MAYO CLINIC LABORATORIES

Test Definition: MTBRP

Mycobacterium tuberculosis Complex, Molecular Detection, PCR, Varies

Overview

Useful For

Rapid detection of *Mycobacterium tuberculosis* complex DNA (preferred method)

Detection of *M tuberculosis*, when used in conjunction with mycobacterial culture

This test **does not assess** *M tuberculosis* rifampin resistance.

This test should **not be used** to determine bacteriologic cure or to monitor response to therapy.

This test is **not intended for** the detection of latent tuberculosis and **must not be used** as a substitute for tests intended for detection of latent tuberculosis such as the tuberculin skin test or an interferon gamma release assay.

Reflex Tests

Test Id	Reporting Name	Available Separately	Always Performed
TBT	Concentration, Mycobacteria	No, (Bill Only)	No

Testing Algorithm

When this test is ordered, the reflex test may be performed at an additional charge.

For more information see Meningitis/Encephalitis Panel Algorithm.

Special Instructions

- Meningitis/Encephalitis Panel Algorithm

Method Name

Real-Time Polymerase Chain Reaction (PCR)

NY State Available

Yes

Specimen

Specimen Type

Varies

Ordering Guidance

This test does not provide rifampin resistance information and is most useful for non-sputum specimens. For sputum specimens, the recommended test is MTBXS / Mycobacterium tuberculosis complex, Molecular Detection and Rifampin Resistance, PCR, Sputum. MTBXS provides rapid resistance information to aid with patient management.

Additional Testing Requirements

This test must always be performed in conjunction with mycobacterial culture. If your facility is unable to perform mycobacterial culture, order CTB / Mycobacteria and *Nocardia* Culture, Varies concurrently with this test.

Shipping Instructions

Specimen must arrive within 7 days of collection; if greater than 7 days of collection, the specimen will be rejected.

Necessary Information

Specimen source is required.

Specimen Required

Submit a raw clinical sample (not a culture isolate) for testing.

Fresh, undigested specimens are preferred. If no fresh specimen is available, digested respiratory specimens treated with N-acetyl-L-cysteine/sodium hydroxide (NALC/NaOH) are acceptable for some specimen types. For detailed information, see the **Specimen Type** information below.

The high sensitivity of amplification by polymerase chain reaction (PCR) requires the specimen to be processed in an environment in which contamination of the specimen by *Mycobacterium tuberculosis* DNA is unlikely.

If a single specimen is being shared between mycobacteria culture, acid-fast smear, and/or *M tuberculosis* PCR, a minimum volume of 2 mL for body fluid, 3 mL for respiratory specimen, or a pea-sized piece of tissue should be obtained. Specimen volumes less than indicated may decrease sensitivity of testing. If insufficient volume is submitted, test or tests will be canceled.

Submit only 1 of the following specimens:

Preferred Specimen Types

Specimen Type: Body fluid
Sources: Body, bone marrow aspirate, ocular, or CSF
Container/Tube: Sterile container
Specimen Volume: 1 mL
Additional Information: Only fresh, non-NALC/NaOH-digested body fluids are acceptable.

Specimen Type: Gastric washing
Container/Tube: Sterile container
Specimen Volume: 2 mL

Specimen Type: Respiratory

Sources: BAL, bronchial washing, tracheal secretion, or sputum
Container/Tube: Sterile container
Specimen Volume: 1 mL if only PCR ordered or 3 mL if PCR ordered with smear and culture
Additional Information: Before collecting sputum specimens, see Ordering Guidance.

Specimen Type: Feces
Container/Tube: Sterile container
Specimen Volume: 5 to 10 g
Additional Information: Only fresh, non-NALC/NaOH-digested fecal specimens are acceptable.

Specimen Type: Tissue
Sources: Fresh tissue, bone, or bone marrow biopsy
Container/Tube: Sterile container
Specimen Volume: 5 to 10 mm
Collection Instructions: Keep moist with sterile water or sterile saline
Additional Information: Only fresh, non-NALC/NaOH-digested tissue is acceptable.

Specimen Type: Urine
Container/Tube: Sterile container
Specimen Volume: 1 mL
Collection Instructions: Collect a random urine specimen.

Acceptable Specimen Types

Specimen Type: NALC/NaOH-digested respiratory specimens
Sources: Lavage fluid, bronchial washing, gastric washing, respiratory fluid, sputum, or tracheal secretion
Container/Tube: Sterile container
Specimen Volume: 2 mL
Collection Instructions:
1. Submit digested specimen treated with NALC/NaOH.
2. Clearly indicate on container and order form that specimen is a digested specimen.

Forms

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

Specimen Minimum Volume

Body fluid, nondigested respiratory specimen, urine: 0.5 mL; Fresh tissue or bone: 5 mm; NALC-NaOH-digested specimen, gastric washing: 1 mL; Stool: 5 g

Reject Due To

Blood Specimen in anaerobe vial or viral	Reject

transport medium (including but not limited to M4, M5, BD viral transport media, thioglycolate broth) Swabs Tissues in formalin fluid	

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Varies	Refrigerated (preferred)	7 days	
	Frozen	7 days	

Clinical & Interpretive

Clinical Information

Each year, *Mycobacterium tuberculosis* accounts for more than a million deaths and is responsible for millions of newly diagnosed cases of tuberculosis worldwide. *M tuberculosis* is spread from person-to-person via respiratory transmission and has the potential to become resistant to many or all antibiotics currently used if antimycobacterial treatment is not promptly initiated. Therefore, rapid and accurate detection of *M tuberculosis* in patient specimens is of clinical and public health importance.

Conventional culture methods can generally detect *M tuberculosis* in 2 to 3 weeks, although up to 8 weeks of incubation may be required in some instances. Developed at Mayo Clinic, this rapid polymerase chain reaction (PCR) assay detects *M tuberculosis* complex DNA directly from specimens without waiting for growth in culture and, therefore, the results are available rapidly after receipt in the laboratory. A mycobacterial culture must always be performed in addition to the PCR assay. The PCR assay is rapid, but the culture has increased sensitivity over the PCR assay. The PCR assay targets a unique sequence within the *katG* gene, which is present in members of the *M tuberculosis* complex. In addition, the assay can detect genotypic resistance to isoniazid mediated by mutations in the *katG* target, when present.

Reference Values

Not applicable

Interpretation

A positive result indicates the presence of *Mycobacterium tuberculosis* complex DNA. Members of the *M tuberculosis* complex detected by this assay include *M tuberculosis, Mycobacterium bovis, Mycobacterium bovis* bacillus

Calmette-Guerin*, Mycobacterium africanum, Mycobacterium canettii*, and *Mycobacterium microti.* Other species within the *M tuberculosis* complex (eg, *Mycobacterium caprae, Mycobacterium pinnipedii,* and *Mycobacterium mungi*) should, in theory, be detected using the primer and probe sequences in this assay, but they have not been tested. This assay method does not distinguish between the species of the *M tuberculosis* complex. If an isolate of *M tuberculosis* complex is already available, species identification can be performed; order TBSP / *Mycobacterium tuberculosis* Complex Species Identification, PCR, Varies.

A negative result indicates the absence of detectable *M tuberculosis* complex DNA.

Isoniazid (INH) resistance mediated through a *katG* variant will be reported when observed but lack of a *katG* variant does not imply that the isolate is susceptible to INH. There are other genetic loci in addition to *katG* that can contribute to resistance for this drug.

Cautions

A mycobacterial culture must always be performed in addition to the polymerase chain reaction (PCR) test. If your facility is unable to perform mycobacterial culture, the Mycobacteria Culture test (CTB / Mycobacteria and *Nocardia* Culture, Varies) should be ordered. The overall sensitivity of the PCR from acid-fast smear positive specimens is approximately 96% compared to mycobacterial culture but sensitivity of the PCR from a smear negative specimen is lower and a negative result does not rule out *M. tuberculosis* complex.

This rapid PCR assay detects *Mycobacterium tuberculosis* complex nucleic acid and, therefore, does not distinguish between viable, disease-related organisms and nucleic acid persisting from prior infection. Test results should be correlated with patient symptoms and clinical presentation before a definitive diagnosis is made.

A negative result does not rule out the presence of *M tuberculosis* complex or active disease because the organism may be present at levels below the limit of detection for this assay.

This test has not been studied for use with specimens from patients being treated with antituberculous agents and, therefore, should not be used to determine bacteriologic cure or to monitor response to therapy. It is not known how long the PCR assay can remain positive following treatment for *M tuberculosis*.

The sensitivity of this test with stool specimens is 80% and testing of additional stool specimens should be considered if the result from the first specimen is negative.

This test does not provide information on rifampin susceptibility. For sputum, the MTBXS / Mycobacterium tuberculosis complex, Molecular Detection and Rifampin Resistance, PCR, Sputum (Cepheid GeneXpert PCR) test is recommended instead as MTBXS will provide rapid resistance information for rifampin to aid with patient management.

Clinical Reference

1. Lewinsohn DM, Leonard MK, LoBue PA, et al. Official American Thoracic Society/Infectious Diseases Society of America/Centers for Disease Control and Prevention Clinical Practice Guidelines: Diagnosis of Tuberculosis in Adults and Children. Clin Infect Dis. 2017;64(2):e1-e33. doi:10.1093/cid/ciw694
2. Nahid P, Dorman SE, Alipanah N, et al. Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America Clinical Practice Guidelines: Treatment of Drug-Susceptible

Tuberculosis. Clin Infect Dis. 2016;63(7):e147-e195. doi:10.1093/cid/ciw376
3. Ortiz-Brizuela E, Menzies D, Behr MA. Testing and treating Mycobacterium tuberculosis infection. Med Clin North Am. 2022;106(6):929-947. doi:10.1016/j.mcna.2022.08.001

Performance

Method Description
Following specimen digestion and decontamination using N-acetyl cysteine and sodium hydroxide, genomic DNA is extracted using the MagNA Pure (Roche Applied Sciences) extraction platform. The purified genomic DNA is placed on the LightCycler instrument, which amplifies and monitors, by fluorescence, the development of target nucleotide sequences after each polymerase chain reaction (PCR) cycle. A specific target sequence from a portion of the *kat*G gene from *Mycobacterium tuberculosis* complex is amplified and the resulting segment is detected by melt-curve analysis using sequence-specific fluorescence resonance energy transfer hybridization probes. The LightCycler PCR assay is a closed PCR system that greatly reduces the potential for false-positive results due to specimen cross-contamination as compared with traditional open-system PCR or other amplification methods like transcription-mediated amplification.(Buckwalter SP, Connelly BJ, Louison LK, et al. Description, validation, and review of a decade of experience with a laboratory-developed PCR test for detection of *Mycobacterium tuberculosis* complex in pulmonary and extrapulmonary specimens. J Clin Tuberc Other Mycobact Dis. 2022;29:100340. doi:10.1016/j.jctube.2022.100340)

PDF Report
No

Day(s) Performed
Monday through Sunday

Report Available
1 to 3 days

Specimen Retention Time
7 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

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.

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Test Classification

This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

87556-*Mycobacterium tuberculosis*, complex, molecular detection, PCR
87015-Mycobacteria culture, concentration (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
MTBRP	M tuberculosis Complex PCR	38379-4

Result ID	Test Result Name	Result LOINC® Value
SRC62	MTB Complex PCR, Specimen Source	31208-2
56044	MTB Complex PCR, Result	38379-4