

# Evidence Update

Summary of a Cochrane Review

Tuberculosis Series

**Is Xpert® MTB/RIF assay accurate in detecting pulmonary TB and resistance to the drug rifampicin in adults?**

**Xpert® MTB/RIF assay is both sensitive and specific in detecting pulmonary TB and rifampicin resistance in adults.**

Researchers from the Cochrane Collaboration conducted a review into the sensitivity and specificity of Xpert® MTB/RIF assay compared to smear microscopy for the detection of pulmonary TB and rifampicin resistance in adults. For diagnosis of TB, Xpert® MTB/RIF assay was evaluated as an initial test replacing microscopy and also as an add-on test following a negative smear microscopy result. It was also investigated as an initial test to replace culture-based drug susceptibility testing for the detection of rifampicin resistance. 27 diagnostic accuracy studies were identified that addressed this question.

## How is TB diagnosed, and what is Xpert® MTB/RIF?

Accurate and rapid detection of TB is critical for patient care and preventing transmission to, especially in the case of drug resistant TB (DR-TB). Sputum smear microscopy is the most commonly used diagnostic test for TB. However, in a population where 1000 adults have TB, 400 to 500 of them will be missed with this smear microscopy test. TB culture is the gold standard for diagnosing TB and TB drug resistance, but is resource-intensive and takes weeks. Xpert® MTB/RIF assay is a novel, automated diagnostic test for pulmonary TB and resistance to the TB drug rifampicin, a proxy for DR-TB. Xpert® MTB/RIF assay is more expensive than smear microscopy but it produces results within 2 hours and can be used in primary care clinics.

## How is test accuracy measured?

Researchers measured diagnostic accuracy by comparing the results of the Xpert® MTB/RIF assay with a reference standard (TB culture). *Sensitivity* is the proportion of patients with the TB who test positive. *Specificity* is the proportion of patients without the disease who test negative.

## What does the research say?

When used as initial test instead of smear microscopy, Xpert® MTB/RIF has a sensitivity of 89% and a specificity of 99%. When used as an add-on test following a negative smear microscopy test, Xpert® MTB/RIF has a sensitivity of 67% and a specificity of 99%. For rifampicin resistance detection, Xpert® MTB/RIF has a sensitivity of 95% and a specificity of 98%.

## Are the review findings reliable?

This was a well conducted review and at a low risk of bias. The review addressed a clearly focused question and the inclusion criteria were explicit. The search strategy was comprehensive and included an appropriate range of databases. Steps were taken to minimise bias and errors at all stages of the review. Study quality was assessed using appropriate criteria and considered in the synthesis. Appropriate methods were used to pool data and heterogeneity was investigated.

## Can the results of the research be applied to my setting?

Studies using any of the Xpert® MTB/RIF assay versions (i.e. G1, G2, G3 or G4) were included in the review. 16 (59%) of the studies were conducted in low-middle income countries where advanced smear positive TB is common. Only two studies were conducted in peripheral laboratories in primary care clinics.

## Test accuracy of Xpert

This table presents sensitivity and specificity of Xpert compared to sputum smear microscopy and TB culture.

Outcome	Xpert® MTB/RIF assay vs culture	What happens	No of studies	Comparison to other TB tests
Xpert® MTB/RIF assay as initial test (replacing sputum smear)	Sensitivity 89% Specificity 99%	Xpert® MTB/RIF assay diagnoses TB in 89 out of 100 people who have TB. Xpert assay diagnoses TB in 1 in a 100 people who do not have TB based on culture results.	22 studies 8998 people	Sputum smear vs. culture: Sensitivity: 50% to 60% <sup>1</sup> Specificity: 98% to 99% <sup>2</sup>
Xpert® MTB/RIF assay as add-on test (following a negative sputum smear result)	Sensitivity 67% Specificity 99%	Xpert® MTB/RIF assay diagnoses TB in 67 out of 100 people with smear-negative microscopy. Xpert diagnoses TB in 1 out of a 100 people who have a negative sputum smear result and who do not have TB	21 studies 6950 people	Sputum smear vs. culture: Sensitivity 0% Culture: 100% sensitivity and specificity; delay <sup>3</sup>
Xpert® MTB/RIF assay to detect rifampicin resistance (compared to phenotypic culture-based DST method)	Sensitivity 95% Specificity 98%	Xpert® MTB/RIF assay diagnoses rifampicin resistant TB in 95% of patients who have rifampicin resistant TB. Xpert® MTB/RIF assay does not diagnose rifampicin resistant TB in 98 out of 100 people who do not have rifampicin resistant TB.	<i>Sensitivity</i> 555 rifampicin-resistant specimens 17 studies <i>Specificity</i> 24 studies 2411 rifampicin-resistant negative specimens	Culture: 100% sensitivity and specificity; delay <sup>3</sup>

### More information

**This summary is based on the following systematic review:**

Steingart KR, Sohn H, Schiller I, Kloda LA, Boehme CC, Pai M, Dendukuri N. Xpert® MTB/RIF assay for pulmonary tuberculosis and rifampicin resistance in adults. *Cochrane Database of Systematic Reviews* 2013, Issue 1. Art. No.: CD009593. DOI:10.1002/14651858.CD009593.pub2.

#### What is a systematic review?

A systematic review seeks to answer a well formulated and specific question by identifying, critically appraising, and summarising the results of all relevant trials, published and unpublished, according to pre-stated and transparent methods.

#### What is the Cochrane Collaboration?

The Cochrane Collaboration is an international network of more than 28,000 people from over 100 countries. The Collaboration is one of the biggest producers of systematic reviews on the effects of healthcare interventions, and Cochrane Systematic Reviews are recognised internationally as the benchmark for high quality information. The *Cochrane Database of Systematic Reviews* is available from [www.thecochranelibrary.com](http://www.thecochranelibrary.com) and free for eligible countries.