A New Tool to Diagnose Tuberculosis: The Xpert MTB/RIF Assay

What is the Xpert MTB/RIF Assay?

The Xpert MTB/RIF assay is a new test that is revolutionizing tuberculosis (TB) control by contributing to the rapid diagnosis of TB disease and drug resistance. The test simultaneously detects *Mycobacterium tuberculosis* complex (MTBC) and resistance to rifampin (RIF) in less than 2 hours. In comparison, standard cultures can take 2 to 6 weeks for MTBC to grow and conventional drug resistance tests can add 3 more weeks. The information provided by the Xpert MTB/RIF assay aids in selecting treatment regimens and reaching infection control decisions quickly.

How Does the Xpert MTB/RIF Assay Work?

The Xpert MTB/RIF assay is a nucleic acid amplification (NAA) test that uses a disposable cartridge with the GeneXpert Instrument System. A sputum sample is collected from the patient with suspected TB. The sputum is mixed with the reagent that is provided with the assay, and a cartridge containing this mixture is placed in the GeneXpert machine. All processing from this point on is fully automated.

What are the Advantages of the Xpert MTB/RIF Assay?

Major advantages of the Xpert MTB/RIF assay are that

- Results are available quickly, and
- Minimal technical training is required to run the test.

Additionally, the Xpert MTB/RIF assay can quickly identify possible multidrug-resistant TB (MDR TB). MDR TB is TB that is resistant to both isoniazid (INH) and RIF, two of the most effective TB drugs. RIF resistance is a predictor of MDR TB because resistance to RIF, in most instances, co-exists with resistance to INH. Rapid diagnosis of RIF resistance potentially allows TB patients to start on effective treatment much sooner than waiting for results from other types of drug susceptibility testing.

For patients who are found to NOT have TB disease, rapid results from the Xpert MTB/RIF assay may contribute to cost savings by avoiding unnecessary treatment and respiratory isolation in hospitals or other institutions.

How Should Xpert MTB/RIF Assay Results be Interpreted?

As with other NAA tests, the Xpert MTB/RIF assay should be interpreted along with clinical, radiographic, and other laboratory findings. The Xpert MTB/RIF assay does not replace the need for smear with microscopy for acid-fast bacilli, culture for mycobacteria, and growth-based drug susceptibility testing, in addition to genotyping for early discovery of outbreaks. Providers and laboratories need to ensure that patient specimens are available for recommended mycobacterial testing.

National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
Division of Tuberculosis Elimination

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Results from the Xpert MTB/RIF assay indicate whether or not MTBC was detected in the sample. In some instances, the result is "invalid," whereby the test should be repeated. If MTBC was detected, the results will also state whether resistance to RIF was

- Detected,
- Not detected, or
- Indeterminate.

Regardless of the Xpert MTB/RIF result, patient specimens should also have mycobacterial culture to ensure isolates are available for drug susceptibility testing and genotyping.

RIF Resistance Detected

Results that are positive for MTBC and for RIF resistance mean that the bacteria have a high probability of resistance to RIF. This should be confirmed by additional rapid testing. If RIF resistance is confirmed, rapid molecular testing for drug resistance to both first-line and second-line drugs should be performed so that an effective treatment regimen can be selected. CDC offers rapid molecular detection of drug resistance (MDDR) services through public health laboratories, free of charge. (For more information, see the Division of Tuberculosis Elimination's website: www.cdc.gov/tb/topic/laboratory/default.htm.)

RIF Resistance Not Detected

Results that are positive for MTBC, but negative for RIF resistance mean that the bacteria are probably susceptible to RIF. However, all tests that are positive for MTBC should have growth-based susceptibility testing to first-line TB drugs.

RIF Resistance Indeterminate

Results that are positive for MTBC and indeterminate for RIF resistance mean that the test could not accurately determine if the bacteria are resistant to RIF. Growth-based susceptibility testing to first-line TB drugs should be performed.

Additional Information

Association of Public Health Laboratories. Laboratory Considerations for Use of Cepheid Xpert MTB/RIF Assay.2013. www.aphl.org/AboutAPHL/publications/Documents/ID_2013Nov_Cepheid-Xpert-Fact-Sheet.pdf.

CDC. Availability of an Assay for Detecting *Mycobacterium tuberculosis*, Including Rifampin-Resistant Strains, and Considerations for Its Use — United States, 2013. *MMWR* 2013; 62 (41). www.cdc.gov/mmwr/preview/mmwrhtml/mm6241a1.htm?s_cid=mm6241a1_e.

CDC. Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings, 2005. *MMWR* 2005; 54 (No. RR-17). www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm?s_cid=rr5417a1_e.

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