Research / Discovery

Engineering researcher exploring portable method for detecting tuberculosis

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Engineering researchers at Colorado State University have found a new way to detect traces of tuberculosis bacteria in fluids that would allow for a more sensitive and accurate detection of the deadly disease.

Accurate and affordable detection of TB

The research by Diego Krapf, assistant professor of electrical and computer engineering and a faculty member in the School of Biomedical Engineering, was recently recognized by the Optical Society of America for its potential use in developing countries that face a greater risk of TB and its prospective use to detect latent cases of TB.

Working with Krapf on the research are Mike McNeil, Mike Scherman, and John Spencer in the Department of Microbiology, Immunology and Pathology at Colorado State.

The end goal of the project is to develop a platform for the detection of TB that is portable, affordable, and does not require highly trained personnel.

Diego Krapf, assistant professor of electrical and computer engineering, works on a biosensor.

Biosensor uses chemistry, lasers

Krapf has developed a biosensor that uses a combination of chemistry and lasers to isolate proteins prevalent in TB. Krapf mixes a sample with fluorescent antibodies for the targeted TB proteins and coats the glass slide with a molecular brush that will stick only to those proteins. Using a home-made microscope, Krapf can determine whether a large number of the proteins are present, which indicates the test is positive for TB.

Also on Krapf's team, working on this project, are biomedical engineering graduate students **Kristen Jevsevar** and **Aubrey Weigel**. Undergraduate students **Jeremy Stone** and **Nathan Proper** are working to develop a smaller and cheaper version of the biosensor – now tabletop size – to use in the developing world.

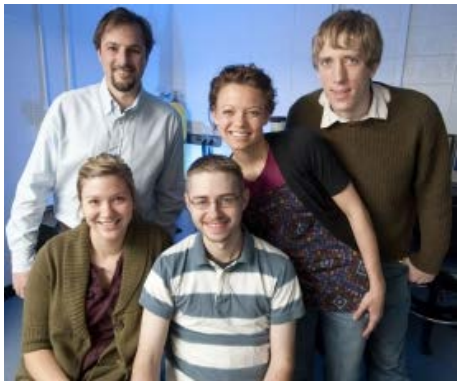
Many people don't know they carry TB

"The problem of TB at the base of the pyramid - in areas lacking the minimal resources such as water and medical facilities - is extremely severe," Krapf said.

"More than 1.5 million people die of tuberculosis every year. It is estimated that two billion people

carry a form of latent TB and 10 percent of them will develop active TB during their lifetime. The detection problem is so drastic that at least half of these people do not know they carry the disease."

The detection techniques now used in the United States require special facilities and training that would be far too expensive for widespread use in the developing world where there are scarce resources and high incidences of the disease. Current technologies used in these areas have only a 60 percent sensitivity for TB detection. These tests are also unable to detect latent forms of TB.



Professor Diego Krapf and his team of student researchers Kristen Jevsevar, Jeremy Stone, Aubrey Weigel, and Nathan Proper.

Applicable to other infectious diseases

"We expect that the development of a TB biosensor will also be applicable to other infectious diseases, both viral and bacterial," Krapf said.

Colorado State has world-renowned tuberculosis researchers working in multiple disciplines such as engineering. In August, professors Kevin Lear and David Dandy, electrical and chemical engineering, respectively, reported that they can detect proteins landing on a silicon chip by directing a laser or LED beam along the surface of the chip and watching where the light is deflected very slightly toward the proteins.

The new chip is intended to simplify and speed up medical diagnostics and other biosensor applications by eliminating extra chemicals, special equipment and complex steps often required for current laboratory tests.

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