

Mycobacterium tuberculosis Complex Speciation

M. TUBERCULOSIS COMPLEX SPECIATION BY GENOMIC DELETION PATTERNS WITH REAL-TIME PCR AND SYBR GREEN MELTING TEMPERATURE ANALYSIS

Test Highlights

- Identifies members of the *M. tuberculosis* Complex (MTC) to species level by comparing genomic deletion patterns generated by real-time PCR and analyzing melting temperatures. Members of this complex include: *M. tuberculosis*, *M. bovis*, *M. bovis* BCG (vaccine strain), *M. africanum*, *M. microti*, and *M. caprae*.
- MTC speciation is often not reliable by alternative methods, such as HPLC or biochemical characteristics.
- Speciation is important for patient management, disease containment, and epidemiological response.

Clinical Background

- Tuberculosis is caused by mycobacteria, which are slow growing, nonmotile, acid-fast staining bacilli with high lipid content.
- Two million fatalities due to MTC-related infection worldwide occur annually, including more than 13,000 reported cases of tuberculosis in the United States in 2006.
- Treatment of tuberculosis requires a minimum of six months with a combination of isoniazid, rifampin, pyrazinamide, and ethambutol. However, *M. bovis* and *M. bovis* BCG are inherently resistant to pyrazinamide, an important factor in directing therapy.

Disease Overview

- Tuberculosis is predominantly a pulmonary disease, but extrapulmonary infection can affect nearly all organs of the body.
- Pulmonary disease can be acute and rapidly progressive or chronic with cavitation.
- Tuberculosis may initially present as a nonspecific pneumonitis, followed by granulomatous inflammation and formation of characteristic lesions, called tubercles. Latent infections may be reactivated to a disease state.

Epidemiology

- *M. tuberculosis*, *M. africanum*, and *M. bovis* can be transmitted person-to-person by droplet nuclei expelled from the respiratory tract.
- *M. bovis*, *M. microti*, and *M. caprae* may have an animal host. The organism can spread via animal products, such as cheese from unpasteurized milk.
- Immunocompromised individuals are at greater risk for disease development with MTC infection.
- Infections from *M. bovis* BCG can occur with vaccination or from *M. bovis* BCG immunotherapy for cancer.

Genetics

Genomic deletion patterns are specific for each member of the MTC, allowing differentiation between the species.

Indications for Ordering

This test can be used to speciate confirmed MTC organisms from a pure culture submission, or may be added to MTC-positive cultures if speciation is needed by requesting [Mycobacterium tuberculosis Complex Speciation \(0060771\)](#).

Additional Ordering Notes

This testing will automatically be added to all New York patient MTC isolates, as required by the New York State Department of Health.

Interpretation

The result identifies the species of the MTC.

Limitations

- This assay is for the differentiation of confirmed MTC only. Nontuberculous mycobacteria may have indeterminate patterns of the genomic deletions used as targets in this assay.
- Changes in DNA sequence at the primer annealing sites may affect genomic deletion pattern determination and speciation.

Methodology

DNA is extracted from cultures of confirmed MTC isolates. PCR amplification with SYBR green dye is performed in a real-time instrument followed by melting temperature analysis. Genomic deletion patterns and species identity are determined.

References

1. Centers for Disease Control and Prevention. Trends in Tuberculosis Incidence, United States, 2006. MMWR 2007;56(11):245-250.
2. Clinical Laboratory Medicine. Second Edition. Editor, K. D. McClatchey. 2002. Lippincott, Williams, and Wilkins, Philadelphia, PA.
3. Parsons LM, Brosch R, Cole ST, et al. Rapid simple approach for identification of *Mycobacterium tuberculosis* complex isolates by PCR-based genomic deletion analysis. J. Clin. Microbiol 2002;40:2339-2345.

Test Information

0060771 *Mycobacterium tuberculosis* Complex Speciation

For specific collection, transport, and testing information, refer to the ARUP Web site at www.aruplab.com.

For information on test selection, ordering, and interpretation, refer to ARUP Consult® at www.arupconsult.com.