Test Definition: MTBT

Mycobacterium tuberculosis Complex, Molecular Detection, PCR, Paraffin, Tissue

Overview

Useful For

Preferred method for rapid detection of *Mycobacterium tuberculosis* complex DNA in formalin-fixed, paraffin-embedded tissue specimens

Detecting *M tuberculosis* complex

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.

Method Name

Real-Time Polymerase Chain Reaction (PCR)

NY State Available

Yes

Specimen

Specimen Type

Tissue, Paraffin

Additional Testing Requirements

When non-fixed specimen is available, a mycobacterial culture on that specimen must always be performed in addition to this test. If your facility is unable to perform mycobacterial culture, order CTB / Mycobacteria and *Nocardia* Culture, Varies concurrently with this test.

Necessary Information

Specimen source is required.

Specimen Required

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

Preferred:
Supplies: Tissue Block Container (T553)
Specimen Type: Formalin-fixed, paraffin-embedded (FFPE) tissue block
Sources: Body tissue
Container/Tube: Tissue block
Collection Instructions: Submit a FFPE tissue block to be cut and returned.

Acceptable:
Specimen Type: Formalin-fixed, paraffin-embedded (FFPE) tissue sections (scrolls)
Sources: Body tissue
Container/Tube: Sterile containers, one for each individual cut section (scroll).
Collection Instructions:
1. Perform microtomy and prepare five separate 10-micron sections.
2. **Place each section (scroll) in a separate sterile container for submission.**

Specimen Minimum Volume
See Specimen Required.

Reject Due To

Any non-formalin-fixed, paraffin-embedded tissue block (FFPE) FFPE slides FFPE body fluids	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Tissue, Paraffin	Ambient (preferred)		
	Refrigerated		

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 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 (BCG*), Mycobacterium africanum, Mycobacterium canettii*, and *Mycobacterium microti.* The 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 at this time. This assay method does not distinguish between the species of the *M tuberculosis* complex.

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.

An inhibition result indicates that inhibitors are present in the specimen that could prevent the detection of *M tuberculosis* DNA. A new specimen can be resubmitted under a new order, if desired.

Cautions

This rapid polymerase chain reaction (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 from formalin-fixed, paraffin-embedded tissue is approximately 63%; therefore, testing of additional specimens should be considered if the result from the first specimen is negative.

A mycobacterial culture on a non-formalin-fixed specimen must always be performed in addition to the PCR test when non-fixed specimen is available. If your facility is unable to perform a mycobacterial culture, CTB / Mycobacteria and *Nocardia* Culture, Varies should be ordered.

The sensitivity of the PCR assay 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.

Clinical Reference

1. Iseman MD: A Clinician's Guide to Tuberculosis. 2nd ed. Lippincott Williams and Wilkins; 2013
2. American Thoracic Society; Centers for Disease Control and Prevention; Infectious Diseases Society of America. Treatment of tuberculosis. MMWR Recomm Rep. 2003;52(RR-11):1-77. Erratum in: MMWR Recomm Rep. 2005;53(51):1203
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 processing, genomic DNA is extracted, and 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

5 to 7 days

Specimen Retention Time

7 days; after which time the block will be returned to the client

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.

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

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
MTBT	MTB complex PCR, FFPE	38379-4

Result ID	Test Result Name	Result LOINC® Value
SRCTB	MTB Complex PCR, FFPE, Source	31208-2
TBRR	MTB Complex PCR, FFPE, Result	38379-4