16 October 2008

This supplement has been prepared to present scientific and technical news items that may be of more interest to technical personnel at RDT&E activities and the labs, or the medics rather than the broader readership of the basic CB Daily. Due to the nature of the material, the articles, if available online, are usually only available through subscription services thus making specific links generally unavailable. Thus, usually only the bibliographic citation is available for use by an activity's technical library.

Should you wish to be removed from this S&T Supplement address group, just send an email to one of the people listed at the bottom of this message. This will not affect your continued receipt of the CB Daily.

Chem-Bio News – S&T Supplement

CB Daily Report

Chem-Bio News

ELECTRICALLY ACTIVE MAGNETIC NANOPARTICLES FOR CONCENTRATING AND DETECTING BACILLUS ANTHRACIS SPORES IN A DIRECT-CHARGE TRANSFER BIOSENSOR
Nanotechnology Business Journal
October 13, 2008

"This paper describes the synthesis of electrically active magnetic (EAM) nanoparticles and

their application in a direct-charge transfer biosensor for detecting B. anthracis Sterne endospores."

"These EAM nanoparticles were synthesized from aniline monomer made electrically active by acid doping and gamma iron (III) oxide (gamma - Fe2O3) nanoparticles resulting in nanomaterials with diameters ranging from 50 to 200 run. Room temperature hysteresis measurements of the synthesized nanomaterials using a Quantum Design MPMS SQUID magnetometer showed that their saturation magnetization values were between 61.1 and 33.5 emu/gm. The structural morphology of the nanomaterial was studied using transmission electron microscopy and the electronic diffraction patterns were observed to determine their crystalline nature. The EAM nanoparticles were coated with antibodies specific to B. anthracis Sterne endospores and used to capture the target antigen from varying spore concentrations (10(1) to 10(7) spores/ml) by applying a magnetic field. The immunomagnetically captured spores were then applied to a direct-charge transfer biosensor having a dimension of 5 mm x 60 mm. The detection of the spores was based on the capillary flow of the captured spores aided by a direct-charge transfer of the EAM nanoparticle. The electric signal generated was recorded for 6 min in a reagentless process. The biosensor was able to detect the presence of B. anthracis spores at a concentration of 4.2 x 10(2) spores/ml. Specificity studies were also carried out to determine the biosensor responses in the presence of nontarget antigens."

"This study shows the novel application of EAM nanoparticles both as an immunomagnetic concentrator and a transducer in a portable, easy to use, biosensor that has the potential to be used as a rapid detection device for defense and biosecurity."

The full article can be found at: (S. Pal, et. al., "Electrically active magnetic nanoparticles for concentrating and detecting Bacillus anthracis spores in a direct-charge transfer biosensor. IEEE Sensors Journal, 2008;8(5-6):647-654). Link not available.

Return to Top

FAST PCR THERMAL CYCLING DEVICE
Technology News Focus
October 15, 2008

"A novel flow-through device for performing fast PCR thermal cycling is presented. The Thermal Gradient thermal cycling device is comprised of layers of highly thermally conducting material separated by insulating layers."

"Channels etched in the conducting and insulating layers create one continuous path through the device. When the device is held between platens at different temperatures and PCR sample mix is pumped through it, every fluid particle undergoes the time-temperature protocol necessary for PCR but with a temperature change rate not possible with conventional cyclers. Ultrafast thermal cycling makes it ideal for bio-defense applications, such as the Instantaneous Bio-Aerosol Agent Identification System under development for the Department of Homeland Security. Its compact size and simplicity of use make it a natural choice for diagnostics, forensics, food and water testing and other DNA testing

applications. Herein we describe the design and fabrication of the device developed for IBADS and the subsequent performance with various assays using plasmid and genomic template DNA. Performance under some circumstances was exceptional: Amplification rates of up to two decades per minute were recorded and total amplification of up to eight decades in 30 cycles was seen."

"We discuss how to optimize the performance of a device that pushes PCR to its fundamental limits and review a wide variety of performance data."

The full article can be found at: (J. Grover, et. al., "Fast PCR thermal cycling device". IEEE Sensors Journal, 2008;8(5-6):476-487). Link not available.

Return to Top

CANTILEVERS BEND OVER FOR DRUG DETECTION
By Hayley Birch
Royal Society of Chemistry [UK] News Release
October 13, 2008

"By watching silicon cantilevers coated with receptors bend when molecules attach to their targets, researchers have already studied a number of biochemical interactions, including DNA and protein recognition.

The team extended this concept by investigating interactions between the antibiotic vancomycin and an amino acid sequence that was an analogue of a polymer called mucopeptide, found in bacterial cell walls. The cantilevers are coated with drug-resistant or drug-sensitive versions of the analogue before vancomycin is added. In the drug-resistant version, which lacks only a single hydrogen bond within its binding pocket, few drug-target interactions occur. But in the drug-sensitive version, the antibiotic hits its targets, and the build-up of intermolecular forces between drug molecules on the cantilever's surface causes the silicon board to bend.

The extent of bending, detected optically, acts as a quantitative measure of the affinity of a drug for its target. Arrays of cantilevers, each coated with a different receptor, could allow many targets to be detected in parallel."

The full article can be found at: http://www.rsc.org/chemistryworld/News/2008/October/13100802.asp

Return to Top

RAND REPORT PROPOSES STANDARDS FOR MASS ANTIBIOTIC DISPENSING
By Lisa Schnirring
CIDRAP News (Center for Infectious Disease Research & Policy – University of Minnesota)
October 15, 2008

“The Rand Corp., responding to a request from the US Department of Health and Human Services (HHS), recently unveiled a set of proposed standards for cities to use as they establish plans to distribute antibiotics to the public in the event of a bioterrorist attack or other public health emergency.

The 133-page technical report, which appears on Rand's Web site, covers four main topics: the number and location of points of dispensing (PODs), internal POD operations, staffing, and security. PODs are places where members of the public would go to receive antibiotics or other countermeasures in an emergency.

The Pandemic and All-Hazards Preparedness Act of 2006 requires HHS to develop performance standards for public health preparedness, and the HHS Office of the Assistant Secretary for Preparedness and Response (ASPR) asked Rand to develop the proposed standards, according to the report.”

The full article can be found at: http://www.cidrap.umn.edu/cidrap/content/bt/bioprep/news/oct1508rand.html

Return to Top

END of CB Daily Report.

Send subscription requests, unsubscribing requests, questions and comments to**:**

Steve Tesko: Steve.Tesko@anser.org