# Nano detector for deadly anthrax

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An automatic and portable detector that takes just fifteen minutes to analyze a sample suspected of contamination with anthrax is being developed by US researchers. The technology amplifies any anthrax DNA present in the sample and can reveal the presence of just 40 microscopic cells of the deadly bacteria Bacillus anthracis.

B. anthracis, commonly known as anthrax, is a potentially lethal microbe that might be used intentionally to infect victims through contamination of food and water supplies, aerosolized particles, or even dried powders, such as those used in bioterrorist attacks in the USA. Detection is crucial to preventing widespread fatalities in the event of an anthrax attack. However, the complexity of the microbe's biology have so far made it difficult to build a portable system that can be employed quickly in the field. That said, there are several systems available that use PCR to amplify a particular component of the genetic material present in anthrax and then to flag this amplified signal. These systems are fast and sensitive but do not integrate sample preparation and so are not as convenient as a single detector unit would be.

Writing in the *International Journal of Biomedical* Nanoscience *and Nanotechnology* this month, Nathaniel Cady of the College of Nanoscale Science and Engineering (CNSE) of the University at Albany and colleagues there and at Cornell University, New York, explain how they have constructed nanofabricated fluidic cartridges that can be used to carry out detection of anthrax. The device is a so-called "lab-on-a-chips" device, or more properly a 3D microfluidic network that contains nanofabricated pillar structures.

The device has fluidic inputs for adding sample and reagents, removing waste, for carrying out DNA purification, and critically an integrated chamber for amplifying only the target DNA in the sample using the polymerase chain reaction (PCR) system. The chip also contains a wave guide for the fluorescence-based identification of the amplified DNA and thus the target microbe. Importantly, the system works without manual intervention other than loading a droplet of sample into the detector.

"The average time required for DNA purification during these experiments was approximately 15 min, and when combined with real-time PCR analysis, this resulted in an average time to detection of 60 min," the team says. The system can detect as few as 40 B. anthracis cells. "Due to its small size and low power requirements, this system can be further developed as a truly portable, hand-held device," the researchers conclude.

**More information:** "PCR-based detection of Bacillus anthracis using an integrated microfluidic platform" in Int. J. Biomed. Nanosci. Nanotechnol., 2011, 2, 152-166

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