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[Molecular Biology] Taiwan Scientists Develop Bio-nanotechnology Platform to Capture and Detect Bacteria in Blood Samples without Using Time-Consuming Culture Processes

[Molecular Biology] Taiwan Scientists Develop Bio-nanotechnology Platform to Capture and Detect Bacteria in Blood Samples without Using Time-Consuming Culture Processes (Chinese Version)

Academia Sinica Newsletter (2011/12/20) A research team led by Dr. Yuh-Lin WANG, Distinguished Research Fellow at the Institute of Atomic and Molecular Sciences (IAMS), Academia Sinica, and Professor at the Department of Physics at National Taiwan University, has developed a fast bio-nanotechnology platform to capture and detect bacteria in human blood samples. This detection technology, which does not require labelling or culture of bacteria was reported in the November 15, 2011 issue of the journal Nature Communications.

Detecting bacteria in clinical blood samples without using time-consuming culture processes would allow much more rapid diagnoses. Conventional biological assays commonly require a sample preparation time ranging from days for fast growing bacteria to weeks for slow growing bacteria. Using culture-free detection methods would speed up the process, but require the capture and analysis of bacteria from body fluids, which usually have a complicated composition.

A team of researchers from the IAMS, National Taiwan University and National Yang-Ming University has found that coating silver-nanoparticle arrays with the antibiotic vancomycin (Van) using technology called surface-enhanced Raman spectroscopy (SERS) can provide label-free analysis of bacteria leading to a 1,000-fold increase in bacteria capture, without introducing significant spectral interference. Bacteria from human blood can be concentrated onto a designated minuscule Van-coated area while blood cells are excluded. Furthermore, a Van-coated substrate produced noticeably distinct SERS spectra of Van-susceptible and Van-resistant bacteria (Enterococcus), indicating the potential of this technology for use in bacterial drug-resistance tests.

These results represent a critical step towards the creation of SERS-based multifunctional biochips for rapid culture- and label-free detection and drug-resistance testing of microorganisms in clinical samples.

Related Website:
http://www.nature.com/ncomms/journal/v2/n11/full/ncomms1546.html
http://www.nanowerk.com/spotlight/spotid=23548.php

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