MAYO CLINIC

Center for Tuberculosis

WORK-TB: Workplace Occupational Risk & Knowledge on TB

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Tuberculosis Screening for the Civil Surgeon

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Civil Surgeon since 2017

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- 1.00 ACPE,
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- 1.00 ANCC
- 1.00 Attendance
- 1.00 IPCE

Disclosure:

No relevant financial disclosures to report and no mention of off-label use of any medications or products

Learning Objectives

- **Identify** TB risk factors in healthcare and other occupational settings.
- **Summarize** current TB prevention, testing, and management guidelines for workers.
- **Recognize** workplace TB exposure protocols and opportunities for cross-sector collaboration.

Polling Question

In the United States, what is the rate of TB disease in healthcare personnel (HCP), compared to the general population?

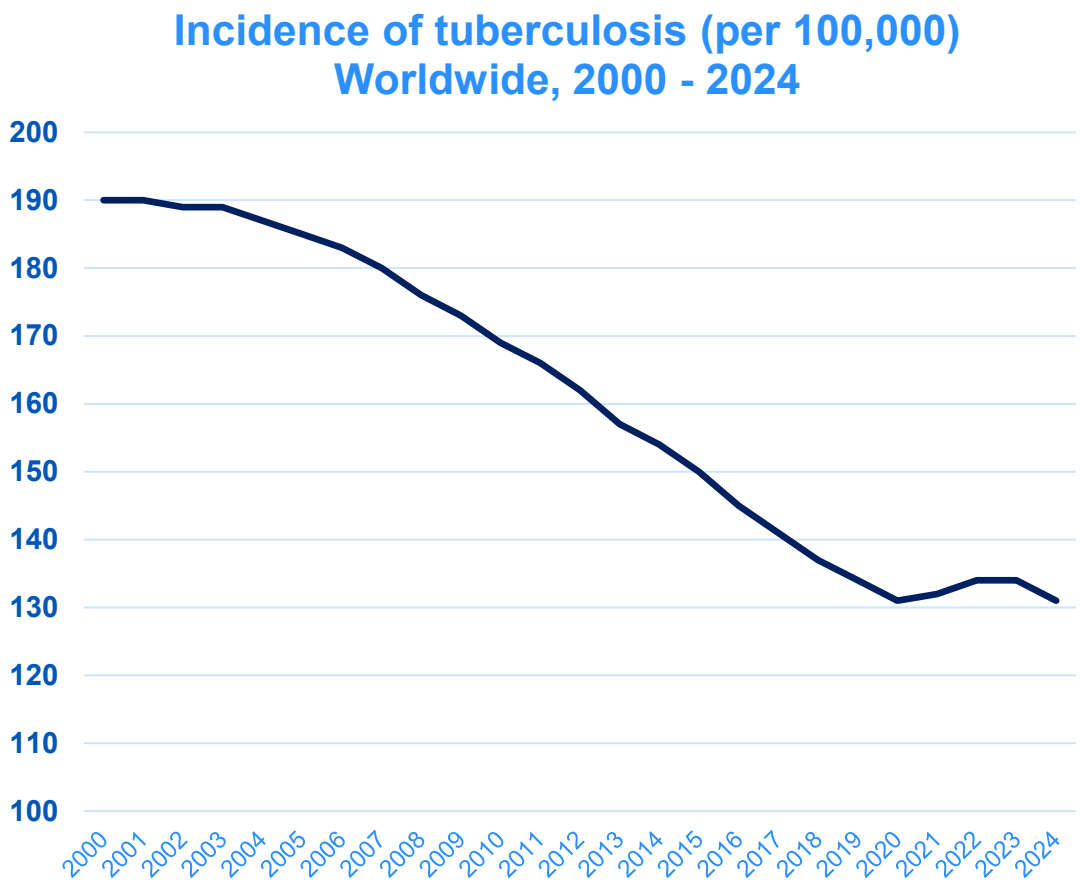
A. HCP have a **lower** rate of TB disease than the general population.

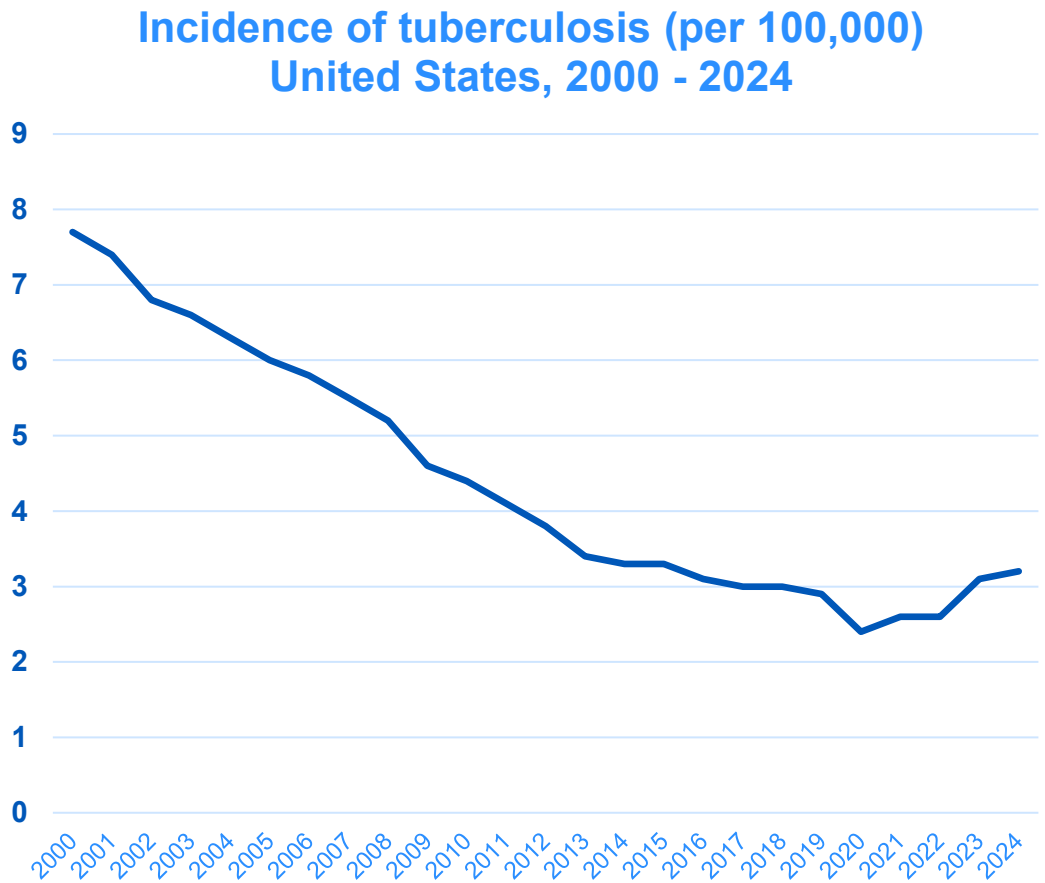
B. HCP have a **higher** rate of TB disease than the general population.

C. HCP have **the same** rate of TB disease as the general population.

D. Unknown due to the lack of occupational information in public health records.

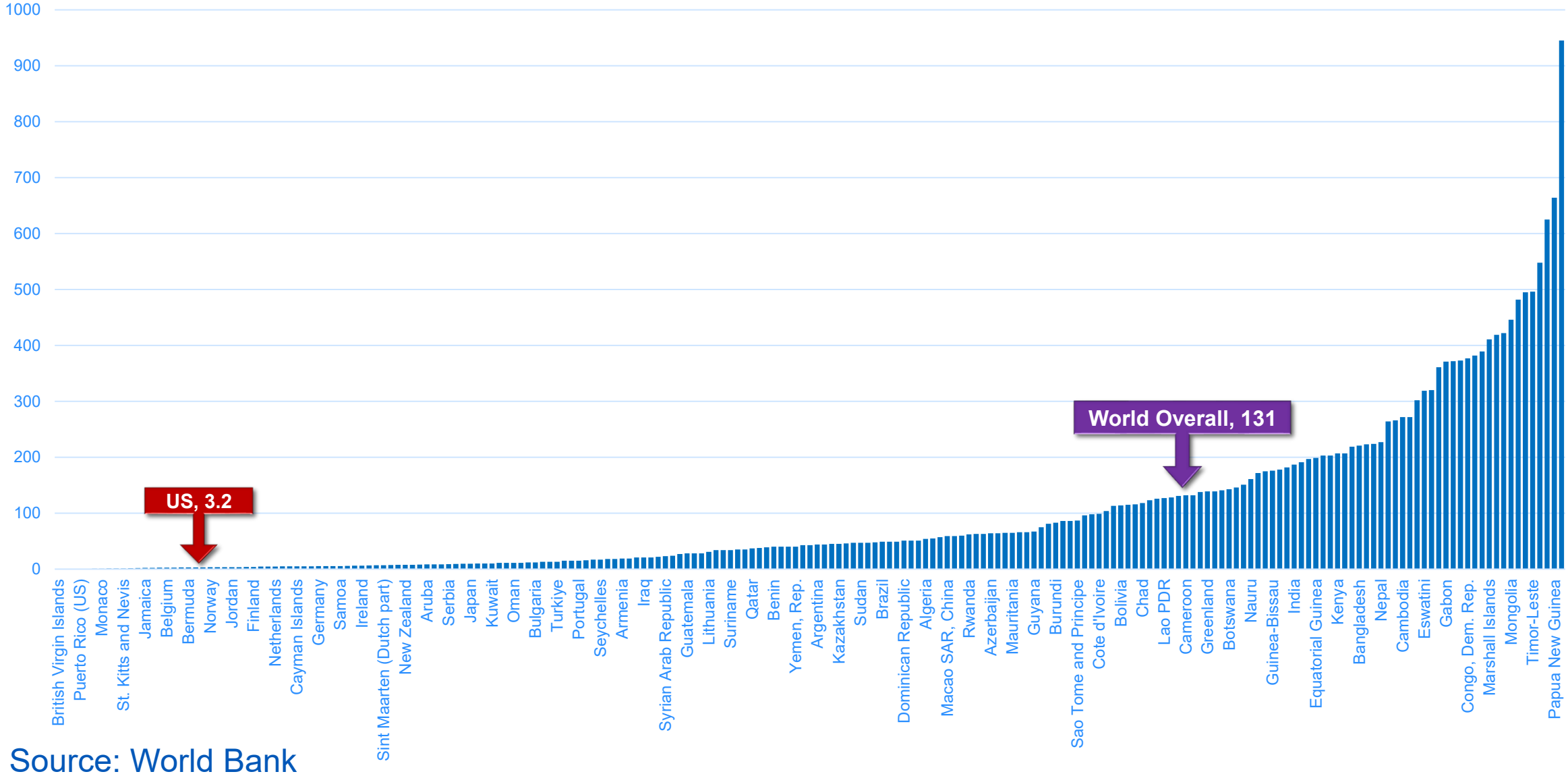
Trends in TB: 21st Century





Source: World Bank

Incidence of tuberculosis (per 100,000)
2024



Source: World Bank

Comparing TB in HCP to US population

TABLE 1. Mean Annual Numbers and Rates of Active TB Cases among Health Care Personnel (HCP) by Country of Birth during 2003–2007 and 2010–2016, Compared With the Total US Annual Numbers and Rates for 2005 and 2013

		HCP*			US†		
Study Period		US-born	Non-US-born	HCP Total	US-born	Non-US-born	US Total
2003–2007	Rate	1.7	17.9	4.2	2.5	22.3	4.8
	No. (%)	151 (35)	278 (65)	429 (100)	6,290 (45)	7,745 (55)	14,065 (100)
2010–2016	Rate	0.8	10.8	2.5	1.2	15.7	3.0
	No. (%)	90 (28)	262 (72)	352 (100)	3,330 (34)	6,222 (68)	9,561 (100)

*The mean annual numbers and rates for the 5- or 7-year periods were obtained from Lambert et al,[11] Mongkolrattanothai et al,[12] and via Lauren Lambert, personal communication.

†The comparison annual US numbers and rates for the two study periods are the data of 2005 and 2013, the mid-year of each study period when rates declined from 4.4 to 5.1 and 3.6 to 2.9, respectively.[13]

Online Tuberculosis Information System (OTIS) Data

Online Tuberculosis Information System

Current Tuberculosis Case Reports

- **1993 - 2022**: By age groups, race / ethnicity, sex, vital status, year reported, state, metropolitan area, several patient risk factors, directly observed therapy, disease verification criteria and multi-drug resistant TB.
  Data Request More information

Archive Tuberculosis Case Reports

- **1993 - 2021**: By age groups, race / ethnicity, sex, vital status, year reported, state, metropolitan area, several patient risk factors, directly observed therapy, disease verification criteria and multi-drug resistant TB.
  Data Request More information

Revised Occupation

All Values
Correctional
Health Care
Migratory Agricultural
Not Employed
Not Seeking Employment
Other
Retired

US Workers with Active TB, 1993 -2021, by Occupation
Health Care: 7,118 (7.3%)
Migratory Agricultural: 2,998 (3.1%)
Correctional: 343 (0.35%)
OTHER: 86,816 (89.2%)

Healthcare workers account for 9.3% of total US workforce.
Bureau of Labor Statistics, 2022

OSHA Definition of Occupational TB: From Presumption to Known Exposure

- **Old:** TB infection or disease is **presumed** to be work related if it seems likely that an exposure in the work environment either caused or contributed. Work-related exposure to TB is presumed in the following industries: correctional facilities; **health care facilities**; homeless shelters; long-term care facilities; and drug treatment centers.
- **Current:** TB infection or disease is considered work related only if the worker was occupationally exposed to someone with a **known** case of active tuberculosis (TB).

Tuberculosis in US Healthcare Personnel

- **Between 1993 and 2021, HCP accounted for less than 2% of TB disease in the US.**
  - Among **workers** with TB, HCP comprised 7.3%
- **Incidence rates are lower for HCP than non-HCP**
- **Compared to non-HCP, HCP with TB are**
  - **More** likely to have been born outside US
  - **Less** likely to have recent infection

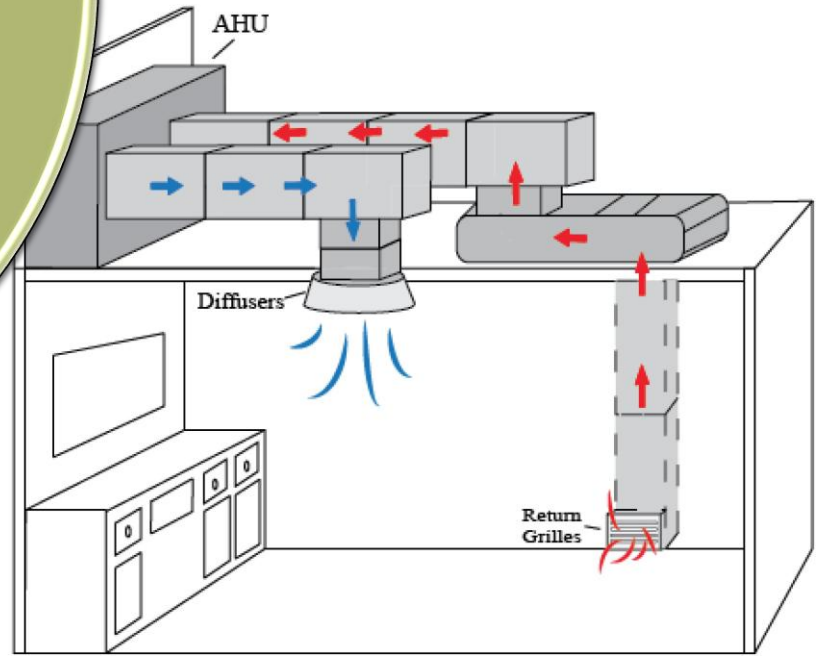
Sources: CDC OTIS data 1993-2021, Mongkolrattanothai, et al ICHE 2019, and Lambert, et al ICHE 2012.

Community prevalence

Administrative controls

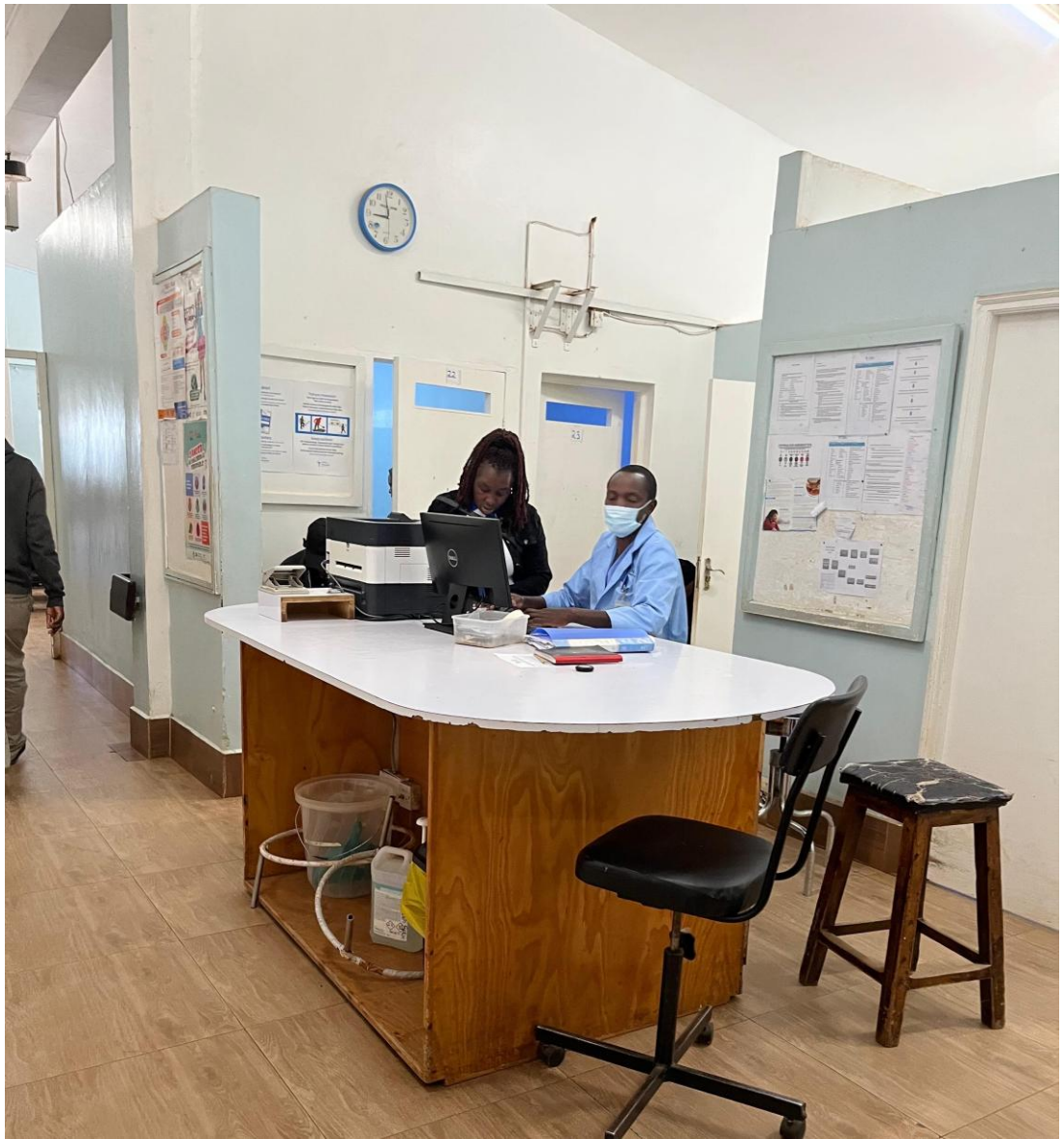
Personal Protective Equipment

Engineering controls



Nursing station
Hospital of the University of Pennsylvania

Nursing station
Kijabe Hospital
Photo courtesy William Buchta, MD, MS, MPH



Morbidity and Mortality Weekly Report

Tuberculosis Screening, Testing, and Treatment of U.S. Health Care Personnel: Recommendations from the National Tuberculosis Controllers Association and CDC, 2019

Lynn E. Sosa, MD[1,2]; Gibril J. Njie, MPH[3]; Mark N. Lobato, MD[2]; Sapna Bamrah Morris, MD[3]; William Buchta, MD[4,5]; Megan L. Casey, MPH[6]; Neela D. Goswami, MD[3]; MaryAnn Gruden, MSN[7]; Bobbi Jo Hurst[7]; Amera R. Khan, MPH[3]; David T. Kuhar, MD[8]; David M. Lewinsohn, MD, PhD[9]; Trini A. Mathew, MD[10]; Gerald H. Mazurek, MD[3]; Randall Reves, MD[2,11]; Lisa Paulos, MPH[2,12]; Wendy Thanassi, MD[2,13]; Lorna Will, MA[2]; Robert Belknap, MD[2,11]

- Eliminate routine annual occupational TB testing
- Continue screening for TB **at hire** and post exposure
- Educate HCP on risk of non-occupational exposure
- **Shift emphasis and resources to treatment of LTBI**
- HCP with untreated LTBI should be screened annually for symptoms

Journal of Occupational and Environmental Medicine

Tuberculosis Screening, Testing, and Treatment of U.S. Health Care Personnel: ACOEM and NTCA Joint Task Force on Implementation of the 2019 MMWR Recommendations

Wendy Thanassi MD, MA; Amy J. Behrman MD; Randall Reves MD; Mark Russi MD, MPH; Melanie Swift MD, MPH; Jon Warkentin MD, MPH; Donna Wegener MA; Lawrence Budnick MD, MPH; Ellen Murray RN, PhD; Ann Scarpita BSN, MPH; Bobbi Jo Hurst MBA; Sarah Foster-Chang DNP, ANP-BC; Trini Mathew MD, MPH; MaryAnn Gruden MSN, COHN-S/CM; T. Warner Hudson III MD

- **Nuts and bolts guide to implementation**
- **Sections:**
  - **Preplacement Screening**
  - Management of Occupational or Nonoccupational Exposures
  - Serial Screening (don’t do unless required to), Education, and Testing
  - **Education and Treatment of HCP with Positive Tests**

Changes in occupational TB programs in healthcare

- Switched from TST to IGRA
- **Annual testing stopped**
- **Post exposure** testing continues
- LTBI detected **at hire**
- Emphasis on LTBI **treatment**

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3 Concepts illustrated with workplace transmission cases:

- PROXIMITY
  SOURCE
  EXPOSURE
  in a Changed World

- Necessitates Increased Workplace Testing

Proximity and another Airborne Infectious Disease: COVID-19, Church, March 2020

Morbidity and Mortality Weekly Report (*MMWR*)

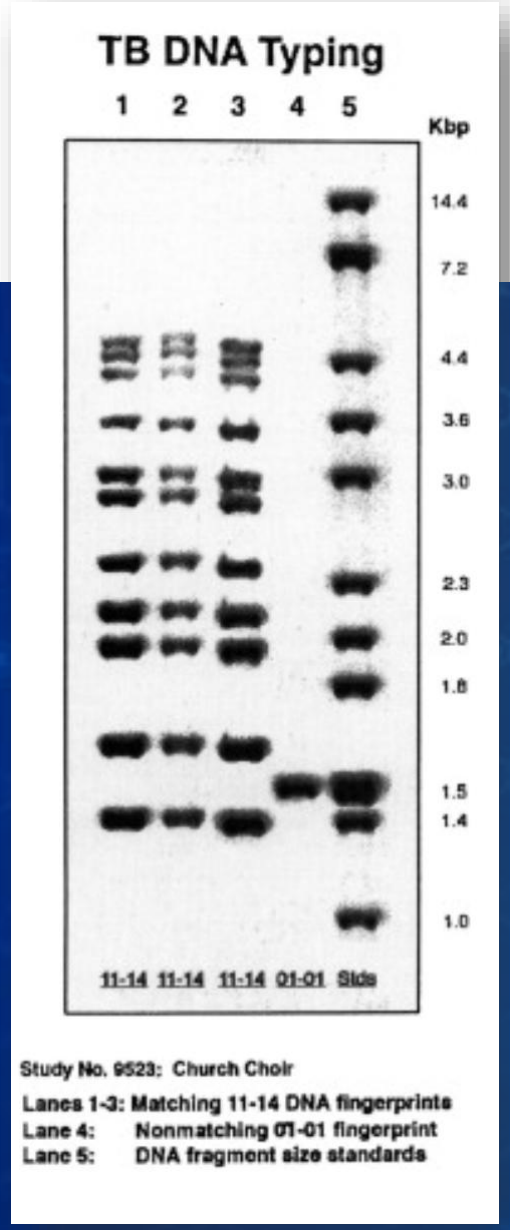
Sear

High SARS-CoV-2 Attack Rate Following Exposure at a Choir Practice — Skagit County, Washington, March 2020

Weekly / May 15, 2020 / 69(19);606–610

- 87% of 61 singers got Covid after 2-hour practice
- Prolonged exposure
- Proximity
- Loud vocalizations

I couldn’t resist



Of 306 of the traced choir members tested, 121 belonged to the 11-am choir; 11 of the 34 (32.35%) tenors were reactors, while 11 of 23 **(47.83%) total reactors were tenors.**

Tenors were compared with all other groups combined with the use of Fisher's exact test; 32.35% of tenors had a positive tuberculin test reaction compared with 13.79% of all other choir members (p=0.037). Furthermore, **tenors** were more than twice as likely to be reactors than the other members of the choir (RR, 2.04; 95% CI, 1.17 to 3.56).

The proportion of cases by vocal range (and therefore seating proximity in the church or rehearsal room) was determined with the use of Fisher's exact test: **10.53% of tenors had TB compared with 1.14% of all other** choir members (p=0.029). **Tenors were twice as likely to have TB** than other members of the choir (RR, 2.85; 95% CI, 1.69 to 4.80).

In the gospel choir outbreak reported here, there were **more tenor cases and more reactors among the contacts** found after TST testing (p=0.037). Tenors reacted to tuberculin at a rate of 33% whereas all the other ranges combined occurred at a rate of 14% (12 of 87).

https://journal.chestnet.org/article/S0012-3692(16)395770/fulltext#:~:text=Tuberculin%20Testing%20Outcome,prescription%20of%20isoniazid%20preventive%20therapy.&text=1.,-American%20Thoracic%20Society

Proximity and another Airborne Infectious Disease: COVID-19, Factories, May 2020

Morbidity and Mortality Weekly Report (*MMWR*)

Search

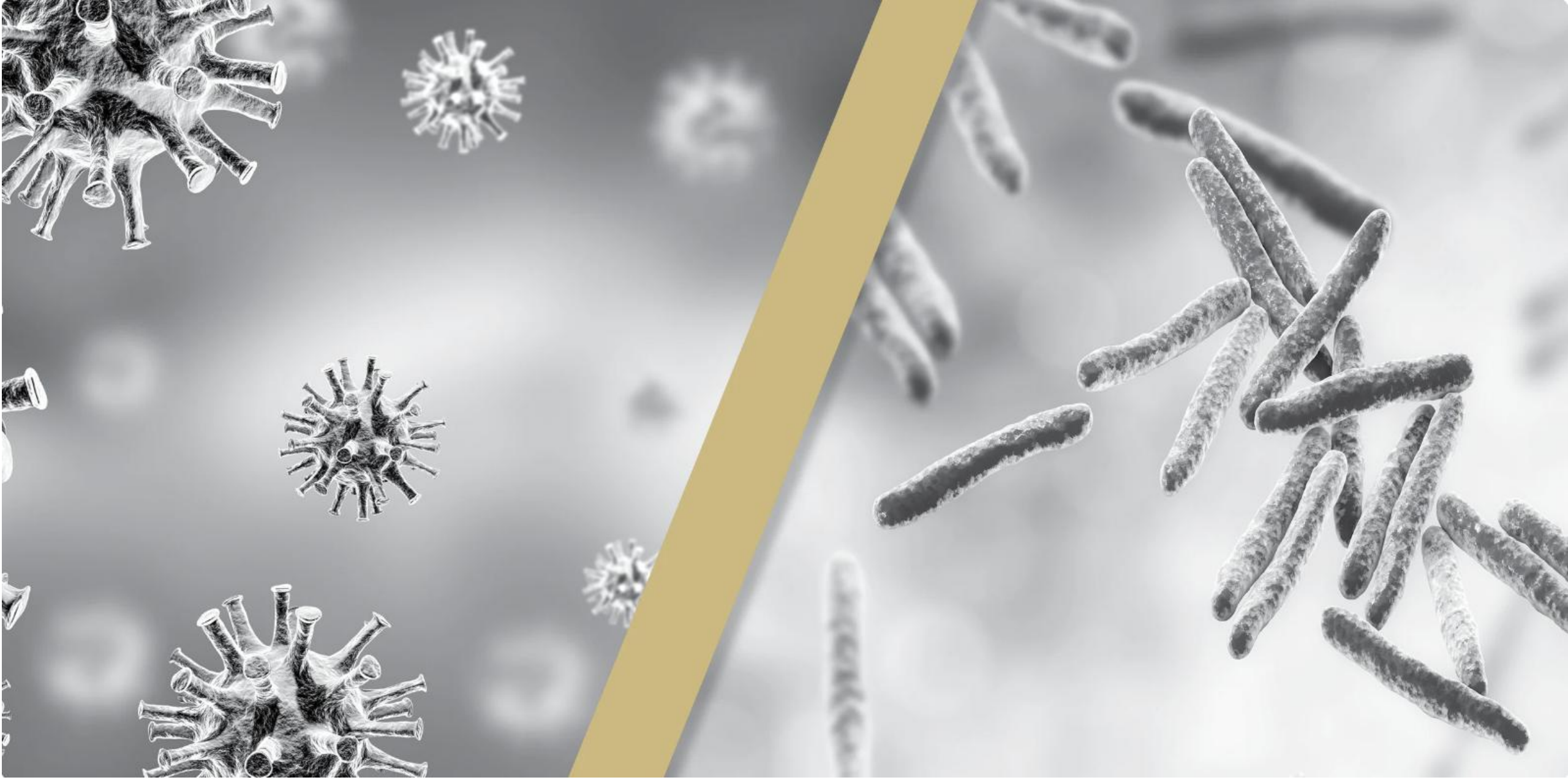
Update: COVID-19 Among Workers in Meat and Poultry Processing Facilities — United States, April–May 2020

Weekly / July 10, 2020 / 69(27);887-892

- 14 states, 9.1% infected
- Prolonged exposure
- Proximity (at work and in transit)
- Loud vocalizations
- Conveyor belts

"Tyson is the latest of dozens of US meat plants to close due to coronavirus outbreaks within facilities."

"Given that the plants employ thousands of people who often work side by side carving meat, distancing is all but impossible."



The OG Airborne Infectious Disease - Tuberculosis

KANSAS MDR TB Outbreak 1

CDC

Morbidity and Mortality Weekly Report (*MMWR*)

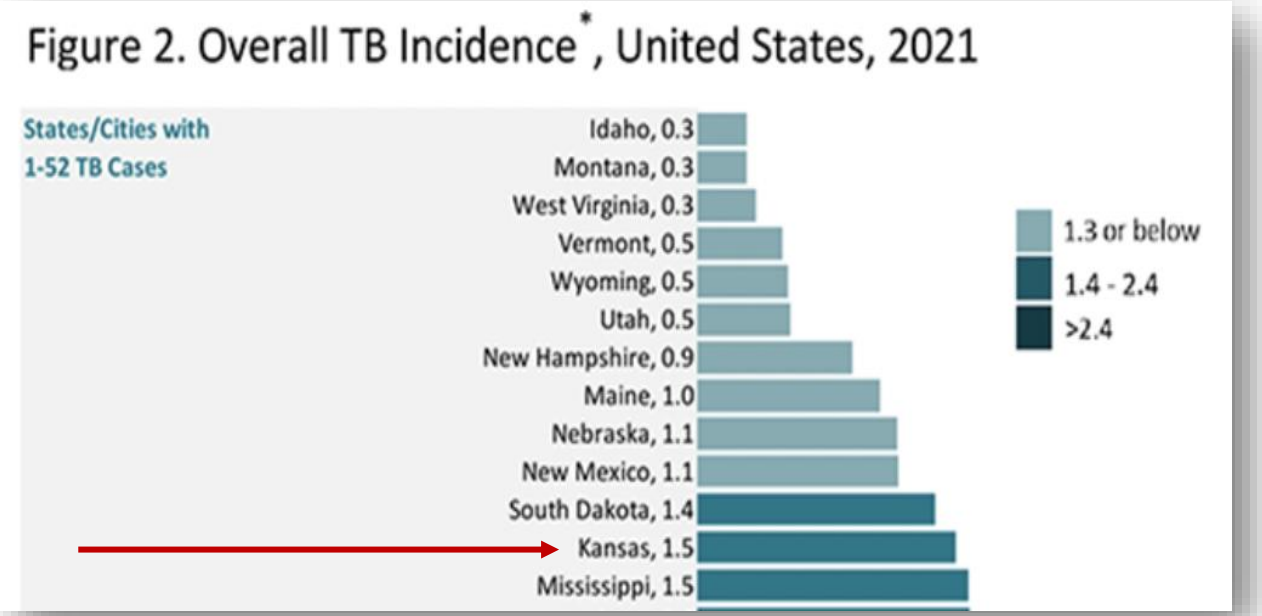
Outbreak of Multidrug-Resistant Tuberculosis — Kansas, 2021–2022

Weekly / September 1, 2023 / 72(35);957–960

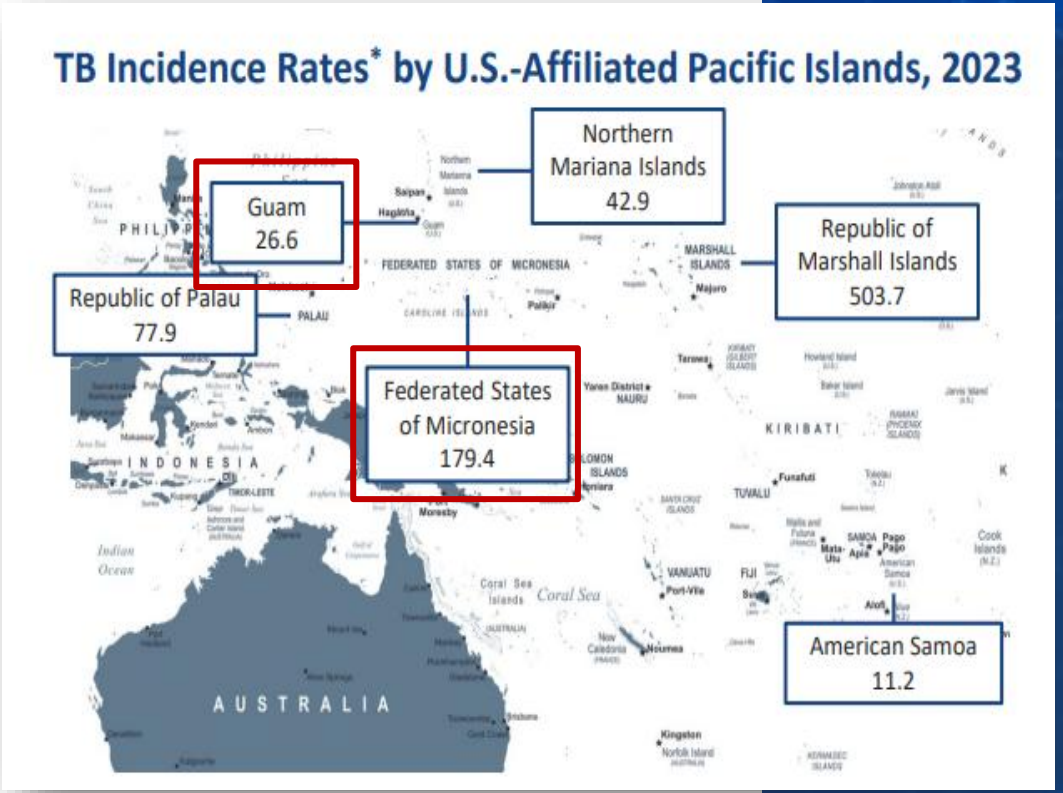
- Infant with pulmonary and meningeal TB hospitalized
  - **resistant to ALL 4 RIPE antibiotics (rifampin, isoniazid, pyrazinamide, ethambutol)**
- then 4 household adults had active disease;
- then 6 more in another house had active disease, including an infant and the pregnant mother.
- Parents in these 2 homes had **SAME WORKPLACE** (meat processing)
- Ultimately: 5 households, 2 states, **14 with MDR TB**, and 9 with TB infection
- Genomic origin (G43881) : Micronesia and Guam

TB in Kansas vs.

Guam and Federated States of Micronesia



TB rate 1.5 vs. 179.4 / 100,000 people



Micronesians can live and work in the US as “nonimmigrants” under the terms of a **Compact of Free Association**.

- makes it easier to come here,
- do not get TB tests like refugees or immigrants.

Dodge & Liberal cities

Kansas Outbreak 2 (also 2022-23)

Origin: Somalia

SOURCE: 2007 refugee resettlement

- ~1,000 new arrivers, mostly young men
- > 400 in meatpacking right away
- Movement between plants*

PROXIMITY:

- Exertional work
- Conveyor belt moving air
- Elevated voices
- Hot or cold

Tuberculosis Screening and Testing of Large, Multicultural Beef Processing Workforces in Southwestern Kansas, 2022-24

Swensson, L[1]; Luria, Y[2]; Gilbert-Esparza, E[1]; Wegener, D[3]; Thanassi, W[4]

Kansas Department of Health and Environment, Topeka, KS[1]; Neuvivo, Palo Alto, CA[2]; National TB Coalition of America, Atlanta, GA[3]; QIAGEN LLC, Germantown, MD and Department of Veterans Affairs, Palo Alto, USA[4].

National Tuberculosis Coalition of America and N. American Region of the International Union Against TB and Lung Diseases 2024

Southwestern Kansas TB Testing Event 2022-24; Meat Processing Plant Workers

Location	Testing Method	# Tested	% of Employee Pop. Tested (approx.)	# Latent Confirmed	% Tested with LTBI	% LTBI Who are Non-US Born	# Active TB Found	# NTM Found	Tx Complete	% Tx Complete	Non-compliance/incomplete Testing
December '22	QFT Plus	373	11.5%	33	8.8%	72.7%	0	1	24	88,90%	0
Feb '23	QFT Plus	137	5%	21	15.3%	85.7%	0	1	18	85,70%	0
May '23	QFT Plus	346	10.6%	36	10.4%	88.9%	0	0	22	71,00%	0
March '24	TST*	406	11.6%	122	30,0 %		2				25%
Total		**1,262**		**212**			**2**	**2**	**64**	**30%**	

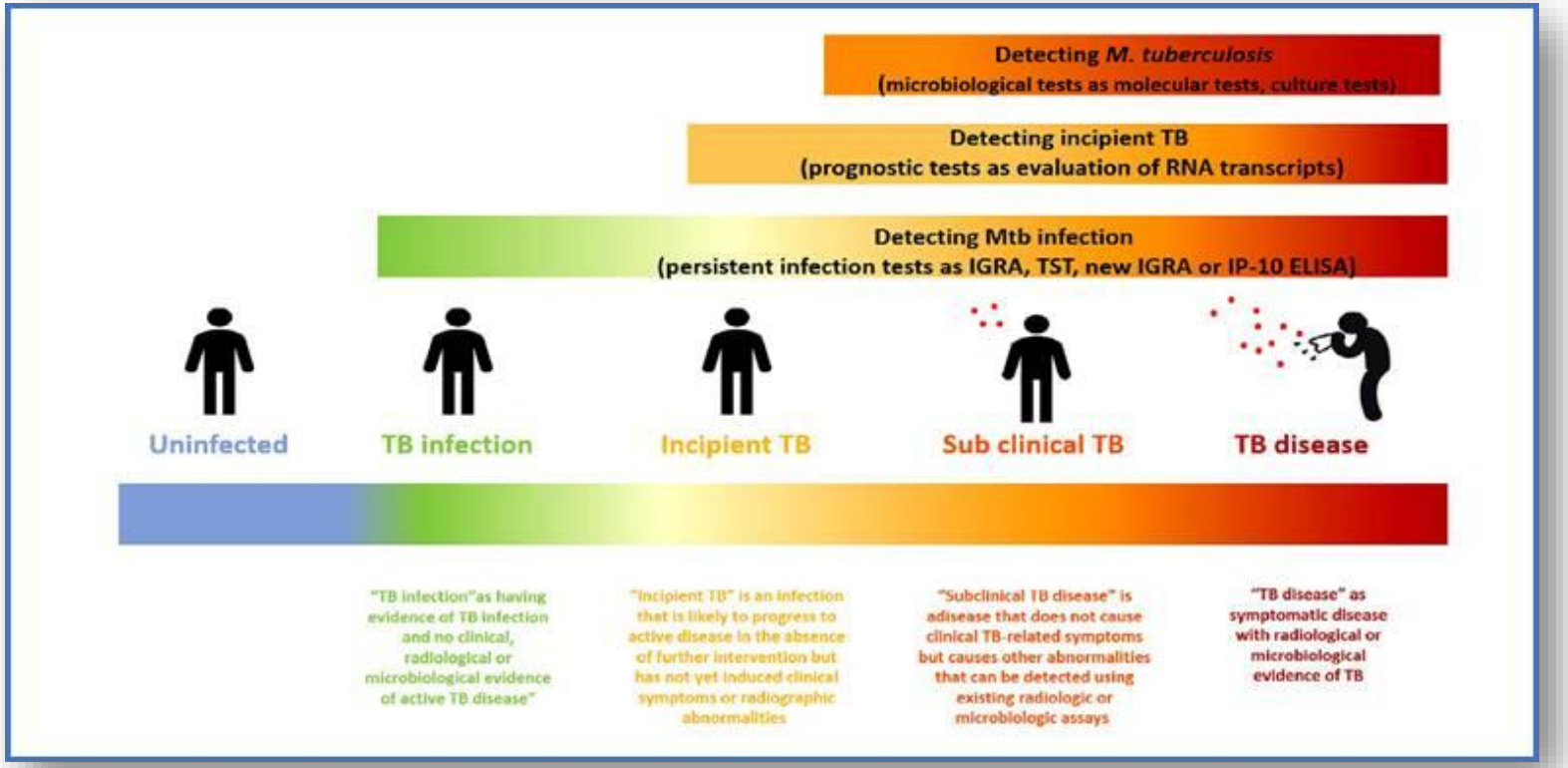
*542 TST placed, 406 completed testing

tx = treatment with 3HP or 4Rif

>500,000 employed in meat processing (beef, pork, chicken, fish)

1 M factory-based auto workers

Tuberculosis is Airborne Infection on a Spectrum

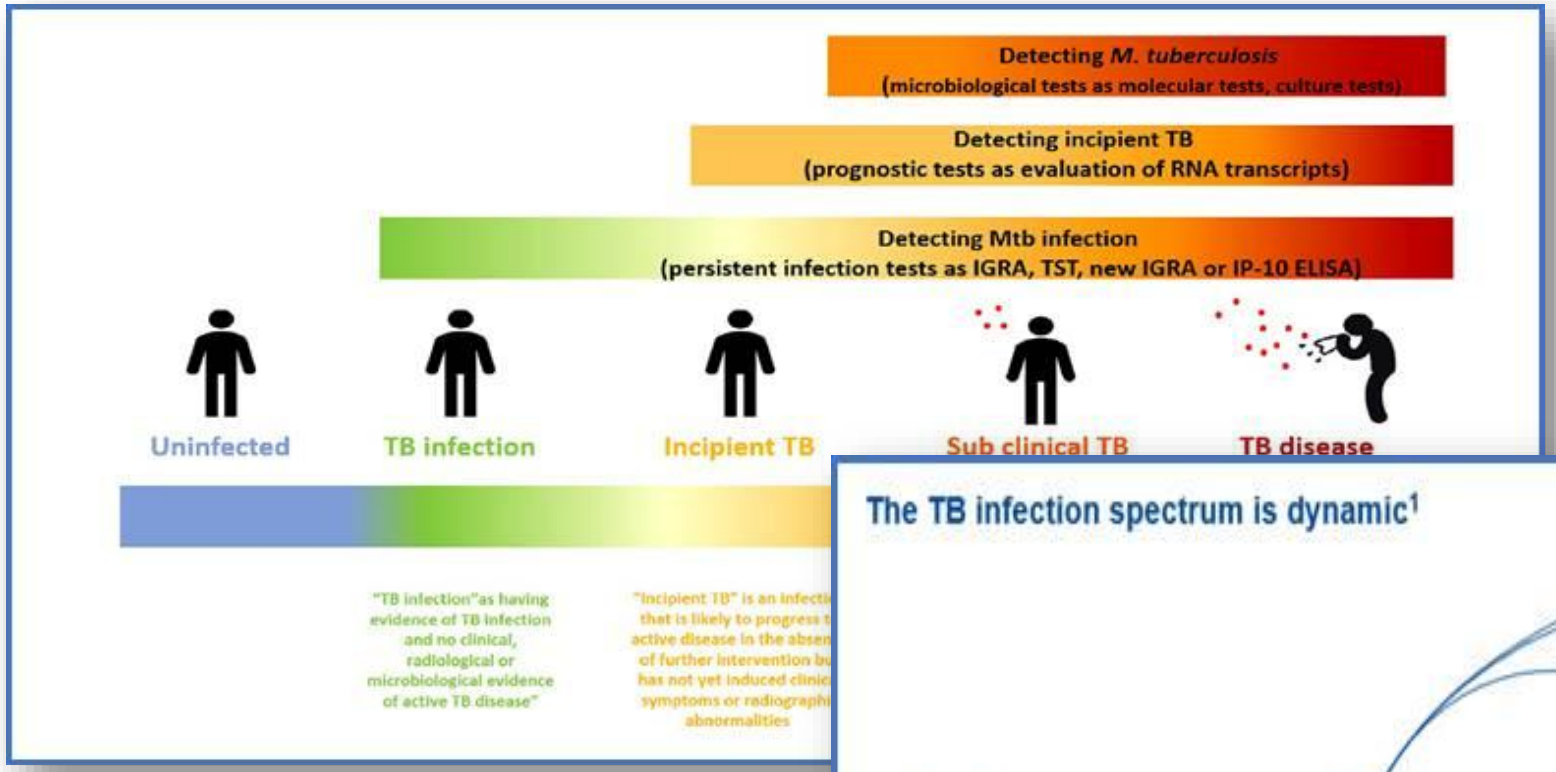


LANGUAGE:

Not Latent TB -> TB INFECTION

Not Active TB -> TB DISEASE

Tuberculosis is Airborne Infection on a Spectrum



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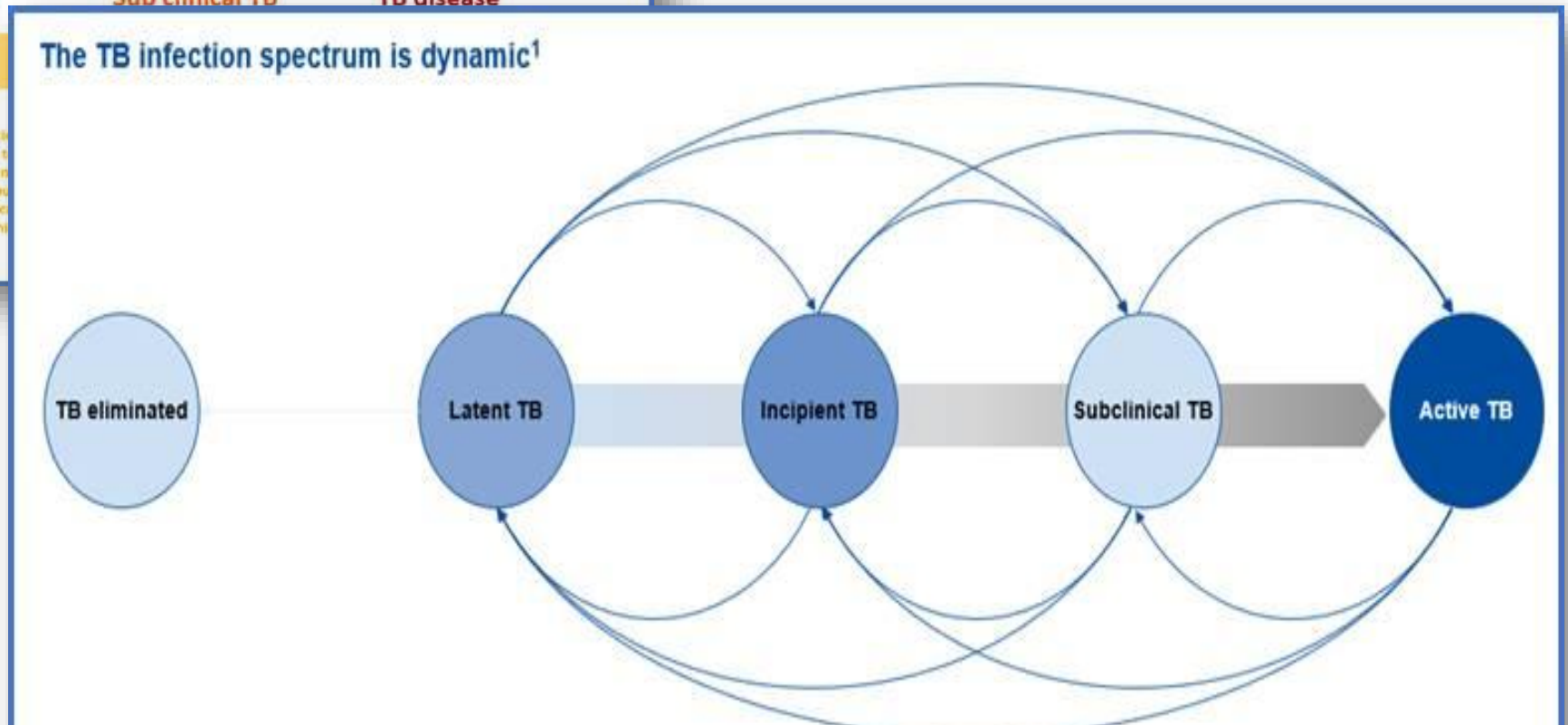


Not 2 states of infection ->

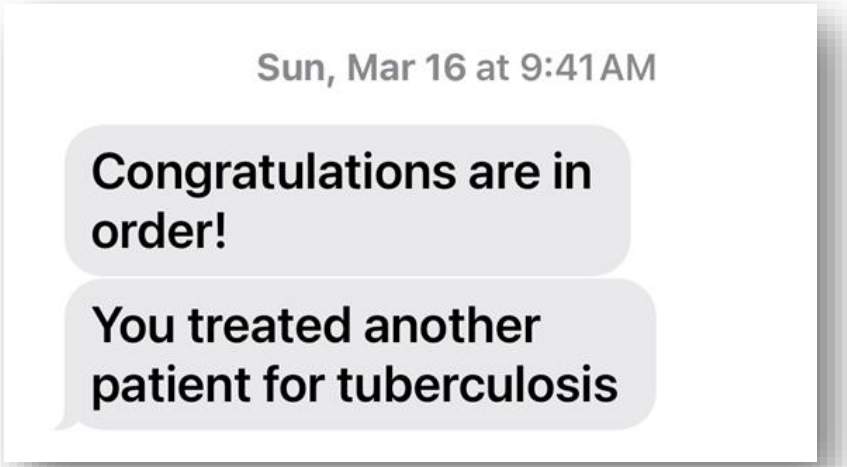
CONSTANT MOVEMENT

Treatment is the next Most Important Step

Latent Tuberculosis Treatment Regimens

Shorter treatment 3-4 months rifamycin based regimens are preferred and more likely to be completed than the isoniazid regimens. The limitations of the shorter regimens are potential drug-drug interactions with multiple classes of drugs such as oral contraceptives (OCPs) and direct oral anticoagulants (DOACs)[1]. CTCA recommends the use of drug interactions guide such as Epocrates or Lexicomp prior to the initiation of rifamycin-based regimens.

Regimen	Adult Dosing	Duration	Treatment Considerations
Rifampin (4R)	10 mg/kg/day (max 600mg daily)	4 months	
Isoniazid and Rifapentine (3HP)	INH – 900mg weekly Rifapentine – 900mg weekly Pyridoxine – 50mg weekly	12 weeks	Monitor for hypersensitivity reaction[2]
Isoniazid/ Rifampin	Rifampin – 10 mg/kg/day (max 600 mg daily) Isoniazid – 5 mg/kg/day (max 300 mg daily) Pyridoxine – 25 mg daily; if patient has neuropathy comorbidities – 50mg daily	3 months	Hepatotoxicity risk – requires closer monitoring
Isoniazid	Isoniazid – 5mg/kg/daily 300mg daily (max) Pyridoxine – 25mg daily; if patient has neuropathy comorbidities – 50mg daily	6-9 months	Hepatoxicity risk – requires closer monitoring Few drug-drug interactions



NTCA PROVIDER GUIDANCE:

Using the Isoniazid/Rifapentine Regimen to Treat Latent Tuberculosis Infection (LTBI)

IMPORTANT NOTE: *Rule out* **active** *TB disease in all persons prior to initiating treatment for LTBI.*

What is the 12-dose isoniazid/rifapentine regimen (aka "3HP")?

The 3HP regimen consists of 12 once-weekly doses of isoniazid (H) and rifapentine (Priftin®) (P). It provides a safe and effective treatment for LTBI. Rifapentine is a member of the rifamycin class and has many of the same drug-to-drug interactions and side effects as other rifamycins.

What are the advantages of 3HP?

- The 12-dose regimen reduces treatment time by two-thirds (9 months to 3 months) compared to isoniazid.
- Shorter treatment regimens have been shown to have higher rates of completion.
- Weekly dosing offers convenience for many individuals.
- There are lower rates of hepatotoxicity with 3HP than with daily doses of isoniazid.

What are the doses?

Drug*	Weekly Dosage	Maximum dose
Isoniazid	15 mg/kg rounded to nearest 50/100mg in patients ≥12 years	900 mg
	25 mg/kg rounded to the nearest 50/100 mg in patients 2-11 years	
Rifapentine (Priftin®)	10.0 – 14.0 kg = 300 mg	900 mg
	14.1 – 25.0 kg = 450 mg	
	25.1 – 32.0 kg = 600 mg	
	32.1 – 49.9 kg = 750 mg	

*Tablets can be crushed and administered with semi-solid food for those unable to swallow pills

Who is not recommended for treatment with 3HP?

- Children under 2 years of age
- Patients with potential for severe or unmanageable drug interactions, including people living with HIV or AIDS on certain antiretroviral therapy regimens
- Persons presumed infected with *M. tuberculosis* that is resistant to isoniazid and/or rifampin
- Pregnant women or women planning to become pregnant during treatment
- Patients who had prior adverse events or hypersensitivity to isoniazid or rifampin or rifapentine

ALERTS:

- Do not confuse **R**ifampin/**R**ifabutin with **R**ifapentine (Priftin®).
- Patients who weigh ≥ 50kg should take 6 tablets of rifapentine and 3 tablets of isoniazid for a total of 9 pills at a time.
- Some TB experts recommend prescribing vitamin B6 with this regimen due to concerns regarding isoniazid-induced peripheral neuropathy.
- If 3HP is self-administered, it is imperative that the patient understands the directions to take all of the pills in the weekly dose at the same time. **The patient should not split doses.**
- If symptoms suggestive of a systemic drug reaction occur, the patient should stop 3HP while the cause is determined.
- Doses should be given at least 72 hours apart, and there should be no more than 3 doses in 10 days, based on the clinical trial design.
- Different from other rifamycins, rifapentine can be taken with food to increase absorption.
- Maintain adequate hydration.

What is completion of therapy?

- Completion of therapy is 12 doses taken in 16 weeks.

NOTE: *Near the end of the treatment period, the TB clinician may consider completion of therapy for LTBI with only 11 once-weekly doses within a 16-week period under rare and insurmountable circumstances in which the patient cannot take an additional (12th) dose.*

Does this regimen have to be administered via directly observed therapy (DOT)?

- DOT ensures the highest quality and safety of treatment and confirms that treatment is completed.
- The healthcare provider should choose the mode of administration, i.e., either DOT versus self-administered therapy (SAT) based on local practice and individual patient attributes and preferences. It is critically important for the clinician to assess the patient's ability to understand risks associated with treatment and procedures to follow if a side effect is suspected, as well as the risk for progression to severe forms of TB disease.

How frequently were toxicities observed with 3HP?

Hypersensitivity *including flu-like symptoms, headaches, hypotension, near-syncope/syncope*	3.8%
Rash	0.8%
Hepatotoxicity	0.4%
Thrombocytopenia	infrequent
Other toxicities	3.2%

NOTE: *Refer to the product insert for a full list of potential side effects. Most side effects occur in the first 4 weeks, although they can continue to occur throughout treatment.*

What can an adverse event include and how should I respond?

	Adverse Event		Response
Moderate to Severe	• Hypersensitivity • Hypotension • Dizziness or nausea/vomiting *(these can be prodrome to syncope)* • Syncope/fainting • Hospitalization • Life-threatening event • Flu-like syndrome *(e.g., fever, chills, headaches, dizziness, muscular ache/pain)* • Thrombocytopenia	• Shortness of breath • Wheezing • Acute bronchospasm • Urticaria • Petechiae • Purpura • Conjunctivitis • Angioedema • Shock	**Discontinue treatment** **Conduct prompt clinical assessment with appropriate lab monitoring**
Mild to Moderate	• Rash • Fever • Pruritus		**Continue to monitor the patient closely with a low threshold for discontinuing treatment**

How do I report an adverse event regarding 3HP?

- Report all adverse events to FDA MedWatch at **www.fda.gov/Safety/MedWatch/default.htm**, **1-888-INFO-FDA (1-888-463-6332)**
- Report adverse events leading to death or hospitalization to your health department. Health departments should report these adverse events to the Centers for Disease Control and Prevention at **1-800-232-4636** or **LTBIdrugevents@cdc.gov**

Are there drug-drug interactions?

Yes, there are common interactions for isoniazid and rifapentine:

- **Isoniazid** increases blood levels of phenytoin and disulfiram.
- **Rifapentine** decreases blood levels of oral or implanted hormonal contraceptives, warfarin, sulfonylureas, methadone, steroids, some cardiac medications, and certain antiretroviral therapy regimens may have serious drug interactions.

NOTE: *Use a drug interactions checker and/or refer to the product insert for a full list of drug-drug interactions.*

Whom do I contact with questions or concerns?

- Contact your local or state health department.
- NTCA has an online directory of TB programs at **http://www.tbcontrollers.org/community/statecityterritory/**

What type of monitoring do I need to do?

- Evaluate the patient at a monthly visit to identify adverse events and to assess treatment adherence.
- Some experts recommend baseline complete blood count (CBC) due to a possible adverse reaction decreasing the white blood cell count and platelet counts and comprehensive metabolic panel (CMP). Hepatitis panel may also be obtained.
- Baseline hepatic chemistry is recommended for patients with these specific conditions:
  - HIV infection
  - Liver disorders
  - In the postpartum period (≤ 3 months after delivery)
  - Regular alcohol or injection drug use

  In addition, consider baseline hepatic chemistry for older persons and for persons taking medications for chronic medical conditions.
- If baseline hepatic chemistry testing is abnormal, determine the risk vs. benefit of treatment. If a decision is made to treat, continue with subsequent hepatic chemistry testing until the patient is determined to be stable.
- If baseline hepatic chemistry is within normal limits and the treatment is self-administered, some experts recommend additional laboratory monitoring monthly to ensure that the patient does not develop hepatotoxicity.
- When or after the final dose is taken, conduct a final visit with the patient to monitor for any adverse events.

NTCA PROVIDER GUIDANCE:
USING THE ISONIAZID/RIFAPENTINE REGIMEN TO TREAT LATENT TUBERCULOSIS INFECTION (LTBI)

NOVEMBER 2018; REVISED, APRIL 2019

For references, go to **http://www.tbcontrollers.org/resources/3hp**

Great handout to give to patients and colleagues:

https://www.tbcontrollers.org/docs/resources/3hp/NTCA_Provider_Guidance_3HP_11918.pdf

HEALTH

Kansas City tuberculosis outbreak is largest in US history

Experts call for more 'organized testing' to stop the spread

By **Angelica Stabile** · **Fox News**

Published January 28, 2025 4:53pm EST

Kansas Outbreak 3 (also 2024-present)

~10 TB disease cases usually in Wyondette and Johnson counties

159 TB diagnoses so far in this ongoing outbreak

69 people with active, infectious disease

90 latent infections, and

2 deaths

with mortality rate in US ~12%... they can **expect more disease and deaths**

Kansas Exposure Investigation 2024:
Workplace = Church

Index case
44 yo M **Pastor**
TSPOT+, CXR abnl 1/30
4+ AFB smear, NAAT MTb
RIPE 2/6

27 TB disease +
16 TB infections
= 47.7% of those tested

Ongoing Outbreak

Index case
44 yo M Pastor
TSPOT+, CXR abnl 1/30
4+ AFB smear, NAAT MTb 1/31
RIPE 2/6

47 yo F
QFT+ 3/4
CXR abnl
RIPE 3/22

27 yo F
QFT+ 3/4
CXR abnl
Cx + 3/5
RIPE 3/8

29 yo M
QFT+ 3/4
CT chest abnl
NAAT + 5/5
RIPE 5/8

20 yo F
QFT+ 3/18
CXR abnl 5/6
RIPE 5/14

28 yo M
QFT+ 4/1
CT chest abnl
RIPE 5/10

22 yo M
QFT neg ; CXR abnl
3+ smear; NAAT +
RIPE 3/28

7 mo M
QFT Ind; TST neg
G. Asp NAAT MTb
RIPE 3/2

2 yo M
TST+ 24mm 3/7
CXR abnl 3/8
RIPE 3/15

4 yo M
TST+ 11mm 3/7
CXR abnl 3/8
RIPE 3/15

4 yo M
QFT+ 3/14
CXR abnl
RIPE 3/18

4 yo M
TST 20mm 3/16
CT chest abnl
RIPE 3/22

28 yo M
QFT+ 4/8
CXR abnl 5/8
RIPE 5/13

22 yo F
QFT+ 4/8
CXR nl
4R 5/14

2 yo M
TST+ 14mm 4/10
CXR abnl
RIPE 4/23

Source: Chuuk, Micronesia
>500/100k TB rate

Non-immigrant Visa Holders are not TB Tested

V • T • E	United States nonimmigrant visas
Diplomatic	A-1 · A-2 · A-3
Temporary	B-1 · B-2
Transit	C-1 · C-2 · C-3
Northern Mariana Islands	CW-1 · CW-2
Crewman	D-1 · D-2
Treaty investor	E-1 · E-2 · E-3 · E-3D · E-3R
Students	F-1 · F-2 · F-3
Official	G (G-1 · G-2 · G-3 · G-4 · G-5)
Temporary worker	**H-1A** · H-1B · H-1B1 · H-1C · H-2A · H-2B · H-2R · H-3 · H-4
Media / journalist	I-1
Cultural Exchange	J-1 · J-2
Family of US Citizen	K-1 · K-2 · K-3 · K-4
Intracompany transfer	L-1 · L-2
Vocational Students	M-1 · M-2 · M-3
SK visa dependents	N-8 · N-9
NATO	NATO-1 · NATO-2 · NATO-3 · NATO-4 · NATO-5 · NATO-6 · NATO-7
Extraordinary ability	O-1 · O-2 · O-3
Athletes, artists, entertainers	P-1 · P-2 · P-3 · P-4
Cultural exchange	Q-1
Religious	R-1 · R-2
Witnesses / informants	S-5 · S-6 · S-7
Human trafficking victims	T-1 · T-2 · T-3 · T-4 · T-5
USMCA professionals	TD · TN
Crime victims	U-1 · U-2 · U-3 · U-4 · U-5 · SIJS
Family of permanent residents	V-1 · V-2 · V-3
Visa Waiver Program	WB · WT · GB · GT

Year	Non-Immigrant Visa	Immigrant Visa
2014	9,932,480	
2015	10,891,745	
2016	10,381,491	
2017	9,681,913	
2018	9,028,026	
2019	8,742,068	462,422
2020	4,013,210	240,526
2021	2,792,083	285,069
2022	6,815,120	493,448
2023	10,438,327	562,976
2024	10,969,936	

NOT Tested

Tested for TB

Immigrant Categories

Immediate Relatives
Special Immigrants[1]
Vietnam Amerasian Immigrants
Family Sponsored Preference
Employment-Based Preference
Armed Forces Special Immigrants
Diversity Immigrants

Public Health

Breathless: An Outbreak of Silico-Tuberculosis Among Engineered Stone Countertop Fabrication Workers in Los Angeles County

David Fuller II, MD; Paul Holden Jr, MPH
Tuberculosis Control Program, County of Los Angeles Department of Public Health (DPH)

Introduction

- Silicosis is a fibrotic lung disease caused by inhaling silica dust, typically produced by occupations such as mining, stone cutting, construction, and demolition.
- Silicosis increases the relative risk of developing tuberculosis (TB) disease by 2.8-39 times[1] depending on the severity of silicosis.
- "Silico-tuberculosis" (silico-TB) describes individuals affected by both silicosis and TB.
- Since 2019, Los Angeles County (LAC), California, has identified 215 cases of silicosis among workers at engineered stone countertop fabrication facilities[2].
- This is an investigation of an outbreak of silico-TB disease among engineered stone countertop fabrication workers in LAC.

Methods

- In 2024, the LAC Tuberculosis Control Program (TBCP) was alerted by the Centers for Disease Control (CDC) TB Genotyping Information Management System (GIMS) to two new TB cases matching into a genotype cluster first identified in an engineered stone countertop fabrication facility worker in 2015.
- These two new cases were found to have worksite epidemiologic linkage (epi-link) to the index case of this cluster, and all three cases were also diagnosed with silicosis.
- It was hypothesized that worksite transmission had occurred with concomitant silicosis contributing to the development of subsequent cases.
- An outbreak investigation was performed by establishing a case definition, conducting chart review for all previous and new patients matching into this cluster, and reviewing worksite contact investigation (CI) outcomes.
- Data sources included the LAC Department of Health Services (DHS) electronic health records, LAC DPH contact investigation (CI) and TB registry databases, and TB GIMS.
- Outbreak cases were defined as individuals with TB disease matching into genotype cluster MTBC016610 diagnosed between 2015 and 2025 in LAC **PLUS** silicosis disease based on a history of occupational exposure to silica dust and the presence of: 1) chest radiography abnormalities interpreted as consistent with silicosis and/or 2) lung histopathology consistent with silicosis.

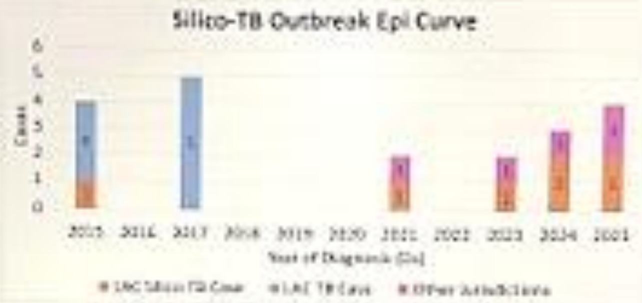


Figure 1. Epi curve. All TB cases in LAC who matched into this cluster since 2021 have been individuals with silicosis. One case from 2017 was culture negative. The silicosis status of cases from outside jurisdictions is unknown.

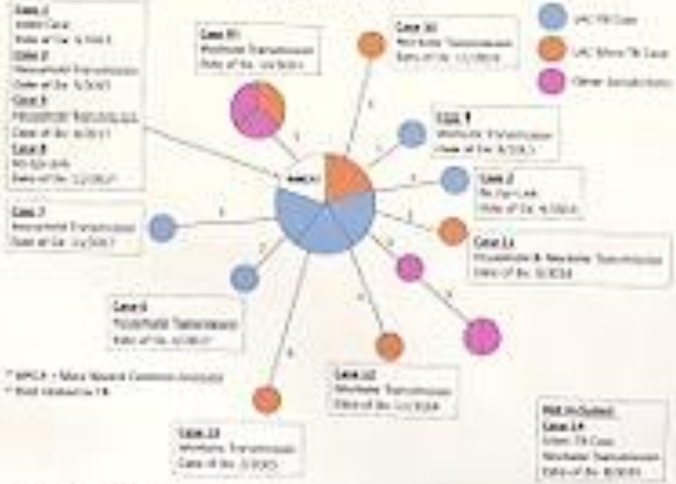


Figure 2. WGS phylogenetic tree. Numbers adjacent to line connecting cases indicate the number of single nucleotide polymorphisms (SNPs) between different cases. ≤5 SNPs indicates likely recent transmission. Case 14 not included in tree because final WGS analysis is not yet available.

Results

- Between 2015-2025, seven cases of silico-TB matching genotype cluster MTBC016610 were identified in LAC, along with 13 other cases without known silicosis (five outside LAC jurisdiction).
- Common features in the silico-TB cohort include sputum acid fast smear positivity, cavitary chest imaging, and history of employment at engineered stone countertop fabrication facilities.
- Five of six subsequent silico-TB cases had confirmed worksite exposure to the index case; the sixth case's epi-links could not be assessed due to the case's death.
- All subsequent silico-TB cases in this cluster developed TB disease more than five years after initial exposure to the infectious TB case.
- Worksite CI identified few contacts with latent TB infection (LTBI), but none completed preventative treatment.

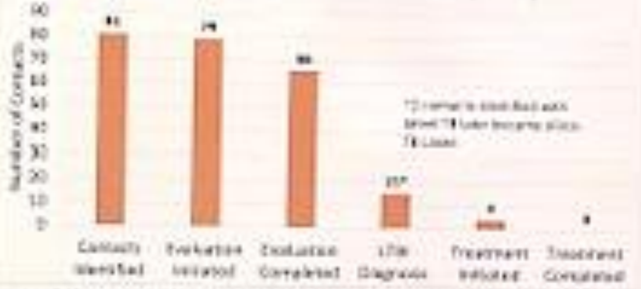


Figure 3. Care cascade for worksite contact investigations. Seven worksite CIs were completed for four silico-TB cases, and final results for one CI are pending. One case's CI was not completed due to patient's death prior to worksite investigation, and two cases did not have worksite CI since they were no longer working in a shared workspace during their infectious periods.

Conclusions

- There was a significant delay (>5 years) between initial exposure and the development of silico-TB disease for many cases in this cluster.
- This delayed presentation may contribute to ongoing TB transmission.
- Silicosis was frequently diagnosed concurrently with active TB disease.
- Targeted TB screening and preventative treatment of workers at engineered stone countertop fabrication facilities could prevent future incidents of TB disease and halt spread of infection.
- Barriers to testing/treatment include reduced public health funding and worker reluctance to participate in TB screening and contact investigations driven by concerns about immigration enforcement.

[1] Barboza CE, Winter DH, Seiscento M, Santos Ude P, Terra Filho M. Tuberculosis and silicosis: epidemiology, diagnosis and chemoprophylaxis. J Bras Pneumol. 2008;34(11):959-966.
[2] California Department of Public Health, Occupational Health Branch, California Engineered Stone Silicosis Dashboard.

Acknowledgements: [illegible]

TB transmission in countertop workers, California:

2015 - 2025

Silico-TB Outbreak Whole Genome Sequencing (WGS) Phylogenetic Tree

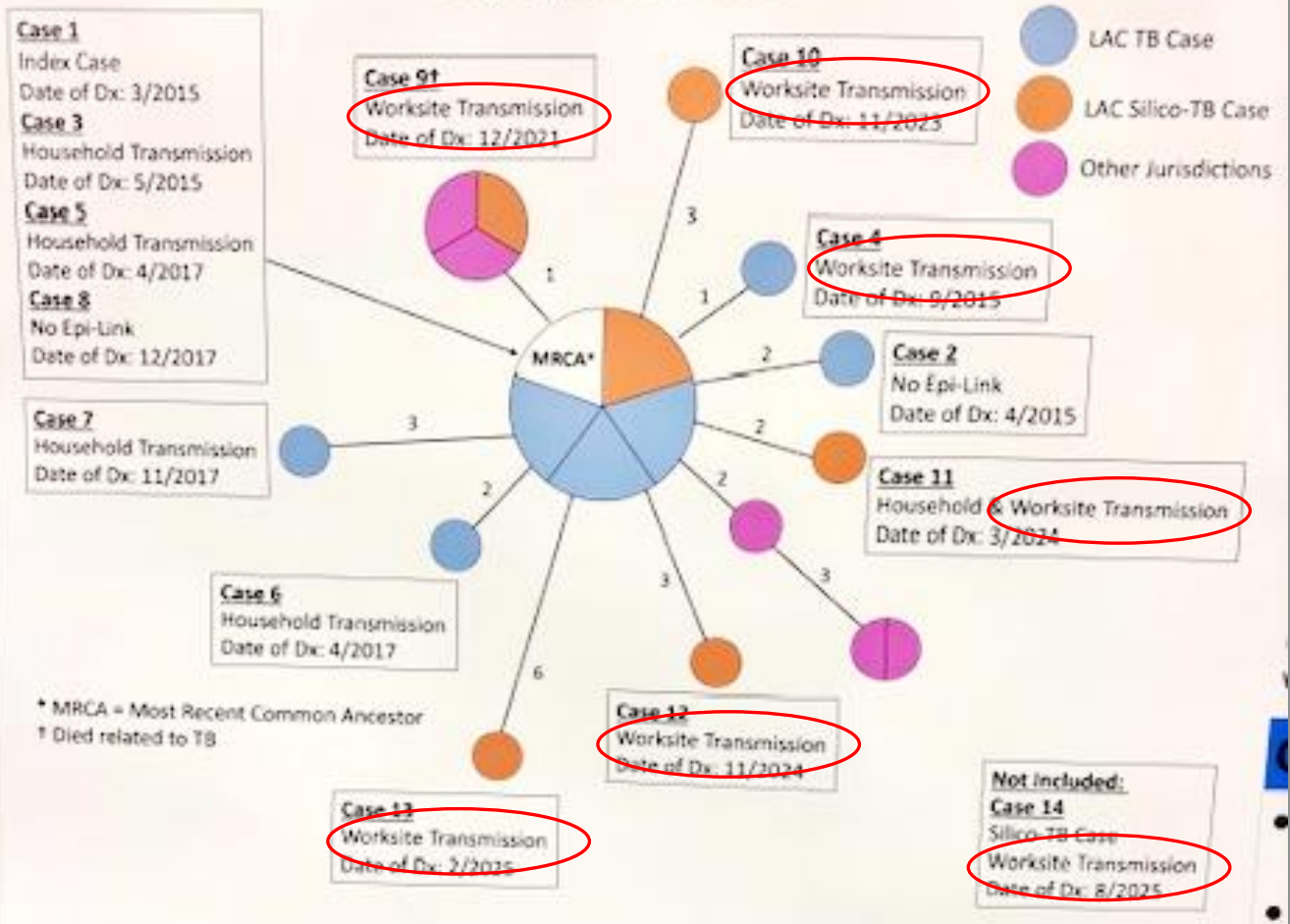


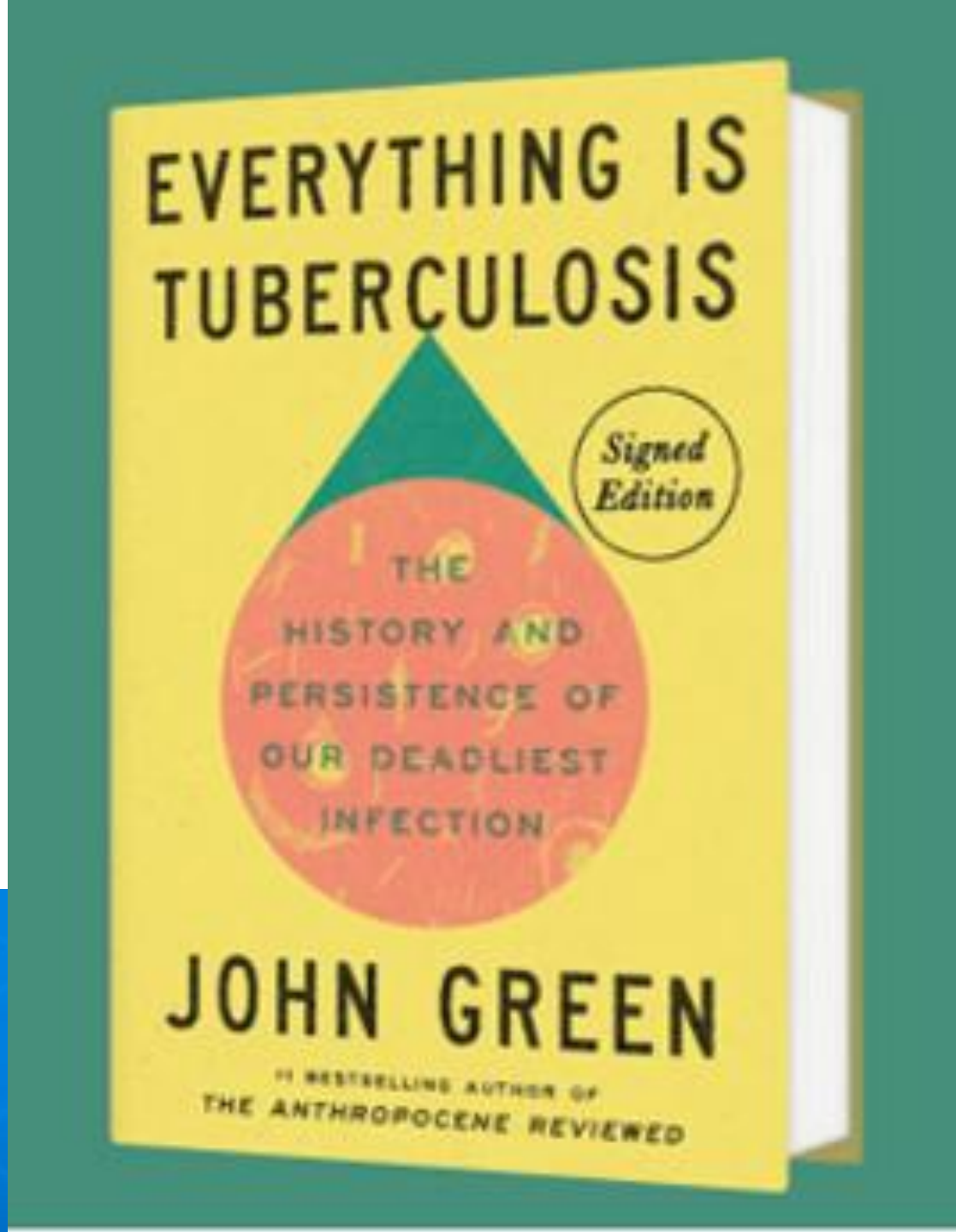
Figure 2. WGS phylogenetic tree. Numbers adjacent to line connecting cases indicate the number of single nucleotide polymorphisms (SNPs) between different cases. ≤5 SNPs indicates likely recent transmission. Case 14 not included in tree because final WGS analysis is not yet available.

TB IN A CHANGED WORLD

$457M TB support cancelled; treatments stopped mid-way; 1/3 of the global TB funding gone

“TB has long exploited human biases and blindspots, wriggling its way through the paths injustice creates.

For centuries, the disease has used social forces and prejudice to thrive wherever social systems devalue human lives.”



Conclusions!

These are cautionary tales, reminding us that:

bad TB can happen in low incidence jurisdictions

that the children pay heavy prices

that getting TB is about proximity

that TB infection is a continuum, not 2 separate states

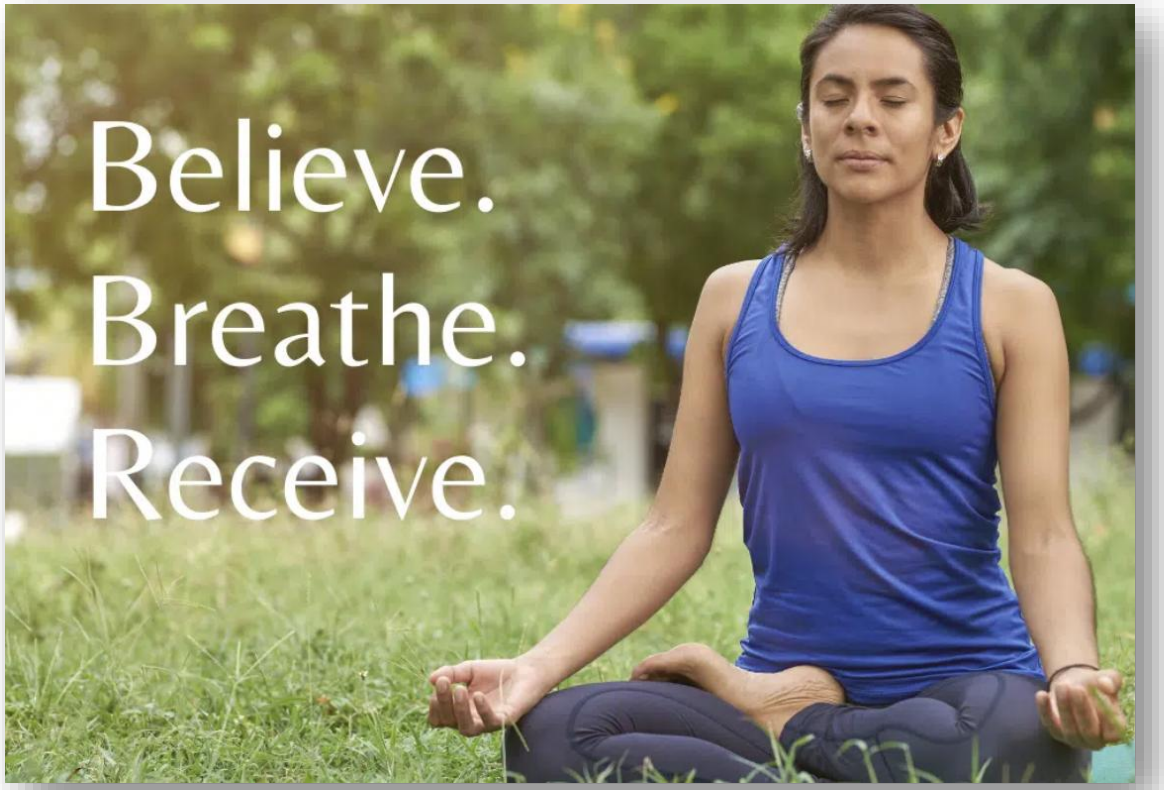
that sources may come on legal visas without TB testing

that TB spreads in workplaces

That outbreaks can go on for years

Cost millions of dollars and cause massive suffering.

And can be prevented
with 1 tube of blood and
12 days of antibiotics!



Thank you for your attention and care.

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Thank you