

Overview

Useful For

Susceptibility testing of *Mycobacterium tuberculosis* complex isolates growing in pure culture against pyrazinamide

Confirming *M tuberculosis* complex resistance to pyrazinamide

Reflex Tests

Test Id	Reporting Name	Available Separately	Always Performed
MTBVP	Mtb PZA Confirmation, pnc A Sequence	No, (Bill Only)	No

Additional Tests

Test Id	Reporting Name	Available Separately	Always Performed
STVP	Susceptibility, Mtb Complex, PZA	No, (Bill Only)	Yes

Testing Algorithm

When this test is ordered the additional test will always be performed at an additional charge.  
If resistance to pyrazinamide is detected, the reflex test for confirmation of resistance will be performed at an additional charge.

Special Instructions

- [Infectious Specimen Shipping Guidelines](#)

Method Name

Broth Dilution at Critical Drug Concentrations

NY State Available

Yes

Specimen

Specimen Type

Varies

Ordering Guidance

To test for first-line agents, isoniazid, rifampin and ethambutol, order TB1LN / Antimicrobial Susceptibility, *Mycobacterium tuberculosis* Complex, First Line, Varies

Additional Testing Requirements

CTB / Mycobacteria and *Nocardia* Culture, Varies or CTBID / Culture Referred for Identification, *Mycobacterium* and *Nocardia*, Varies must also be ordered and will be charged separately **unless identification of organism is provided**.

Shipping Instructions

1. See [Infectious Specimen Shipping Guidelines](#)
2. Place specimen in a large infectious container (T146) and label as an etiologic agent/infectious substance.

Necessary Information

Specimen source and suspected organism identification are required.

Specimen Required

- Specimen Type: Organism
- Supplies: Infectious Container, Large (T146)
- Container/Tube: Middlebrook 7H10 agar slant
- Specimen Volume: Isolate
- Collection Instructions: Organism must be in pure culture, actively growing.

Forms

If not ordering electronically, complete, print, and send a [Microbiology Test Request](#) (T244) with the specimen.

Reject Due To

Other	Agar plate
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Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Varies	Ambient (preferred)		
	Refrigerated		

Clinical & Interpretive

Clinical Information

Primary treatment regimens for *Mycobacterium tuberculosis* complex often include isoniazid, rifampin, ethambutol, and pyrazinamide (PZA). Susceptibility testing of each *M tuberculosis* complex isolate against these first-line antimycobacterial agents is a key component of patient management.

The Clinical and Laboratory Standards Institute (CLSI) provides consensus protocols for the methods, antimycobacterial agents, and critical concentrations of each agent to be tested in order to permit standardized interpretation of *M tuberculosis* complex susceptibility test results. Current recommendations indicate that laboratories should use a rapid

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broth method in order to obtain *M tuberculosis* complex susceptibility data as quickly as possible to help guide patient management. According to the CLSI, resistance can be confirmed by another method or by another laboratory at the discretion of the testing laboratory.

This test uses an FDA-cleared commercial system for rapid broth susceptibility testing of *M tuberculosis* complex against PZA. Since the literature indicates that broth testing of PZA can, at times, produce falsely resistant results, resistance to PZA by the broth method is automatically confirmed by *pncA* DNA sequencing. The *pncA* gene of *M tuberculosis* complex is responsible for activation of the prodrug PZA and hence PZA activity. Variations in the *pncA* gene and upstream promoter region have been reported to account for the majority (70%-97%) of PZA-resistant isolates. However, 3% to 30% of PZA-resistant isolates do not have a corresponding *pncA* variant and other genes (eg, *rpsA*) may also play a role.

A separate test is available for testing of the other first-line agents (isoniazid, rifampin and ethambutol). If desired, this must be ordered separately; TB1LN / Antimicrobial Susceptibility, *Mycobacterium tuberculosis* Complex, First Line, Varies.

### Reference Values

Results are reported as susceptible or resistant.

### Interpretation

*Mycobacterium tuberculosis* complex isolates are reported as susceptible or resistant to pyrazinamide at the critical concentration.

### Cautions

For resistant organisms, confirmatory testing using *pncA* DNA sequencing is automatically performed and the presence or absence of *pncA* variations associated with pyrazinamide resistance is reported.

In vitro susceptibility does not guarantee clinical response. Therefore, the decision to treat with a particular agent should not be based solely on the antimicrobial susceptibility testing result.

Susceptibility testing should be performed on pure culture isolates of *Mycobacterium tuberculosis* complex.

Some variants associated with pyrazinamide resistance that may occur outside of the *pncA* promoter and gene region and may therefore not be confirmed by DNA sequencing of this target.

### Clinical Reference

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3. Dormandy J, Somoskovi A, Kreiswirth BN, et al: Discrepant results between pyrazinamide susceptibility testing by the reference BACTEC 460TB method and *pncA* DNA sequencing in patients infected with multidrug-resistant W-Beijing *Mycobacterium tuberculosis* strains. *Chest* 2007;131:497-501
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5. Campbell PJ, Morlock GP, Sikes RD, et al: Molecular resistance of mutations associated with first- and second-line drug resistance compared with conventional drug susceptibility testing of *Mycobacterium tuberculosis*. Antimicrob Agents Chemother 2011;55:2032-2041
6. Shi W, Zhang X, Jiang X, et al: Pyrazinamide inhibits trans-translation in *Mycobacterium tuberculosis*. Science 2011;333:1630-1632
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8. CLSI. Performance Standards for Susceptibility Testing of *Mycobacteria*, *Nocardia* species, and Other Aerobic Actinomycetes. First edition. CLSI supplement M62. Clinical and Laboratory Standards Institute; 2018
9. LaBombardi VJ: Comparison of the ESP and BACTEC Systems for testing susceptibilities of *Mycobacterium tuberculosis* complex isolates to pyrazinamide. J Clin Microbiol 2002;40:2238-2239
10. Espasa M, Salvado M, Vicente E, et al: Evaluation of the VersaTREK system compared to the Bactec MGIT 960 system for first-line drug susceptibility testing of *Mycobacterium tuberculosis*. J Clin Microbiol 2012;50:488-491
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12. Jureen P, Werngren J, Toro JC, Hoffner S: Pyrazinamide resistance and *pncA* gene mutations in *Mycobacterium tuberculosis*. Antimicrob Agents Chemother 2008;52:1852-1854

## Performance

### Method Description

This test method is based on presence or absence of growth of *Mycobacterium tuberculosis* in broth cultures with the presence of critical concentrations of the antimycobacterial drug pyrazinamide. One of 2 FDA-cleared platforms (VersaTREK or BD MGIT 960) may be used.

The VersaTrek platform uses the presence or absence of a pressure increase inside broth vials containing *M tuberculosis* in the presence of critical concentrations of the antimycobacterial drug pyrazinamide. Increasing pressure indicates the presence of actively growing *M tuberculosis* that is resistant pyrazinamide at 300 mcg/mL. Low or undetectable pressure increases in the presence of critical drug concentration suggests a lack of *M tuberculosis* growth and susceptibility to pyrazinamide 300 mcg/mL.(Package insert: VersaTREK Mycobacteria Detection and Susceptibility Testing system, TREK Diagnostics, 04/ 2014)

The BACTEC MGIT 960 platform uses the production and measurement of fluorescence within a Mycobacterial Growth Indicator Tube (MGIT) in the presence of actively growing *M tuberculosis* complex isolates in the presence of critical concentration of the antimycobacterial drug pyrazinamide. Low or undetectable levels of fluorescence in the presence of critical drug concentrations suggests lack of *M tuberculosis* growth and susceptibility to pyrazinamide at 100 mcg/mL. Increased fluorescence suggests active growth of *M tuberculosis* and resistance to pyrazinamide at 100

mcg/mL.(Package insert: BACTEC MGIT 960 SIRE Kit, BD Diagnostics, 10/ 2016)

PDF Report

No

Day(s) Performed

Monday through Sunday

Report Available

10 to 21 days

Specimen Retention Time

1 year

Performing Laboratory Location

Rochester

Fees & Codes

Fees

- Authorized users can sign in to [Test Prices](#) for detailed fee information.
- Clients without access to Test Prices can contact [Customer Service](#) 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact [Customer Service](#).

Test Classification

This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information

87188-Susceptibility, *Mycobacterium tuberculosis* Complex, Pyrazinamide  
87153-Mtb PZA Confirmation, pncA Sequencing (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
TBPZA	Susceptibility, Mtb Complex, PZA	56026-8

Result ID	Test Result Name	Result LOINC® Value
TBPZA	Susceptibility, Mtb Complex, PZA	56026-8