bank)	Is BCG Vaccination Recommended For HIV-Positive Babies?
TB Incidence (per 100 000 per year) *†	Year of changes to BCG schedule
TB Incidence (Count) *‡	Are there special groups that receive BCG?
Current BCG vaccination?	Location of Administration of BCG Vaccine
BCG Recommendation Type	BCG Strain
First appearance of BCG vaccine (unofficial)	BCG Manufacturer
Which year was vaccination introduced?	BCG Supply Company
Timing of 1st BCG?	How long has this BCG vaccine strain been used?
Multiple BCG?	Were there shortages/stockouts of the vaccine?
Multiple BCG in the past?	Is the BCG vaccination policy regularly assessed?
Year of BCG coverage estimate	Process of Assessment (if not regular)
BCG coverage (%)	BCG Policy Link
Is TST administered pre-BCG vaccination?	Datasource

Lancione S, Alvarez JV, Alsdurf H, Pai M, Zwerling AA. Tracking changes in national BCG vaccination policies and practices using the BCG World Atlas. BMJ Global Health 2022;7:e007462.

Questions?

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