The Big Picture: State Lab Updates

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November 6, 2025

TB Nurse Expert Meeting · November 6-7, 2025 · San Antonio, Texas

TEXAS Health and Human Services

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Current Testing Offered at the Texas DSHS Mycobacteriology Laboratory

TB Nurse Expert Meeting

November 6, 2025

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Jan Owen has the following disclosures to make:

- No conflicts of interest
- No relevant financial relationships with any commercial companies mentioned in this educational activity

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Objectives

- Discuss tests offered, both historical and those recently added
- Present an interesting test result scenario

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Tests offered at Texas DSHS

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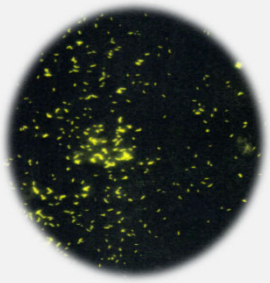
Acid Fast Bacilli Microscopy (AFB Smear)

- Important things to remember
  - Not sensitive - misses ~50% of TB
    - 5,000 to 10,000 AFB/ml must be present to be detected in 1 drop for smear
    - It is possible to have a negative smear but a positive culture
  - Positive smear may be a non-tuberculous mycobacteria species
  - Can detect dead organism



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Nucleic Acid Amplification Test (NAAT)

- Tiny amounts of DNA/RNA are amplified until there is enough for easy detection (PCR or Polymerase Chain Reaction)
  - Identification of MTB culture
  - Detection of certain mutations conferring rifampin resistance
- Like the smear, does not distinguish between live and dead bacilli
  - For initial specimens only
  - Not recommended for monitoring already detected infection
  - Cured patients may be NAAT + for years
- Sensitivity of test
  - >95% for AFB smear-positive
  - Only 55-75% for AFB smear-negative

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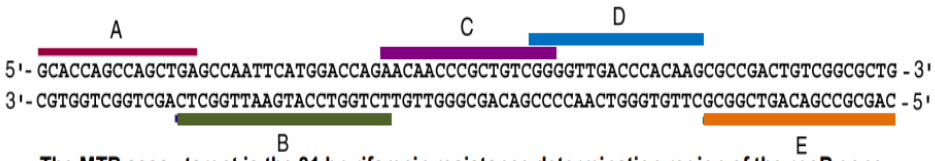
Cepheid GeneXpert ® Target Region



The MTB assay target is the 81 bp rifampin resistance determination region of the rpoB gene.

- Approximately 10% of rifampin resistant predictions are false and are often found when Probe B does not bind
- GX Rifampin resistant results must be confirmed by molecular detection of drug resistance (MDDR) at the CDC

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AFB Culture

- More sensitive than smear
  - 5,000 to 10,000 AFB/ml must be present to be detected in 1 drop for smear
  - ~10 viable AFB/ml must be present for culture to grow
- Required for drug susceptibilities & genotype (WGS)
- HPLC is methodology used at DSHS
- Lengthy
  - Cultures are held for 6 weeks before being called negative

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Drug Susceptibility Testing (DST) of *M. tuberculosis complex*

- Initial isolate will be tested against first-line drugs (FLD) and a fluoroquinolone
  - Isoniazid (2 concentrations), Rifampin, Ethambutol, Ofloxacin, Pyrazinamide (tested by WGS)
  - Repeat test if patient is culture+ after 3 mo. of treatment
- For isolates resistant to Rifampin or to any 2 FLDs: test second-line drug panel
  - Ethionamide, Rifabutin, Capreomycin, Kanamycin, Streptomycin

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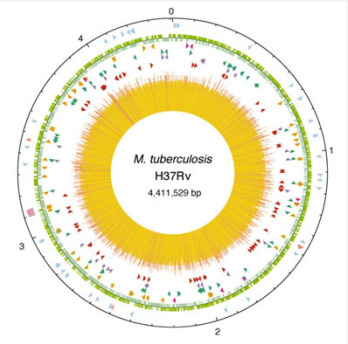
Molecular DST using Whole Genome Sequencing

- WGS looks at entire DNA profile of *MTB complex*
- Originally instated to obtain PZA results
  - Results also available for Isoniazid, Rifampin, Ethambutol and Ofloxacin (Fluoroquinolone)
  - Reports list specific mutation(s) present and state whether susceptible or resistant



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Speciation of the MTB complex

- PCR test that can differentiate M. bovis and M. bovis bcg from the MTB complex
- Specimens were previously sent to CDC but testing could take months
  - Performed when genotyping suggests bovis, bcg
  - Performed by special request for submitters nationwide (CDC no longer offers this test)

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MALDI-TOF Testing

- Mass spectrometry technique
  - Uses matrix-assisted laser desorption/ionization to create ions which are then detected by a time-of flight analyzer
  - Ability to be more specific about groups and complexes
  - Test has been recently validated at DSHS Lab and will be available soon

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Test Result Scenario

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2025 Scenario

- Eighty y/o male visiting from Mexico
- Poor health
- Rifampin resistant by Xpert

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MDDR Report

Rifampin (RIF)	Result	Interpretation
RIF interpretation		RIF resistant
rpoB*	His445Tyr	

Comments and Disclaimers
* DTBE Reference Laboratory has transitioned from the E. coli to the M. tuberculosis numbering system for reporting rpoB gene mutations.

Isoniazid (INH)	Result	Interpretation
INH interpretation		INH resistant
inhA	No mutation	
fabG1	No mutation	
katG	Ser315Thr	

Ethambutol (EMB)	Result	Interpretation
EMB interpretation		Effect of mutation unknown. Cannot rule out EMB resistance.
embB	Trp290Cys	

Pyrazinamide (PZA)	Result	Interpretation
PZA interpretation		Effect of mutation unknown. Cannot rule out PZA resistance.
pncA	Ile6frameshift	

Fluoroquinolones (FQ)	Result	Interpretation
FQ interpretation		Cannot rule out FQ resistance.
gyrA	No mutation	
gyrB	No mutation	

Amikacin, Capreomycin, and Kanamycin (AMK, CAP, and KAN)	Result	Interpretation
AMK CAP and KAN interpretation		Cannot rule out resistance to AMK, CAP, and KAN.
rrs	No mutation	
eis	No mutation	

Bedaquiline (BDQ)	Result	Interpretation
BDQ interpretation		Effect of mutation unknown. Cannot rule out BDQ resistance.
atpE	No mutation	
rv0678	Asp15Glu	
pepQ	No mutation	

Clofazimine (CFZ)	Result	Interpretation
CFZ interpretation		Effect of mutation unknown. Cannot rule out CFZ resistance.
pepQ	No mutation	
rv0678	Asp15Glu	

Linezolid (LZD)	Result	Interpretation
LZD interpretation		Effect of mutation unknown. Cannot rule out LZD resistance.
rplC	No mutation	
rrl	C2070A, C2130A	

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Conventional DST Result (Wadsworth Center NYHD)

- BPaL Susceptibility testing for M. tuberculosis complex (MGIT)
  - Bedaquiline [1.0 ug/ml]: **Susceptible**
  - Clofazimine [1.0 ug/ml]: **Susceptible**
  - Linezolid [1.0 ug/ml]: **Susceptible**

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Summary

- Each of these testing methods have individual benefits and disadvantages
- Understanding these characteristics can reconcile seeming discordance
- Integrating these methods provides a clearer understanding of patient's situation and appropriate treatment especially with the rise of resistant and complex results
- If unsure how to interpret results, ask!

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Thank You!

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