

## Evidence-based Tuberculosis Diagnosis

One-page plain language summaries of systematic reviews - #1

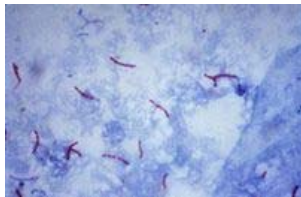
### Title: Fluorescence versus conventional sputum smear microscopy for tuberculosis

This *systematic review* presents *evidence* from a collection of studies evaluating tests or strategies for the diagnosis of tuberculosis (TB). Terms in *italics* are defined in the TB Evidence Glossary.

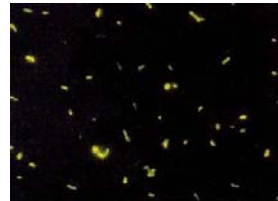
**Why this review is important:** Most of the world's TB cases occur in low-income and middle-income countries, where sputum microscopy with a conventional light microscope is the primary method for diagnosing pulmonary TB. A major shortcoming of conventional microscopy is its relatively low *sensitivity* compared with culture, especially in patients co-infected with HIV. In high-income countries, fluorescence microscopy (FM) rather than conventional microscopy is the standard diagnostic method. FM is credited with increased sensitivity and lower work effort, but there is concern that *specificity* may be lower.

**Objective:** To summarize the accuracy of fluorescence microscopy compared with conventional microscopy for the diagnosis of active TB.

**Main findings:** 45 studies were included in the review. Sensitivity of conventional microscopy (the Ziehl-Neelsen method) ranged from 32% to 94%, and sensitivity of FM ranged from 52% to 97%. FM was on average 10% more sensitive than conventional microscopy, *p-value* <0.001. Specificity of FM was high (98%) and similar to conventional microscopy (average difference -1%, 95% CI -2, +0.8). There was insufficient evidence to determine the value of FM in HIV-infected individuals. Concerning work effort, one large study involving 23,427 specimens and blinded to both smear and culture results, found that FM, which took 1 minute, had higher sensitivity and equivalent specificity compared with conventional microscopy, which took 4 minutes.



Conventional microscopy



Fluorescence microscopy

**Authors' conclusions:** Fluorescence microscopy is more sensitive for the diagnosis of pulmonary TB than conventional microscopy. The specificity of FM for detection of acid-fast organisms in sputum is high and similar to that of conventional microscopy. In addition, fluorochrome-stained smears take less time to examine than smears stained with the Ziehl-Neelsen method.

**Policy implications:** At the time of this review, it was felt that fluorescence microscopy, dependent as it was on expensive, complex equipment and mercury vapour lamps, was inappropriate for use outside of reference laboratories. It was noted that new low-cost simple FM systems based on Light-Emitting Diodes (LEDs) were being developed and these might permit FM in resource-constrained settings in the future. In 2009, WHO recommended that FM be replaced by LED microscopy in all settings and that LED microscopy be phased in as an alternative for Ziehl-Neelsen microscopy in both high-volume and low-volume laboratories.

**Comments:** See Minion J et al. Light emitting diode (LED) fluorescence microscopy for the diagnosis of tuberculosis, plain language summary #10.

**Systematic review:** Steingart KR et al. Fluorescence versus conventional sputum smear microscopy for tuberculosis: a systematic review. *Lancet Infect Dis.* 2006 Sep;6(9):570-81. Available at [www.tbevidence.org](http://www.tbevidence.org)

### Publications and other resources of related interest

1. Bennedsen J, Larsen SO. Examination for tubercle bacilli by fluorescence microscopy. *Scand J Respir Dis* 1966; 47: 114–20.
2. Steingart KR, Ramsay A, Pai M. Optimizing sputum smear microscopy for the diagnosis of pulmonary tuberculosis. *Expert Rev Anti Infect Ther.* 2007 Jun;5(3):327-31.

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