Office of Science Laboratory
Counter-Terrorism Exhibits

Chemical and Biological Mass Spectrometer (Oak Ridge National Laboratory) The CBMS unit is a pre-production chemical and biological detector for military use based on technology that won a R&D 100 award in 2000. It will be vehicle mounted and able to discriminate between biological and chemical warfare agents in the midst of pollens, mold spores, engine exhausts and other background that would confuse earlier generation detectors.

RAMan Tunable Integrated Sensor (RAMiTS) (Oak Ridge National Laboratory) This is a chemical agent detector designed for the use of first responders in HAZMAT suits. The unit weighs about 40 pounds, and has a 12-foot fiber optic sensing probe which is held up to a sample of a potentially harmful agent. Within seconds, the spectrum of the sample is taken, then compared to an internal library of known spectra, and identified. The unit can detect most chemical agents and explosives.

Mini-Raman Lidar System - MRLS (Brookhaven National Laboratory) An outgrowth of BNL basic research, the MRLS can be used to look for chemicals resulting from nuclear, chemical, narcotics or other illegal drug processing, and accidents involving hazardous materials on any surface. The MRLS works at ranges of about 3-feet to tens of feet. This standoff can provide first responders with a unique non-contact tool for interrogating and identifying unknown chemicals. It has the capability to detect an` airborne "cloud" of these chemicals and identify its perimeter and composition.

Large-Volume Radiation Detector Using Compressed Xenon (Brookhaven National Laboratory) BNL has demonstrated a portable, battery powered, room-temperature xenon spectrometer about the size of a suitcase that is ready for field-testing. Further development is required to construct and test the feasibility of very large detectors suitable for fixed installations such as piers where containers are offloaded from ships. This technology offers higher resolution than current devices, and could distinguish between legitimate shipments of medical isotopes and other nuclear materials. When fully developed it offers the promise of a detector that can identify a nuclear threat in ships or other vehicles from a distance.

Acoustic Inspection Device (Pacific Northwest National Laboratory) Originally developed by DOE for weapons inspection deployment in Iraq, the lap-top sized unit can identify hidden compartments or cavities inside liquid-filled containers or solids. Foreign objects (contraband or hidden compartments) or different liquids can be easily detected. Now being commercialized, the first unit will be available for testing in early November.

Holographic Imaging System for Personal Screening (Pacific Northwest National Laboratory) Developed for the Federal Aviation Administration, this detector currently being commercialized displays clear 3-D images of items concealed beneath the clothing of an individual. Various metallic and nonmetallic weapons or simulated contraband such as knives, guns, explosives, and vials can be easily and quickly (within seconds) detected.

Advanced Sensing Materials for Chemical Agent Sensors (Pacific Northwest National Laboratory) Polymers that sense toxic vapors have been designed, made and tested. Patented and licensed to government use, this technology has been incorporated into highly sensitive Sarin microsensors and Sandia lab-on-a-chip warfare agent detector research and development.

Biodetection Enabling Analyte Delivery System -- BEADS (Pacific Northwest National Laboratory) Using microfluidic systems, an automated sample preparation system has been created. This system (BEADS) takes bacteria from soil, air or water samples and analyzes the DNA for pathogen identification. No human intervention is needed in the sample preparation or analysis process. This system can be adapted to identify a wide range of pathogens and chemical agents and is small enough to be incorporated into other detectors of chemicals, proteins or whole cells.

Protect System (Argonne National Laboratory) A prototype warning and response system for chemical or biological attack in subways, office buildings, air terminals or other interior spaces. PROTECT will provide first responders and law enforcement officials with timely and accurate information about airborne chemical, and eventually, biological attacks. PROTECT's early warning system will detect and identify chemical and biological aerosols, map contaminated areas, and assist in managing and mitigating the crisis. The initial phase of the program focuses on chemical attacks in underground transportation systems.

Biochip Technology (Argonne National Laboratory) This system uses microscopic gel pads containing reagents that react with proteins and nucleic acids diagnostic for disease-causing bacteria, viruses and toxins. The equivalent of test tubes, these micron-sized dots can be used as a specific chemical detector. In early tests, the chips have been successfully validated for detection of anthrax, but a field deployable system is 1 year - 3 years away.

Cyanide Microsensor Development (Argonne National Laboratory) Few current gas sensors can detect either single chemicals at low concentrations or many chemicals simultaneously. A ceramic metallic (cermet) microsensor array has been developed and tested that detected and identified very small amounts of cyanides. The microsensor and its software have been delivered for integration into a military hand-held chemical agent detector.

Building Occupant Protection (Lawrence Berkeley National Laboratory) Based on modeling and experimentation on how aerosols are dispersed within buildings, this is an information kit for first responders and for building owners, managers, and occupants. It explains how contamination spreads through buildings, so that rescue workers can take steps that minimize the impact of an intentional chemical or biological release. The information will help responders determine which occupants are most likely to be exposed, where the concentrations of the contamination are likely to be the highest, and where the contamination is likely to spread as time passes

DOE JGI (Joint Genome Institute): Rapid DNA Sequencing of Microbial Pathogens (Lawrence Berkeley National Laboratory, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Oak Ridge National Laboratory) The Joint Genome Institute is fully operational as one of the most rapid

and cost effective sequencing operations in the world. It is a large research facility combining advanced sequencing machines, robotic instrumentation, and computational resources that can be directed toward microbial pathogens considered to be potential biothreat agents. The JGI is powerful enough to sequence the genome of E.coli almost ten times every day. These sequence data on pathogens are needed for (1) identifying pathogen-specific genomic regions for DNA-based detection and diagnostic technologies, (2) deciphering the molecular mechanisms responsible for an organism's virulence, and (3). identifying genetic variations to differentiate among strains of a given pathogen. The understanding gained will be extremely valuable to researchers and agencies developing medical prophylaxis/treatment for biothreat agents and better forensics to determine genetic signatures.

Compact Neutron Source for Rapid Screening of Closed Containers (Lawrence Berkeley National Laboratory) Neutron-based interrogation systems are used to screen closed containers on trucks, ships, and airplanes for concealed terrorist materials, including chemical weapons, explosives, and fissile materials. Concealment would require a level of shielding that would be obvious to the detector, and signal the need for manual inspection. This powerful, compact, and potentially long lived source will enable systems to be built that (1) detect smaller objects, (2) screen containers more rapidly, and (3) better discriminate among materials
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