

TB TESTING IN CHILDREN



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THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT TYLER
HEART *Land*
NATIONAL TB CENTER
A PARTNERSHIP OF UT HEALTH SCIENCE CENTER AND TCID


UTHealth | Medical School
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THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT TYLER
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BCM
Baylor College of Medicine

TB TESTING METHODS IN CHILDREN

Tuberculin Skin Test (TST):

- Measures the delayed-type hypersensitivity reaction to purified protein derivative (PPD) of *Mycobacterium tuberculosis* (Mtb)
- Is widely available
- Because the protein derivative is present in many non-tuberculous mycobacteria (e.g., BCG) it is less specific than other tests

Quantiferon Gold In-Tube® (QFT-GIT):

- Measures the quantity of IFN-gamma released by T cells in response to Mtb-specific antigens
- More specific to Mtb than the TST, similar sensitivity
- Requires a blood draw and laboratory capabilities

T-SPOT.TB®:

- Counts the T cells secreting IFN-gamma in response to Mtb-specific antigens
- More specific to Mtb than the TST, similar sensitivity
- Requires a blood draw and laboratory capabilities

TESTING PROCEDURE

Tuberculin Skin Test:

- Placed in the office
- Requires two visits
 - one to place to the test
 - one to read the test
- Results read by the provider 48-72 hours after placement

QFT/T-SPOT:

- Blood draw
- Send out laboratory test
- Results usually back within 2-3 days

INTERPRETING RESULTS OF A QUANTIFERON TB GOLD IN-TUBE

Nil (IU/mL)	TB Antigen minus Nil (IU/mL)	QFT-GIT Result	Mitogen	Interpretation
≤ 8.0	< 0.35 or ≥ 0.35 and < 25% of Nil value	Negative	≥ 5.0	<i>M. tuberculosis</i> infection unlikely
≤ 8.0	≥ 0.35 and ≥ 25% of Nil value	POSITIVE	ANY	<i>M. tuberculosis</i> infection likely
≥ 8.0	ANY	Indeterminate	ANY	Indeterminate
≤ 8.0	< 0.35 or ≥ 0.35 and < 25% of Nil value	Indeterminate	< 5.0	Indeterminate

INTERPRETING RESULTS OF A T-SPOT.TB®

Nil	TB Response	Result	Mitogen	Interpretation
≤ 10 spots	≥ 8 spots	POSITIVE	Any	<i>M. tuberculosis</i> infection likely
≤ 10 spots	5, 6, or 7 spots	Borderline	Any	Uncertain likelihood of <i>M. tuberculosis</i> infection
≤ 10 spots	≤ 4 spots	Negative	Any	<i>M. tuberculosis</i> infection unlikely
> 10 ≤ 10	Any Both panels < 5 spots	Indeterminate	< 20 spots	Uncertain likelihood of <i>M. tuberculosis</i> infection

Note: Repeating an IGRA or performing a TST may be useful when the initial IGRA result is indeterminate, borderline, or invalid, and a reason for testing persists.

NEXT STEPS

If a child tests positive for TB infection by any of these tests, additional information regarding treatment for latent TB infection (LTBI) or TB disease can be found in *TB at a Glance*

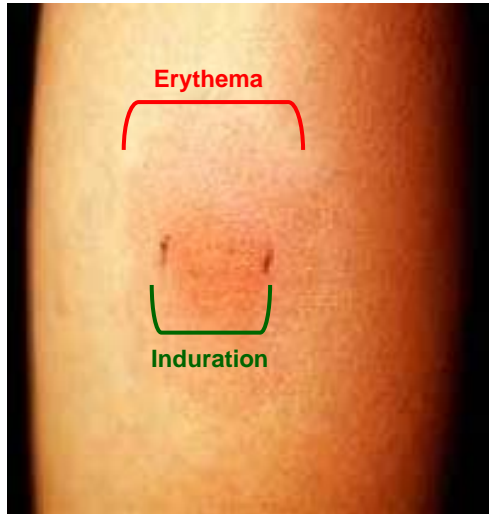
(http://www.heartlandntbc.org/products/tb_at_a_glance.pdf), an educational product provided by Heartland National TB Center.

INTERPRETATION

Reading a Tuberculin Skin Test:

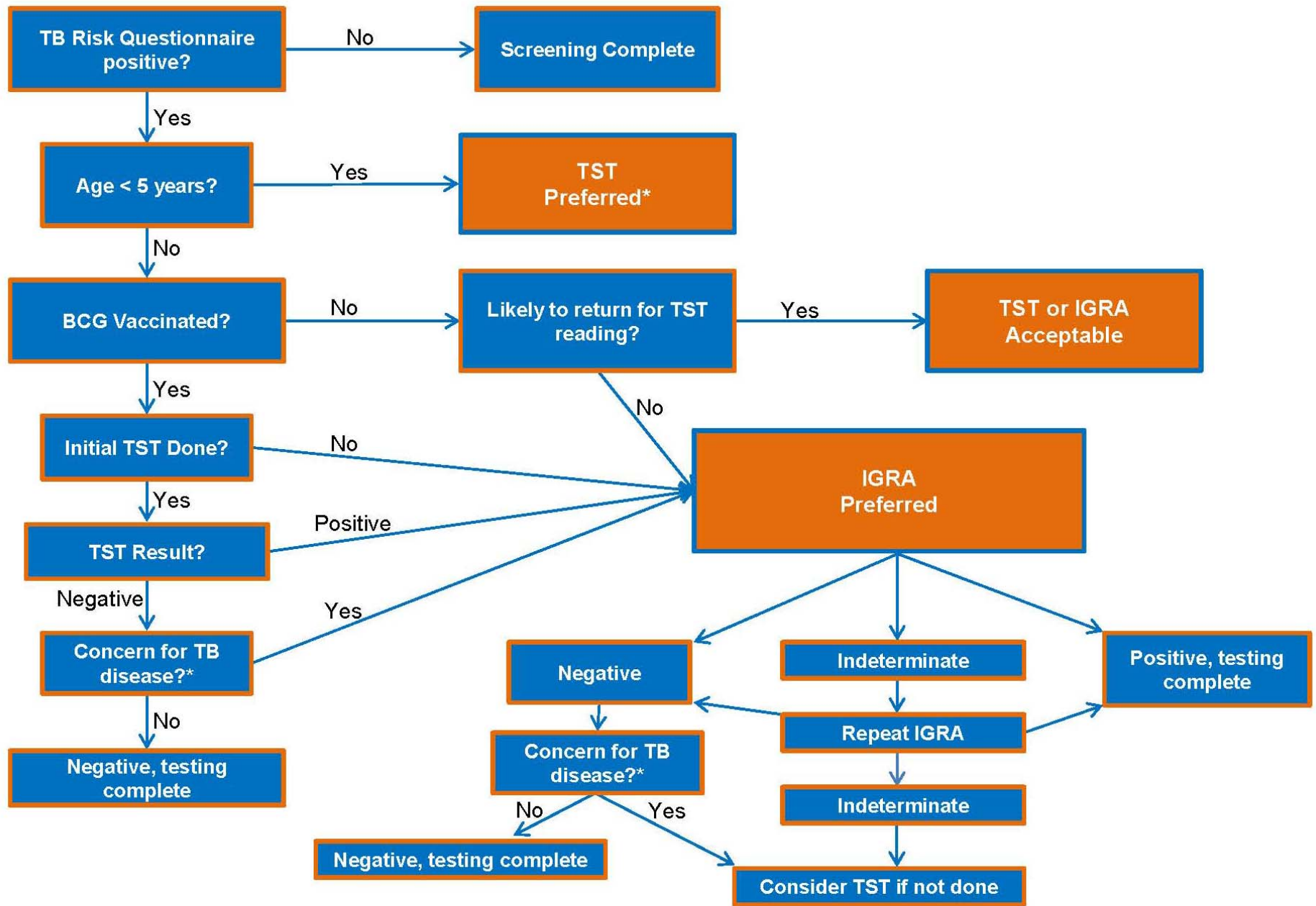
Induration not erythema is measured! Measure the induration laterally across the forearm. Measure with a millimeter ruler. The TST is positive if the induration measures:

- $\geq 5\text{mm}$ in HIV co-infection, immunocompromised, recent TB contact, suspected disease
- $\geq 10\text{mm}$ in foreign born from a high risk country, drug use, living in HR (High Risk) congregate setting, children ≤ 4 , specific HR groups
- $\geq 15\text{mm}$ with no risk factor



What's Measured?	Tuberculin Skin Test (TST) (> 100 years)	QuantIFERON-TB Gold In-Tube Test® (QFT-GIT) (2007)	T-SPOT.TB® (2008)
	Delayed hypersensitivity to PPD (purified protein derivative) from mycobacteria	Amount of IFN-g secreted in response to <i>Mycobacterium tuberculosis</i> -specific antigens	Number of T-cells secreting IFN-g in response to <i>Mycobacterium tuberculosis</i> -specific antigens
What's Needed?	2 visits Trained personnel, accurate test placement and measurement	1 visit 3 mL blood	1 visit 2, 4, or 8 mL blood (depending on tube size)
Sensitivity	General: 89-95% (Children: ~90%)	General: 70-83% (Children: ~90%)	General: 90-91% (Children: ~90%)
Specificity	General: 85-86% (Children: ~90%)	General: ~90%	General: ~90%
Antigens Studied	Many	ESAT-6, CFP-10 (TB 7.7 for QFT-GIT only)	
Cross reactivity with BCG	Yes	No	No
Cross reactivity with NTM (non-tuberculous mycobacteria)	Yes	<i>M. kansasii</i> <i>M. marinum</i> <i>M. szulgai</i>	
Boosting following TST	Yes	Possibly	
Distinguish between LTBI and active disease?	No	No	No
When to use a TST vs. IGRA (with preference, but either is acceptable)	Children < 5 years old	Patients (≥ 5 years old) who may not return for a second visit	
When to use a TST or an IGRA without preference	Testing recent contacts of persons with known or suspected active TB disease. (May need to test over time)	Patients who have received the BCG vaccine	
	If the initial test is negative, and there is a risk of infection, progression, and poor outcome (e.g., a patient screening for immune modulator)		
	If the initial test is negative, and there is a clinical suspicion for active TB disease and confirmation is desired (Increased sensitivity)		
	Initial test is positive and further evidence is required to encourage treatment compliance		
When to use a TST and an IGRA	Initial IGRA is indeterminate, borderline, or invalid		
	Any value from an initial IGRA is unusual		

ALGORITHM FOR TB TESTING CHILDREN



*A positive TST or IGRA is significant if there is clinical suspicion of disease or a high risk of progression to disease.

Geltemeyer A, Smith KC. 16th Annual Conference of the IUATLD-North American Region, Feb 2012.