

Team Accomplishments

Research And Technology Directorate

Applied Test

Provided comprehensive test data used to certify a new source of paper for use with M256A1 kits, due to the manufacturer discontinuing production of the paper. New concept of operations also required additional capability in the paper. Generated test data on blister agent, nerve agent and semivolatile compounds of concern. Working with the manufacturer of both the kits and the paper, production of the paper was restarted -- the goal being to produce enough paper for the next five years.

Biochemistry

Discovered an approach to estimate survival of potential viral warfare agents after their release at a disparate set of locations and times of the year. This new understanding of viral agent fate in the environment will support the development of new consequence management strategies and help to clarify and redefine military requirements for the development of pertinent countermeasures. This accomplishment was valuable for developing a novel approach to predict the survival of viruses in the environment that will guide military doctrine on biological defense and will expedite recovery of military and civilian assets after a biological attack. Research published in *Journal of Virology*, November 2005.

Forensic Analytical

Supported Operations Iraqi Freedom and Enduring Freedom through deployment of specialized mobile laboratory and personnel who analyzed suspected chemical warfare samples in Iraq.

Mobile Labs and Kits

Designed, fabricated and delivered a suite of chemical and biological mobile laboratories for the 20th Support Command. Included specially designed analytical equipment and engineering controls. Also trained personnel on mobile laboratory operation and provided laboratory protocols and methodologies.

Aerosol Sciences

Partnered with the Department of

Homeland Security to conduct objective experimental characterizations of performance of contractor-developed biological detection system components for the BioWatch Program, including aerosol samples and sample analyzers, at various stages of the research and development process.

Smoke and Target Defeat

Conducted studies of many materials and identified two that exceeded the goal to develop and test a dry powder obscurant with performance (mass extinction) four times current infrared obscurants. In fact, the obscurant material identified provides 10 times the performance factor of present materials, which increases survivability in the field. These new materials will be further explored as part of a FY06 Army Technology Objective to disseminate these new advanced infrared obscurants.

Operational Toxicology

Completed research focused on whole-body inhalation exposure effects of GF vapor in the swine and VX vapor effects in rodents, which is essential to confirming/ updating existing estimates of exposures standards for humans. Specifically, discovered that nerve agents GF and GB are equally potent and that human estimates should be revised upward. The overall impact of this work is to refine accuracy of existing estimates of human health risks for both military and civilian populations, which determines the requirements for defensive equipment and affects concept of operations in the field. Researchers in this area published 23 presentations and publications in 2005.

Environmental Toxicology

New methods for investigating the fate of chemical agent on soil were needed. Designed and fabricated Soil System Units that allow determination of the fate of chemical warfare agents in soil, as well as investigation of the soil chemical and physical characteristics affecting the persistence of threat from continuing presence of agent in soil, under conditions that represent those in the field. For the first time, we were able to replicate and

investigate the residual levels of GD found at hazardous levels in the field using the Soil System Unit approach. Results of our initial experiment showed that persistence of G-agent (GD) in soil can be expected for days following contamination. Furthermore, we established that life-threatening atmospheric levels of G-agent (GD) may be expected to successively reoccur in response to increasing moisture in soils contaminated with G-agent. Information generated on the fate of chemical agent on soil will be used for developing new guidelines for Warfighter operations and for response to homeland defense activities.

Biosensors

Conducted assay optimization and development of the Sector PR electrochemiluminescent Biodetection system in support of Department of Homeland Security. This device, a product of Meso-Scale Discovery, is a first generation plate-based analyzer, using biowarfare agent immunoassays fabricated on a proprietary screen-printed carbon electrode surface. Work involved assay optimization, increased throughput and an investigation into downsizing the platform. Multiple assays have been developed.

Molecular Engineering

Developed baculovirus as simulant for viruses used in laboratory and testing studies. Non-pathogenic to humans, the baculovirus resemble poxviruses in their physical construction, size and genome composition more closely than current simulants. Filed a patent application for the use of baculoviruses as simulant viruses in biodefense work. Pursuing a collaboration with the French Ministry of Defense research laboratory, the Centre d'Etudes de Bouchet, which also has an interest in simulant research.

Microbial Analysis and Products

For the Environmental Protection Agency, evaluated commercial fumigation technologies. The purposes of this evaluation was to: study the correlation between the decontamination efficacy of chlorine dioxide generated by two

processes; understand the ease of decontamination of carpet, ceiling tile, and I-beam steel relative to wallboard, wood and concrete; evaluate the decontamination efficacy of concrete and wallboard, and the necessity of multiple fumigation runs; understand the difference of recoveries from porous versus non-porous materials; and understand the impact of low temperature and low humidity. These findings will provide the Environment Protection Agency critical guidance for selection of appropriate building fumigants.

Point Detection

Development and implementation of a new proteomics-based method for the classification and identification of over 200 species of bacteria: This method integrates mass spectrometry based proteomic technology with a bacterial taxonomic database and numerical taxonomy methods to reveal genomic relatedness among bacteria. The unique readout of genomic information through ultra-fast sequencing of expressed gene products and bioinformatics methods allow for rapid classification and identification of microorganisms and their protein toxins. It may function as a strong complement to the alternative approaches of comparing microbial genomes based on DNA sequencing or microarray hybridization techniques.

Laser Standoff Detection

Transitioned Raman surface detection technology to the Chemical Biological Radiological Unmanned Ground Reconnaissance Advanced Concept Technology Demonstration and determined the final algorithm. This technology transition represents a significant improvement over the current mechanical method of conducting sampling and analysis of contamination on surfaces. Also calculated the Raman cross sections and populated a Raman repository for 10 neat chemical warfare agents and 38 toxic industrial chemicals.

Passive Standoff Detection

Demonstrated real-time detection of chemical vapor plumes in demonstrations at Huntsville, AL, Porton Down, UK and the Naval Surface Warfare Center in Virginia using the Adaptive Infrared Imaging Spectroradiometer technology. Completed upgrade of Adaptive Infrared

Imaging Spectroradiometer to incorporate a 256x256 focal plane array operating at 5 scans/second. Results from all demonstration locations indicate that the sensor was able to detect and discriminate both the agent and simulants at extremely low release rates.

CB Technology Evaluation

Completed Technology Readiness Evaluation for detection systems. Tested 11 point biological identifier systems at Dugway Proving Ground against four pathogens in approximately 400 blind samples of varying concentrations. The systems were assessed in the areas of suitability, performance and maturity based on contractor provided information and the test results. The systems were assessed individually for application to three programs: Joint Point Biological Detection System, Guardian and Joint Biological Agent Identification and Diagnostic System. This was the first time that Technology Readiness Levels were assigned to all detectors tested.

Decontamination Sciences

Conducted demonstration of decontamination of C-141 airplane using modified Vaporous Hydrogen Peroxide technology at Davis Montham Air Force Base. Also conducted demonstration of decontamination of sensitive equipment at Tyndall Air Force Base. Results from both tests indicated modified Vaporous Hydrogen Peroxide is a viable technology for large-scale and sensitive equipment decontamination. Also redesigned technology to improve and miniaturize delivery systems. Expect technology to transition into joint service decontamination acquisition program in FY07.

Agent Chemistry

Completed non-traditional agent synthesis and study.

Chemical Biological Radiological Filtration

Transitioned novel sorbents to individual and collective protection programs. Four sorbents, which have the capability to remove toxic industrial chemicals such as ammonia, ethylene oxide, nitric acid, nitrogen dioxide, as well as traditional chemical agent, were incorporated into mask technology and large filtration system programs.

Respiratory Protection

Completed Defense Technology Objective project that resulted in the development of a low-cost, multi-agent End-of-Service-Life Indicator for protective mask filters. Assisted with transition to the Joint Service General Purpose Mask program. Also, validated the performance of a test system developed in-house to objectively monitor respirator lens fogging kinetics and to measure the impacts of lens misting on visual acuity in support of NIST and NIOSH CBRN respirator standards development and certification testing efforts.

Nuclear Biological Chemical Battlefield Management

Installed the Port Warning and Reporting Network System at the Port of Ash Shuaybah, Kuwait in September 2005. This system is an integrated hardware and software network that provides a commander with situational awareness to include near real-time display of detector data, event management, hazard prediction, and messaging. PortWARN will be used in the Fusion Cell of the port's operation center and will be operated by the 143rd Transportation Command and the Surface Deployment and Distribution Command. It was also installed at Kuwait Naval Base in January of 2006.

Modeling, Simulation, and Analysis

Defined analysis and modeling and simulation infrastructure for detection technology development managed by the Joint Project Manager for Contamination Avoidance. Developed master plan that laid out technological system milestone decisions and defined what analysis is required at each stage. A gap analysis was also completed to identify what additional modeling and simulation or analytical capabilities needed to be in place to support the analyses

Chemical Biological Systems Integration

Designed, fabricated and evaluated the TAC-BIO (TACTical BIOlogical); a low cost, low power, lightweight biological agent detector. Test bed designs successfully detected biological aerosols while rejecting a wide range of potential battlefield interferents. With a target unit cost of <\$500 per detector, this technology could lead to an affordable means of achieving wide area surveillance and early warning against biological agent attacks.

Team Accomplishments

Engineering Directorate



Test Technology Engineering

Conducted tests and performed contract negotiations to enable full-rate production of the Joint Service Mask Leakage Tester. The leakage tester is a portable device designed to test the serviceability and fit of protective masks. Completed two rounds of developmental testing to ensure all design and software changes were acceptable under all required environmental conditions. Also, completed a second operational test and evaluation to prove out several design improvements and upgrades. Created a spare parts pool to decrease turn-around time for maintenance. Once fielded, the mask leakage tester will provide the warfighter increased mask safety and ensure its protective value.

Collective Protection Engineering

The M93 filter is installed in small collective protection shelter systems to provide clean filtered air, but has been found to clog in dusty environments. The Collective Protection Engineering Team developed and tested a dust separator adaptor kit for the M93, which removes over 80 percent of dust in the air, resulting in extended filter life in dusty environments.

Respirator Engineering and Acquisition

Completed system demonstration of the Joint Service General Purpose Mask and began low rate initial production in support of the Joint Program Manager for Individual Protection. The new mask, which is to be fielded in 2006-2007 to warfighters from all services, offers improved protection and ease of use. Lower breathing resistance, higher filtration flow rates, increased protection against toxic industrial materials and improved system compatibility are features of this new mask.

Homeland Protection Engineering

Installed and certified filtration systems in numerous critical government facilities across the nation that require specialized collective protection to provide clean air after a potential chemical, biological or radiological attack. Provided continuous surveillance, preventative maintenance and regular re-certification of these systems.

Chemical Detection Engineering

Inspected and repaired hundreds of Improved Chemical Agent Monitors and M21 Automatic Chemical Agent Alarm systems in support of the Army RESET program that is focused on restoring equipment used in the field to a fully mission-capable status. Included conducting site visits at chemical units and installations throughout the United States and identifying equipment requiring service as a result of the increased pace of Army operations and employment of the equipment under extreme in-theater operational conditions. These actions will ensure that critical chemical defense assets supporting operational efforts are restored to fully mission capable status and noted hardware and system sustainment deficiencies are corrected to preclude future problems.

CUGR Advanced Technology Concept Demonstration

In 2005, the Chemical Biological Radiological Unmanned Ground Reconnaissance program faced issues that had potential to delay development of new reconnaissance technology by one year. In collaboration with other organizations, the team identified problems impeding progress with the surface detector software and restructured the program schedule to allow additional software verification testing. Operational demonstration testing will still take place in 2006, and the project will be completed as scheduled and original cost projections are still valid. Once fielded, CUGR will be a unique and valuable surface contamination detection tool for warfighters.

Decontamination Engineering

Support provided to current operations in the Gulf caused a large spike in demand for M17A3 Decontamination spare parts, quickly depleting the Defense Logistics Agency stock and adversely impacting system readiness. ECBC, working in partnership with TACOM, requested management of spare parts be returned for intense management and close technical control. Addressed special technical problems to ensure successful item procurements. Improved functionality of spare parts by applying equipment enhancements such as improved air filtration and protective caps. As a result, critical spare parts are available to restore M17s to fully mission capable status. Additionally, spare part enhancements improve the M17's survivability in the harsh desert environment.

Advanced Design and Manufacturing

Developed and fielded 3,000 Low Volatility Hazard Detector units within three weeks. The detector units, now known as the M256LVH Chemical Agent Detector Low Volatility Hazard Kit, advanced chemical agent detection capabilities for warfighters by enhancing the fielded M256A1 Chemical Agent Detector Kit. By adding a small plastic Sample Heater Assembly for simple sample containment and heating, and the use of the existing fielded M256A1 detection chemistry, the M256LVH provides the ability to detect the presence of low volatility hazards.

Smoke Engineering

Inserted the Starter Patch ignition method technology into the M18 Colored Smoke and M83 Training Smoke Grenade. Testing has been successfully completed on all four colors as well as the training grenade. The Starter Patch configuration ignites the grenades more efficiently, with the grenades producing usable smoke faster, especially for arctic-conditioned grenades. This configuration is also less sensitive to low fuze output.

Homeland Defense

Conducted field trials to determine the amount of a liquid contaminant that represents a hazard to special weapons and tactics officers during a response to a chemical warfare agent terrorist event. The data collected will be used to develop risk assessments and to provide operational guidance. The evaluation of the liquid transfer hazard has not been addressed in the past. Published six reports related to the subject in 2005.

Special Plans Office

Provided chemical and biological reachback to warfighters. Included experts from multiple rapid response programs that supplied subject matter expertise, hardware, and support on chemical and biological operations. Projects included conducting detailed analysis for a site in Mosul, Iraq, designing and fabricating a Sensitive Item Decontamination Unit, and supporting multiple training exercises.

DTRA-CBX

Managed commercial-off-the-shelf testing for the Department of Defense responders in coordination with the Joint Program Executive Officer for Chemical and Biological Defense and the Weapons of Mass Destruction Civil Support Teams. Testing was conducted on the AreaRAE; MultiRAE; QuickSilver Sampling Kit; BTC 650; and Draeger HAZMAT kit. This data will be used for Non Standard Equipment Review Panel's approval of these items for Department of Defense use.

Pyrotechnics

Demonstrated a new improved Advanced Incendiary Tool designed to support the US Naval Explosive Ordnance Disposal/Low Intensity Conflict. The demonstration showed greatly improved performance producing a complete penetration of MK82, MK83 and M117 bombs with a hole of a consistent diameter.



Team Accomplishments

Chemical Biological Services Directorate

Explosive Destruction System

Successfully deployed the Explosive Destruction System, a mobile munition containment and destruction device, to Dover Air Force Base, DE and Aberdeen Proving Ground, MD to destroy one mustard-filled munition, one cyanogen chloride and seven hydrogen cyanide canisters. EDS testing was conducted with test items filled with mustard and lewisite. Personnel operated and maintained the EDS, manned the personnel decontamination station and performed air monitoring and laboratory analyses.

Munitions Assessment and Processing System

Supported concept, development and construction of the Army's Munitions Assessment and Processing System. This \$12.9M system, located at the Edgewood Area of the APG supports both the installation's restoration program and the Program Manager for the Elimination of Chemical Weapons by safely treating all types of explosively configured chemical and smoke munitions found in those locations. Completed developmental and operational testing and prepared for start of operations in FY06.

Environmental Monitoring

Deployed to Tirana, Albania in May 2005 to support the Defense Threat Reduction Agency's Albania Chemical Weapons Elimination Program. During the field deployment, personnel performed storage container sampling, on-site agent analyses and sample preparation for shipment to the U.S.

Risk Reduction

Participated, on behalf of the Army Materiel Command, in the development of biological surety regulations that are now implemented throughout DoD. Also developed air monitoring methods for detecting new worker population limits (WLP), updated documents (e.g., SOPs, MSDSs, air monitoring plans, etc.), developed written plans and strategies for reacting to airborne detections (WPL Excursion Plan) and agent clearance methods for PPE to be laundered, and informed/educated the workforce of the changes to comply with the new Department of the Army chemical agent guidance, which introduced new airborne exposure limits to the classic (G, V, and H-type) chemical agents.

Pine Bluff Arsenal Munitions Assessment System

Initiated project to assess and repackage approximately 1,200 recovered munitions and several thousand Chemical Agent Identification Sets at Pine Bluff Arsenal in Arkansas. Provided air monitoring and agent screening of waste and protective clothing/protective equipment. In 2005, placed 16 support personnel on site to include chemists, operators and technicians.



Team Accomplishments

Advanced Planning and Initiatives Directorate

International

Conducted quick-turnaround test program for Japan's Health and Medical Affairs. Evaluated Japanese physical protective equipment against realistic biological challenges. Tested collective protection filters, masks, and clothing using US military performance standards as performance measure.

Decision Analysis

Conducted a downselection study in support of the Project Manager for Smoke and Obscuration. This study was done as a follow on to a Functional Solutions Analysis, as part of the Joint Capabilities Integration and Development System process. Developed a methodology based on Multi-Criteria Decision Making to identify the best potential materiel solutions for small and medium area obscuration. The foundation for the analysis was an evaluation model, made up of weighted criteria with definitions and performance scales, which was used to assess each potential solution. Conducted an analysis of the model results and developed program recommendations in conjunction with the PM. These recommendations were provided as input to the Maneuver Support Center Battle Lab to be used in a war-game simulation model.

Technology Transfer

Achieved milestones with two industry partners. First, licensed enzyme technology to Genencor International, who now manufactures the decontamination technology under the trademark DEFENZ™. This decontamination technology was named a winner of the prestigious 2006 Award for Excellence in Technology Transfer by the Federal Laboratory Consortium for Technology Transfer. Second, transitioned the Modified Vaporous Hydrogen Peroxide decontamination technology, developed in conjunction with STERIS Corp., so that it is poised for incorporation into an acquisition program in 2007.

Chemical, Biological, Radiological, Nuclear and Explosive Training Team

Facilitated seminar on behalf of CENTCOM for Gulf Cooperative Council officers from Egypt, Jordan, Kuwait, Qatar and the United Arab Emirates on nuclear, biological and chemical topics. Seminar subjects included Toxic Industrial Chemicals, chemical agents (and precursors), decontamination, biological agents, biological detection with practical exercises in the use of the Hand-Held Assay and Biological Sampling Kit. The training was primarily conducted in White Marsh, Maryland and site tours included the Harford County Emergency Operations Center and the Aberdeen Proving Ground Ordnance Museum.

