Rapid testing for TB aims to reduce drug resistance, lower mortality rate

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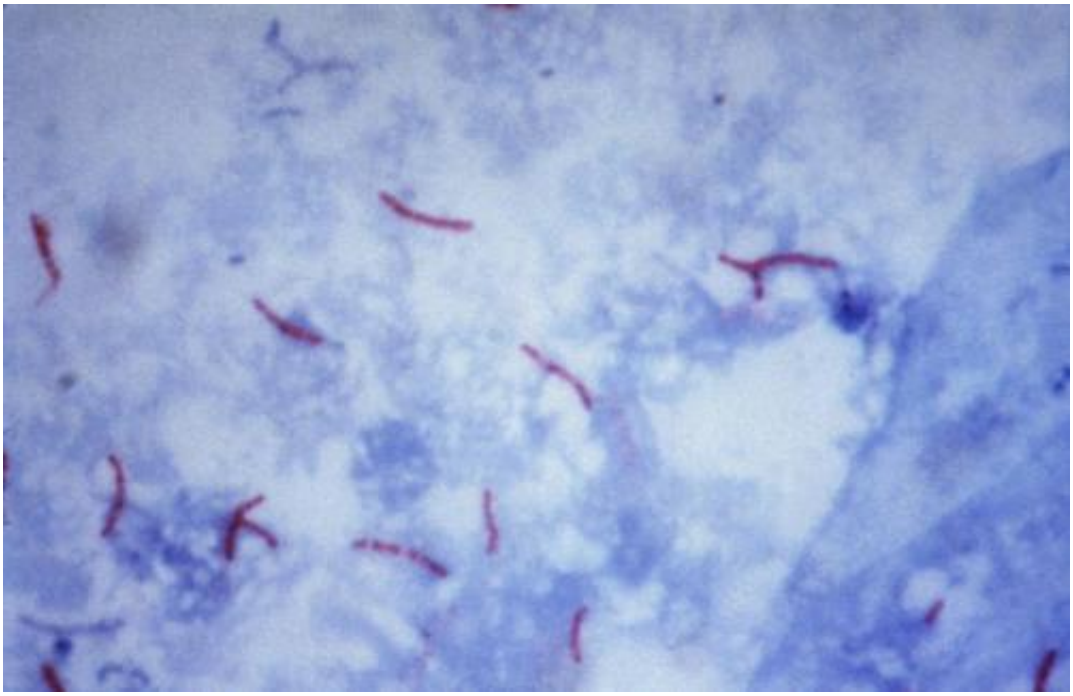

This photomicrograph reveals Mycobacterium tuberculosis bacteria using acid-fast Ziehl-Neelsen stain; Magnified 1000 X. The acid-fast stains depend on the ability of mycobacteria to retain dye when treated with mineral acid or an acid-alcohol solution such as the Ziehl-Neelsen, or the Kinyoun stains that are carbolfuchsin methods specific for M. tuberculosis. Credit: public domain

Researchers at University of California, San Diego School of Medicine have documented the accuracy of three new tests for more rapidly diagnosing drug-resistant forms of tuberculosis (TB), which are much

harder and more expensive to treat and which, experts say, represent a major threat to global public health.

The study is published online in the current issue of *PLOS ONE*.

"Our study shows that TB testing that once took two to three months can now be done in as little as a day," said co-author Richard Garfein, PhD, professor in the Division of Global Public Health at UC San Diego School of Medicine. "This means we can put people on the right medications sooner, spare them the toxic effects of drugs that are ineffective and prevent the development of drug resistant forms of TB that can occur when the wrong medications are given."

Although rates of TB are declining in the United States due to effective control measures, it remains one of the world's deadliest infectious diseases, causing (or contributing to) an estimated 1.5 million deaths in 2013, according to the World Health Organization. TB is also the leading killer of people who have HIV.

For the study, sputum (a mixture of saliva and mucus coughed up from the lungs) from 1,128 study participants at TB clinics in India, Moldova and South Africa were examined using three rapid tests for detecting drug-resistant forms of TB. Two of these tests use molecular techniques to look for genetic mutations in the pathogen's DNA that confer resistance to antibiotics. The third test employs a low-cost and easy-to-use version of the standard bacterial culture technique, making it suitable for resource-limited community clinics and hospitals. An estimated 95 percent of TB deaths globally occur in low- and middle-income countries.

Results from the rapid tests were then compared to the reference standard technique for detecting resistance to seven of the most important anti-TB drugs. These comparisons showed that all three rapid

assays accurately identified resistance to first- and second-line oral antibiotic treatments (isoniazid, rifampin, moxifloxacin and ofloxacin). They were less accurate but still very good at detecting resistance to injectable antibiotics (amikacin and capreomycin) typically administered to those with multi-drug resistant TB. The rapid tests performed poorly in detecting resistance to only one drug, the injectable antibiotic kanamycin, which is also used to treat multi-drug resistant TB.

The study also documented the time it took to obtain results. The molecular techniques showed themselves to be superior, with a mean time of 1.1 days for both DNA testing methods; 14.3 days for the rapid culture method; and 24.7 days for the reference standard test.

"The results from this international collaboration take us one step closer to achieving the World Health Organization's goal of reducing deaths due to TB by 95 percent by 2050," said lead author Antonino Catanzaro, MD, Professor Emeritus in the Division of Pulmonary, Critical Care and Sleep Medicine. "Rapid, accurate drug susceptibility tests are critical for physicians. They help us ensure that patients receive the appropriate anti-TB drugs to combat their specific form of tuberculosis. When patients receive the proper drug treatment, we see a large reduction in TB mortality."

Provided by University of California - San Diego