



Edgewood Chemical Biological Center
Aberdeen Proving Ground, MD

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CB
Quarterly

Biotechnology at ECBC

Also:

- Ocular Toxicity Study
- Chemically and Biologically Protected Shelter
- Chemical Biological Defense Research Conference
- Fieldings

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Domestic Preparedness Receives Hammer Award See page 49

From the DAR . . .

As the Deputy for Acquisition and Readiness for the U.S. Army Soldier and Biological Chemical Command (SBCCOM), I am pleased to introduce another exciting issue of the CB Quarterly. This publication originates at the Edgewood Chemical Biological Center (ECBC). ECBC has a unique mission: "Protect the warfighter and the United States' interests through the application of science, technology, and engineering in chemical and biological defense."

This issue of the CB Quarterly provides a summary of the biotechnology program at ECBC. Developments such as DNA sequencing and cloning, DNA synthesis, and macromolecular structural analysis now allow people to reprogram genes in yeast and bacteria and use these cellular factories to manufacture useful products. More recent breakthroughs suggest the ultimate in biological control, the ability to selectively control gene expression, hence the biochemical processes required to maintain life. ECBC's interest in biotechnology relates to missions involving detection of chemical and biological agents, decontamination of these agents, destruction or demilitarization of stockpiles, and environmental remediation. An article on an in vitro assay that

could be used to test chemicals for ocular toxicity follows the lead article on biotechnology. This validation study is a major step in the process of gaining FDA approval for a newly developed assay. ECBC is conducting this study for The Gillette Company, and if successful, could alleviate the need to use animals to assess a chemical's ocular toxicity. Stories on the new CB protective field duty uniform and the CB protected shelter, which help to block CB contaminants, show advances in this field. As always, the latest fielding dates for CB equipment are included.

During this quarter, ECBC held two prestigious events, which are described in this issue. The 2001 Scientific Conference on Chemical and Biological Defense Research was co-hosted with the U.S. Army Medical Research and Materiel Command. Team APG Biotechnology Showcase 2001 displayed research facilities to biotechnology firms that may have interest in forging research and development partnerships with the Army. This command continues to be committed to partnering with academia, private industry and other government agencies, both nationally and internationally. Various sections in this issue discuss some of our partnering achievements.

This will be my last column for the CB Quarterly as the DAR. After more than 30 years of serving this great Army and country, I am retiring. My replacement has not yet been named. However, I know that my successor will be leading a great work force. Throughout the RDA Enterprise, everyone is doing a superb job. Keep up the great work. HOOAH!



BG. Philip M. Mattox

On the cover:

Photo by **Conrad Johnson**

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Headquarters of the U.S. Army Soldier and Biological Chemical Command



is located at the Edgewood Area of Aberdeen Proving Ground, MD. Within SBCCOM's RDA Enterprise are the PM-Soldier Systems, PM-Soldier Support, PM-Force Provider, PM-NBC Defense Systems, Integrated Materiel Management Center, and the Research, Development and Engineering Center (RDEC). The RDEC consists of the Natick Soldier Center and the Edgewood CB Center. This publication is prepared at the Edgewood CB Center, incorporating CB-related information from the entire RDA Enterprise.

We publish this information under the auspices of AR 70-45, R&D Scientific and technical Information Program, which states that "The objectives of the S&TI Program are to—

a. Improve the flow of technical information into, through and from the Department of the Army in order to

(1) Secure economies by reducing RDTE lead time and by eliminating unnecessary duplication of effort,

(2) Improve RDTE program management and execution, and

(3) Support the information needs of scientists, engineers, and managers."

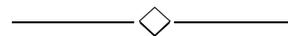
AR 70-45 further states "Department of the Army elements will provide for adequate interchange of technical information among themselves and with their contractors, the other military departments and Federal agencies, and, to the maximum extent consistent with national security, the US scientific, technical, and academic communities."

This document is distributed to over 1,200 addressees throughout the Joint Services, industry, and academic R&D community, and it could be a vehicle to publicize what is going on where you are. Please submit articles to Director, Edgewood Chemical Biological Center, ATTN: AMSSB-RAS-C, Aberdeen Proving Ground, MD 21010-5424, or by electronic mail to cet@sbccom.apgea.army.mil. All submissions are accepted at the discretion of the editor and are subject to editing.

Managing editor is Dr. James J. Savage. For additional information, please contact our copy editor, Ms. Joanne Coale at (410) 436-5385 or DSN 584-5385.

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The CB Quarterly is available on our web site:

<http://www.sbccom.apgea.army.mil/RDA/ecbc/quarterly/index.htm>

BIOTECHNOLOGY AT ECBC

The biological revolution is an extension of the information revolution

by James J. Valdes, Roy G. Thompson, Akbar S. Khan, Kevin P. O'Connell, and Jennifer W. Sekowksi

The use of biotechnology is literally as old as civilization. Beer and wine have been fermented for millenia, bread is leavened with yeast, bacteria are used to produce cheese and yogurt, and animals are bred selectively to produce more meat and milk. The first major advance in applying these principles in a systematic way to industrial manufacturing was in 1917, when Chaim Weizmann used a pure yeast culture to ferment cornstarch and produce acetone, which Britain needed for the manufacture of explosives. Even then, biotechnology had military uses.

The fermentation industry really came of age after 1945 with the production of antibiotics. All of this may be called the Old Biotechnology, and was essentially trial and error.

We are at the dawn of the Third Revolution of the modern age, and at the Edgewood Chemical Biological Center, we are developing the people and tools needed to capitalize on this change.

The First Revolution, known as the Industrial Revolution, radically changed society by introducing new sources of energy to manufacturing. Its single defining symbol is the steam engine.

The Second Revolution began in the 1950's with the invention of the transistor and continues



unabated today. Sometimes called the Information Revolution, it brought new ways of handling vast amounts of data to manufacturing and is best symbolized by the microchip.

Both the Industrial and the Information Revolutions have significantly altered warfare, the implications of the latter being

hotly debated by military and civilian defense planners even now.

The Third Revolution can most properly be called the Biological Revolution and traces its origin to the elucidation of the DNA double helix and the subsequent development of the tools molecular biology needed to manipulate genetic material.

Developments such as DNA sequencing and cloning, DNA synthesis, and macromolecular structural analysis now allow man to reprogram genes in yeast and bacteria and use these cellular factories for the manufacture of useful products. In a sense, the Biological Revolution is an extension of the Information Revolution because it allows access to the vast information stored in genes, which will allow us to radically re-make the biological world.

The science writer, Edward Yoxen referred to the biological world as "a vast organic Lego kit," and technologically advanced nations now have the ability to tailor life forms in order. More recent breakthroughs suggest the ultimate in biological control, the ability to selectively control gene expression,

hence the biochemical processes required to maintain life.

Nature, for a variety of evolutionarily-driven reasons, has produced a wide variety of remarkably dangerous organisms and toxins that are lethal to humans and for which we have few early warning sentinels. Biological agents derived from these have been developed as weapons of mass destruction and represent the primary strategic threat to the United States.

Unlike conventional or chemical munitions, pathogenic agents such as bacteria and viruses are self-replicating (although viruses must use their host's genetic machinery), hence very small initial quantities could be used in an attack and the effect amplified by secondary infection. They are easy to produce with commercially available cell culture and fermentation equipment and can be manufactured by countries and groups with relatively unsophisticated scientific capabilities.

ECBC's interest in biotechnology relates to missions involving detection of chemical and biological agents, decontamination of these agents, destruction or demilitarization of stockpiles of chemical agents and energetic materials such as explosives and propellants, and environmental remediation. Longer term interests focus on the development of new biotic and biomimetic structural materials with high performance characteristics, and the use of genomic and proteomic arrays to address issues of low-level

toxicology, biological detection, and identification.

Present methods to detect biothreat agents for point detection depend heavily on the use of antibody-based reagents. As a complex protein with complex structural requirements for optimal activity, the use of whole antibodies poses a significant logistic burden in maintaining their viability in both storage and use in non-laboratory environments. The traditional hybridoma approach to developing monoclonal antibodies specific for binding a unique target antigen (i.e., threat agent) is also both time and cost intensive and has limited ability to rapidly develop antibodies against rare or emergent threat agents.

The development of technology to display antigen binding fragments of antibodies on the surface of cells has enabled researchers to transfer the genetic principles of immune system specificity into extremely large, combinatorial libraries of antigen-binding molecules. The expression and screening of such libraries offers significant savings in time and cost over the hybridoma approach in identifying antibodies that will bind specifically to a single antigenic epitope. In addition to the advantages of rapid screening against a targeted threat agent, the phage display approach allows one to identify only that fragment (e.g., Fab, single chain) of the whole antibody construct that is necessary to confer specific binding.

These methods, while expedient, are still contingent upon an immunization schedule of weeks or

months, and a knowledge of the identity of the threat. Given the pace of progress in biotechnology, it is likely that a unique threat may be encountered for which no detection system has been designed, and to which current hybridoma technology will be incapable of responding.

It is now possible to by-pass animals completely by constructing a synthetic repertoire of antibody genes. Libraries of peptides can be prepared biochemically by splicing a random mixture of synthetic DNA molecules encoding the peptide of interest (e.g., receptor specific for a particular threat agent) to the gene encoding a readily expressed protein. This DNA construct is introduced into an appropriate expression system and the resulting peptide is synthesized as a fusion protein.

Currently, one of the most common expression systems fuses the random sequences to the gene III or gene VIII coat protein of filamentous phage particles. Each viral particle contains a unique DNA sequence that encodes only a single peptide and, typically, libraries containing $10^8 - 10^9$ different phage particles are assembled. These libraries can be screened for biological activity and affinity or activity-selection procedures can be used to isolate the phage particles expressing bioactive peptides. By their very nature, combinatorial antibody libraries duplicate many aspects of the mechanisms used by the human immune system.

Biochemical interactions involving a variety of large biomolecules can

be mimicked by the binding of linear peptide sequences on the order of 5-15 amino acids. ECBC has applied the principles of combinatorial peptide library display technology to identify the minimal peptide sequence that mimics the ability of an antibody to identify and bind to a specific antigen. In addition to seeking short peptide sequences that mimic the binding specificity of antibodies, the combinatorial peptide library is also being screened against antibodies to define mimics of threat agents, which can then be used as positive controls in validating antibody specificity. Unlike the original antigen, these epitope mimics would be non-infectious and non-toxic, thus obviating the need for special biosafety control procedures and allow the use of a more realistic simulant for assay and sensor development and testing.

The development of peptide substitutes for antibody reagents and peptide mimetics for antigen epitopes offer significant advantages for future operational requirements in contamination avoidance and point biological detection and include: (1) rapid identification and selection of reagents for detecting antigens where hybridoma and antibody technology is not practical or feasible, (2) decreased logistic requirements and increased reagent stability, shelf life and ruggedness, (3) decreased production costs, (4) decreased reagent variability, and (5) increased operational reliability/readiness/decision certainty by providing non-toxic

reagents for positive controls in field testing and validation.

There are also several DNA based approaches to detection that are being pursued. The most well known is to amplify the DNA in a sample which might have a biological agent using the polymerase chain reaction (PCR). Oligonucleotide probes and primers, designed to recognize and amplify genetic sequences unique to particular pathogenic organisms, are being produced and incorporated into PCR assays. PCR assays are notoriously subject to interference from contaminants in the sample, and a related project has developed rapid clean-up procedures which improve the fidelity of the PCR assays.

More recent developments in microarray technology now enable researchers to immobilize thousands of gene sequences on chips. Known as gene arrays, these chips can be designed for a number of applications such as toxicogenomics and biological agent detection. In toxicogenomics, genes known to respond to exposure to toxic industrial chemicals, chemical agents, or pathogens are immobilized on microarrays. RNA is isolated from blood taken from a person suspected of exposure (or an animal or cell culture exposed experimentally), converted to DNA and bound to the microarray. The relative activity of the genes can be assessed from the amount of binding, and the importance of the changes deduced by identifying the genes' functions. Since these genetic alterations can occur weeks to months before pathology

appears, this technology offers the possibility of early treatment by elucidating the underlying mechanisms of toxicity.

This work is now being extended to the realm of biological agent detection. ECBC researchers are now identifying genetic sequences which uniquely identify particular pathogens down to the species and strain level. Microarrays of these genes will be designed and used in an analogous fashion to the toxicogenomics studies. That is, RNA will be isolated from samples suspected of being contaminated with pathogens and treated as before. The presence or absence of genetic markers for pathogens will be detected with extreme fidelity owing to the redundancy built into the microarrays. This genomic work, and planned studies in a related area called proteomics, will be a large part of the future biotechnology program.

All of these products must be manufactured in order to have any utility at all, and this is performed in our Process Engineering Facility (PEF). The PEF is the DOD's sole facility with complete cradle to grave research, development, production, storage and validation of biological products. It is a 20,000 square foot facility with state-of-the-art equipment to perform scale-up production and optimization using hollow fiber bioreactors, stirred reactor fermentors ranging from 5 to 1500 liters, filtration/purification and final product milling, drying and cryopreservation. The PEF is fully staffed with a highly trained, multi-disciplinary team with extensive experience in molecular

and cell biology, biochemical engineering and protein chemistry. In addition, bioprocess designs incorporate the use of the same economic analysis software used as the standard in the pharmaceutical industry.

The PEF recently marked the opening of the Critical Reagent Repository (CRR). Funded by the Joint Program Office for Biodefense, the CRR stores and validates all immunological and DNA based reagents for the DOD. The facility includes three fail-safe liquid nitrogen freezers capable of storing more than 75,000 samples, a 1500-gallon liquid nitrogen tank for supplying uninterrupted coolant, an archiving database with secure “Swiss vault” capability, remote monitoring, a back-up generator and secured access.

The program is housed in four areas covering 1215 cubic feet of the facility which include a validation lab that will act to perform quality control and quality assurance on antibody and PCR reagents destined for fielding. The CRR supports validation activities and the long-term storage of cryopreserved samples.

The PEF is currently being upgraded to full compliance with the FDA’s guidelines for *current Good Manufacturing Practices* (cGMP). Compliance with cGMP requirements will allow the PEF to manufacture human use and diagnostic products for Phase I and II clinical trials, for both DOD and commercial clients. The plans call for a clean room capable of a “dual campaign,” i.e., running two different product lines simultaneously, with both mammalian cell culture and bacterial fermentation process lines.

CONCLUSION

ECBC has a full spectrum biotechnology program with strong collaborative links to academia, the commercial sector, and other government agencies. The program includes the DOD’s only complete Process Engineering Facility with pilot scale biomanufacturing capability, and the planned upgrade to cGMP compliance will

vastly expand business opportunities. The National Research Council just completed a study, entitled “Opportunities in Biotechnology for the Future Army,” which describes the increasingly pivotal role that biotechnology will play in developing the future Objective Force, and ECBC is committed to making those visionary recommendations a reality.

For additional information, please contact Dr. James J. Valdes, Commercial (410) 436-1396, DSN 584-1396 or email james.valdes@sbccom.apgea.army.mil

OCULAR TOXICITY STUDY

Edgewood CB Center, one of three laboratories in the world certified to perform the corneal epithelial cell assay

by Cheng J. Cao, Karen Heroux, and James J. Valdes

The Center's Molecular Engineering Team was selected by The Gillette Company to be one of three laboratories conducting a toxicology validation study of Human Corneal Trans-epithelial Permeability (TEP) assay, an *in vitro* assay that can be used to test chemicals for ocular toxicity. A validation study is a major step in the process of gaining FDA approval for a newly developed assay and this would be the first approved *in vitro*, ocular assay. If successful, this work would alleviate the need to use animals to assess a chemical's ocular toxicity.

The ability to evaluate the potential of a chemical or formulation to cause eye irritation or injury is of great importance in the safety testing of consumer products and other reagents. The Draize rabbit eye irritation test (Draize et al, 1944) has been the long-standing and widely used standard source for eye irritation or injury data. In support of alternative tests development, there have been numerous major programs by industry and government which evaluated diverse test systems for their ability to predict the Draize test data. These objectives address the needs for mechanism-based and human cell-based tests for supporting *in vitro* toxicology and human risk assessment. An *in vitro*

model based on human ocular tissue is most likely to be useful for this purpose since it may approximate the range of species-specific cellular targets, chemical metabolic profiles, and response to toxic injury that occur in the human eye.

The human cell line 10.014 pRSV-T used in Gillette's model was derived from the transfection of primary human corneal epithelial (HCE) cells obtained from a single donor cornea. A significant feature of this cell line, termed HCE-T, is its extended life span in culture, which has established its utility in supporting a reproducible *in vitro* model. The corneal epithelium is an appropriate structure for the development of an *in vitro* alternative test for assessing ocular irritancy because this tissue provides a primary functional barrier to toxicant penetration of the eye. Rather than the traditional monolayer culture, the HCE-T model presents a 3-dimensional structure of HCE-T cells grown on a collagen membrane to provide a species- and tissue-specific equivalent of the human corneal surface *in vivo*. In this model, HCE-T cells stratify into four to six cell layers, similar to the corneal epithelium in the intact eye. Barrier function established by the HCE-T model can be determined by

measuring transepithelial permeability to sodium fluorescein (TEP) and transepithelial electrical resistance (TER). A number of chemicals have been examined for their effects on the barrier function using this model. The results indicate that TEP and TER assays are useful endpoints for the evaluation of the chemically-induced damage to human corneal tissues. In this validation project, we completed phase II and III studies by conducting TEP and TER assays for 35 chemicals. The HCE-T model provides an alternative to experimental use of animals or humans for risk assessment of chemicals, toxins, and drugs. Gillette's choice of ECBC to conduct this study is recognition by a Fortune 500 company of our technical excellence. As one of only three laboratories in the world certified to perform the validation study, we are uniquely positioned to expand our role in *in vitro* toxicity testing, enhancing revenue, and reducing animal use.

For additional information, please contact Dr. James J. Valdes, Commercial (410) 436-1396, DSN 584-1396, or by email to james.valdes@sbccom.apgea.army.mil

NANOREACTOR-BASED TOPICAL SKIN PROTECTIVE CREAMS

A novel approach, using nanoscale reactors

by Dr. Ray Yin, CPT Stephen T. Hobson, and Dr. H. Dupont Durst

In recent years there has been an increased awareness to the chemical and biological threats on both and civilian military personnel. Many of these problems were first surfaced during the Gulf war where the existing chemical protective clothing was too clumsy (heavy and difficult to fire a shot), unbreathable, and in some circumstances, not effective against mustard.

In addition, during the Tokyo subway attack in the mid-90s, there was a high percentage of casualties from the first responders who did not wear the proper protective gear.

A joint Army Research and Development (R&D) team with members from the U.S. Army Research Laboratory (ARL), the U.S. Army Medical Research Institute for Chemical Defense (MRICD), and the Edgewood CB Center at SBCCOM came up with a novel approach that uses nanoscale reactors (nanoreactors) to tackle this problem.

Two years ago, this R&D team started developing a new type of reactive topical skin protective cream (*r*TSP).

The resulting nanoreactor possesses a matrix compatible

exterior and a reactive interior as shown in Figure 1.

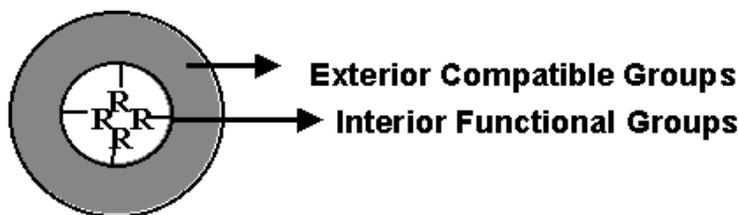


Figure 1. Nanoreactors by Design

The facile design of exterior allows these nanoreactors to be compatible with a variety of matrixes, while the interior consists of highly reactive catalytic groups that can rapidly detoxify all of the chemical agents.

Unlike the lipid-based micelles (in the micron region), the nanoreactors are much smaller in sizes (i.e., from 10 nm to 100 nm in diameter), thus enhancing the decontamination efficiency very dramatically.

In addition, these nanoreactors can stand a variety of harsh conditions such as extreme temperatures and pHs. Due to their superior solubility

or compatibility, the nanoreactors have proven to be ideal reactive

additives for enhancing the performance of existing TSP creams without causing any skin irritation. For example, when modified with a Teflon-like exterior, the resulting nanoreactor can be readily dispersed into the fluoropolymer-based TSP base creams without the formation of different microdomains or channels (nanoscale mixing).

Once the chemical agents (often smaller than 1 nm) are in contact with the nanoreactor-containing TSP creams, a majority of the agents are immediately reflected from the surface. The residue agents that are left on the cream surface will quickly be adsorbed inside these *nanoreactors* and then detoxified *in situ*, see Figure 2.

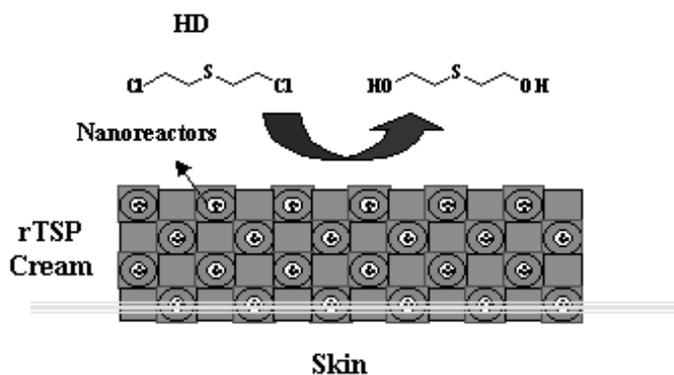


Figure 2. An Illustration of HD Decon Process by Nanoreactor-based rTSP Creams

So far, a variety of live agent tests (with both liquid and vapor challenges) have been performed on *nanoreactor*-based TSP creams. The results were astonishing. In addition to significantly extending the nerve agent protection time, the new *rTSP* can protect against HD vapor.

Almost all of these additives are toxic and cause skin irritation; however, the nanoreactors are the first and the only mild ingredient that works for both nerve and blister agent protection. More importantly, such a success comes from the addition of only 1% of such *nanoreactor* into the existing TSP base creams that are currently mass-produced by the Army Medical Department (AMEDD).

This invention allows a quick insertion of cutting technologies (i.e. *nanoreactor* technology) into the Army fielded products (TSP cream).

The superior performance of the new *rTSP* will significantly reduce the weight as well as logistics of the current CB protective gear, thus providing a great advance-ment for the Future Combat Systems (FCS). The joint ARL/ECBC/MRICD team is the leader in incorporating nanotechnologies into the CB defense systems. This team is at least 3-5 years ahead of other DOD or non-DOD research groups in this area.

This discovery has a strong impact in such frontier interdisciplinary sciences as nanotechnology and biometrics and will indubitably provide a significant improvement over the current soldier protection systems for CB defense and domestic preparedness.

This team recently received an Army R&D Achievement Award for their work.



Dr. H. Dupont Durst and Dr. Ray Yin

Biographical Notes on Team:

Dr. Ray Yin, U. S. Army Research Laboratory (ARL). One of Dr. Ray Yin's major duties is to build and direct a world-class *Nanomaterials Synthesis/Technology* team at ARL. His team's mission is to develop novel nanofunctional materials that require multi disciplinary research, especially at the interface of chemistry, biology, materials science, and medicine to solve complex DOD CB defense problems. Dr. Yin's current research activities involve the synthesis and understanding of complex polymeric systems. Much of his recent activity is centered on unique, highly-branched (dendritic) polymers. Dr. Yin's polymer synthesis efforts have application in CB detection, decontamination, personnel protection as well as immunization and antidote development, and aftermath medical treatment. In addition to planning and conducting his own in-house research and development efforts, he serves as a deputy program manager at the ARL Dendritic Polymer Center of Excellence. Dr. Yin is a technical advisor to a variety of DOD programs and committees such as the ARL-ARO Multi University Research Initiative program (MURI), the U.S. Army Center for Environmental Health Research, the U. S. Army Medical Research Institute for Chemical Defense (USAMRICD), the Joint Service Tech Base program-Biodetection Writing Team, and the U. S. Marine Chemical Biological Incident Response Force (CBIRF). As a technical expert, Dr. Yin is also responsible for identifying,

developing, and rapid prototyping of polymer-based CB detectors for the Joint Service Agent Water Monitor program (JSAWM). In addition, Dr. Yin is also serving as an SBIR contract manager at ARL, a postdoctoral research fellow advisor at ASEE/NRC/ORISE, and an adjunct professor of mechanical engineering and chemistry at the University of Delaware and Drexel University.

CPT Stephen T. Hobson's duty is to serve as principal investigator and technical lead in the search for reactive moieties, formulation development, and proof of neutralization in the (*r*TSP) DTO. This duty is in the Advanced Assessment Branch, Drug Assessment Division of USAMRICD. The mission of USAMRICD is to develop medical countermeasures to chemical warfare agents (CWAs). The development of a barrier cream to protect the warfighter is one of the major initiatives of USAMRICD. The first phase of this project was culminated in the approval of the New Drug Announcement (NDA) by the FDA for the Skin Exposure Reduction Paste Against Chemical Warfare Agents (SERPACWA). In the next in the development of the *r*TSP, CPT Hobson has three responsibilities: discovery, screening, and evaluation of existing and emerging components that will neutralize CWAs; the formulation of these components into SERPACWA; and the development of analytical methods to insure proof of neutralization of CWAs by the *r*TSP. As the technical lead for reactive component development, CPT Hobson is responsible for the

identification, evaluation, and development of reactive components that not only show high activity in aqueous or organic media but also improve the protective factor of the *r*TSP against CWAs. Equally important to the development of the *r*TSP, the reactive component must be formulated into the SERPACWA base cream in a fashion such that its barrier properties are not compromised so that the resultant cream maintains appropriate properties to ensure compliance by the warfighter. Finally, to ensure that CWAs are not transported in the *r*TSP, CPT Hobson has been active in determining analytical techniques (i.e., 1D and 2D ³¹P, ¹³C and ¹H NMR, GC/MS) that will determine the extent of neutralization by the *r*TSP. In addition to his work on the *r*TSP DTO, CPT Hobson also serves as principal investigator, technical lead, and team leader for the "Organic Synthesis Team." The Organic Synthesis Team is active in many areas including the synthesis of potential medical countermeasures against Botulinum Neurotoxin B; the solid and solution phase synthesis of bridged pyridinium oximes as new nerve agent antidotes; the synthesis of peptidomimetic enzyme release factors for carboxylesterase; and a Quantitative Structure Activity Relationship (QSAR) project in the development of medical countermeasures against nerve agents. In addition to his in-house research effort, CPT Hobson has served as a reviewing officer for SBIR phase I and II proposals, Contracting Officers Representative for an SBIR Phase I contract and a STAS contract, and as a

contact between USARMICD and academia.

Dr. **H. Dupont Durst** serves as principal investigator, technical lead, and team leader of the “Skunk Works” Team in the Chemistry Area of ECBC’s Research and Technology Directorate. This team’s mission is to develop novel and innovative chemical solutions to current problem areas in the Chemical and Biological Defense and Chemical Demilitarization arenas of the Department of the Army. The mission objective of the “Skunk Works” Team is to apply rigorous chemical theory to understand difficult and perplexing problems and provide rational chemical principles to develop and execute strategies for solutions to present and developing interest areas. Thus, this team is tasked to

address intellectually demanding problems, confronting and providing innovative solutions to these unique problems faced in the CB Defense related programs. In this capacity, Dr. Durst is responsible for planning, conducting, and directing diverse and unique research projects. As the technical lead, Dr. Durst is responsible for the area of advanced analytical chemistry that includes identifying, developing, and the rapid transition of analytical protocols into other DOD support laboratories for more routine application. In addition to these analytical chemistry areas, Dr. Durst is a principal investigator in basic research related to both decontamination and detection, and unique chemistry of dendritic polymers. Besides his own in-house research and development efforts, he also serves as a technical advisor to a variety of DOD programs or committees such as the ARO Multi University Research

Initiative program (MURI), the National Research Council’s Committee on Review and Evaluation of the Army Chemical Stockpile Disposal Program, the Chem/Bio basic research program for the Army Research Office, the International Union of Pure and Applied Chemistry (IUPAC), Committee for Chemical Weapons Destruction Technologies, and the U.S. Department of State’s International Science and Technology Center (ISTC) program in the Russian Federation.

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HIGH PERFORMANCE COMPUTER MODERNIZATION PROGRAM GRAND CHALLENGE PROJECTS

To maintain a technological advantage and assist the warfighter

by Dr. William White

To help maintain a technological advantage in the design and development of equipment to assist the warfighter in conducting his mission, the Department of Defense has allocated considerable resources to the High Performance Computer Modernization Program. The program consists of three components.

- The four large Major Shared Resource Centers and several smaller distributed processing centers maintain an array of supercomputers and requisite software to allow scientists and engineers to conduct a wide range of computational experiments.

- The Defense Research and Engineering Network provides a robust high speed network to connect the computing centers into a consolidated entity and allow customers at remote sites to maximize their use of the facility.

- The Common High Performance Computing Software Support Initiative develops codes and other software needed by the computational scientists and engineers. Much of the effort involves the development of codes for parallel processing – a technique in which the problem is

divided into several segments that are addressed simultaneously by separate processors rather than sequentially by one processor. This approach allows large calculations to be completed in a reasonable amount of chronological time.

A significant problem for the program administration is the equitable and timely apportionment of limited computed time. The approach has been to allocate much of the computer time for routine work that requires a moderate amount of computational hours and can be performed with a few processors running simultaneously. A series of allotments and queues were established that allowed reasonable access to everyone. The remaining hours were reserved for the Grand Challenge program.

The Grand Challenge program allots significant hours (i.e., more than 100K per year) to high priority projects that are amenable to parallel processing. In addition to the computer hours, the Grand Challenge projects receive a high priority so they are able to use many processors simultaneously. Without this priority, a sufficient number of processors would seldom be available at the same time to allow a systematic calculation.

The U.S. Army Soldier and Biological Chemical Command and particularly its Research, Development and Engineering (RDE) Center has the mission to develop clothing, clothing related items, field rations, and equipment to detect and protect the warfighter from chemical and biological attacks. Because of the costs and hazard associated with laboratory experiments and field exercises, the Natick Soldier Center and the Edgewood CB are increasing their use of computational studies and simulations.

The panel that reviewed the proposals selected two from SBCCOM for inclusion in the FY01 Grand Challenge Program. The Edgewood Chemical and Biological Center's effort focuses on the mechanism of catalysis of acetylcholinesterase, the enzyme that is the target of the chemical warfare nerve agents. The scientists working on this project are William E. White, SBCCOM, Edgewood, MD; Margaret M. Hurley, Army Research Laboratory, Aberdeen Proving Ground; J.B. Wright, Natick Soldier Center; and Gerald H. Lushington, Ohio Supercomputer Center in Columbus. The Natick Project is to develop new software to facilitate the development of parachutes and airdrop systems. This work is being

conducted by Keith Stein and Richard Benney at SBCCOM, Natick, MA; Professor Tayfun Tezduyar and James F. Barbour, Rice University, TX; Professor Michael Accorsi, University of Connecticut; Professor Hamid Johari, Worcester Polytechnic Institute; and Professor Sonya T. Smith, Howard University. Each project is summarized below.

Interactions of Chemical Warfare Agents with Acetylcholinesterase

Background. Both nerve agents and organophosphorus pesticides function by inhibiting acetylcholinesterase (AChE) – thereby leading to the uncontrolled accumulation of the neurotransmitter, acetylcholine, at the neuro-neuro and neuro-muscular junctions and eventually to death as a result of respiratory collapse. AChE catalyzes the hydrolysis of acetylcholine in a two-step sequence. In the transesterification reaction, the acetate moiety is transferred from the choline to a serine residue on the active site of the enzyme. Water then hydrolyzes the acetylated serine to form acetate and regenerate the enzyme. With organophosphorus compounds, the serine 200 becomes phosphorylated by essentially the same transesterification reaction. Unfortunately, water is not sufficiently nucleophilic to hydrolyze the phosphorus serine bond so the phosphorus moiety remains attached and blocks the enzyme to further catalysis.

During the last half century, considerable empirical data has emerged regarding the

substrate/activity relationships of AChE, rates of inhibition, and nucleophiles for removing the adducts. Unfortunately, comparable theoretical mechanistic studies have lagged because of inadequate computational capabilities. Previous efforts were limited to studies at low levels of theory or on small fragments of the AChE protein.

It is generally acknowledged that enzymes accelerate reactions by binding more tightly to (and thereby lowering the energy of) the transition structure than to the reactants or products. Therefore, to gain a thorough understanding of the reaction at the molecular level, one must focus on the electronic structure and interactions of the transition rather than the stable reactants and products. Computational approaches are ideally suited for this type of investigation because the transient nature of the structures is beyond the capability of traditional spectroscopic or other empirical methods.

Goals. We hope that this study will lead to

- evaluation and prediction of novel compounds that will be effective inhibitors of AChE.
- improved design of oximes and other nucleophiles used therapeutically to reactivate inhibited AChE.
- identification of new chemical agents that function by binding reversibly (though very tightly) to AChE rather than by forming a covalent adduct.

Approach. In quantum chemistry, two factors (level of theory and number of basis functions) determine the complexity of the calculation and thereby the required computer time. The basis set is essentially the description of the electrons in the system and depends on the number of electrons and the preciseness of the description. A small basis set contains a few electrons described superficially. A moderate size could contain several atoms described superficially or a few atoms described in great detail. A large basis set could contain many atoms described with many mathematical terms. The level of theory is related to the number and types of electronic interactions that are ignored – the more assumptions the lower the level of theory and the increased probability of error. Modern computers permit a high level of theory with a small basis set or a low level of theory on a large basis set.

The most common nucleophilic substitution of organophosphorus esters proceeds through a pentavalent transient in which the incoming nucleophile and leaving group occupy opposite sites of a trigonal bipyramid. Because the reaction with small alkoxides is similar to that with the serine anion, much base line information can be obtained on small systems. Unfortunately, the electronic interactions that reduce the energy of activation at the active center are much larger and require different techniques and additional computer power.

Even with current supercomputers, acetylcholinesterase is too large to be studied in its entirety at high levels of theory with large basis sets. Therefore, QM/MM methods are required. In this approach, the active site and the ligands bound to it are studied with quantum mechanical methods. The amino acid residues several angstroms away are described by molecular mechanics, an empirical method that requires little computer time to generate good structural information. This approach allows rigorous determination of the electron distribution (and resulting energy) of the most critical region. The geometry of the active site is maintained by the remainder of the amino acids (studied at low levels of theory).

Airdrop System Modeling for the 21st Century Airborne Warrior

Background. Airdrop technology is a vital Department of Defense (DOD) capability for the rapid deployment of warfighters, ammunition, equipment, and supplies. In addition, airdrop of food, medical supplies, and shelters for humanitarian relief efforts are increasing in demand. This year, a Grand Challenge project entitled “Airdrop System Modeling for the 21st Century Airborne Warrior” was awarded to the Natick Soldier Center to develop new high performance computer based technologies to advance DOD airdrop capabilities. Natick is leading a collaborative team of researchers from across the country in this effort.

Traditionally, parachutes and airdrop systems development was

time-consuming and involved costly full-scale testing. The ability to use computer software to model airdrop systems will greatly reduce life-cycle costs, assist in the optimization of new airdrop capabilities, and provide an airdrop virtual proving ground. For example, although the T-10 parachute has been in service for more than 40 years, there is a technology void in predicting its behavior. A recent example of this technology void surfaced during initial mass assault airdrop testing of the T-10 from a new transport aircraft. At the time of these tests, little was known about the T-10’s ability to withstand a wind gust or a lead aircraft wing tip vortex of a given strength. The Army’s ability to predict parachute-related 3D fluid-structure interaction (FSI) phenomena matured significantly over the past few years.

Goals. This effort will

- allow the airdrop modeling capabilities to progress further
- result in significant reduction of life-cycle costs for future airdrop systems, which will ultimately support the 21st Century Airborne Warrior.

Approach. For this project, we will use resources at the Army’s High Performance Computing Research Center (AHPCRC), White Sands Missile Range, and at the Army Research Laboratory (ARL). To date, most of these simulations were conducted on the CRAY T3E-1200 at AHPCRC. For this Grand Challenge project, current airdrop modeling capabilities are being enhanced and used to model

phenomena associated with personnel parachutes and cargo parachute systems in various stages of their life cycles. In the area of personnel, the Advanced Tactical Parachute System (ATPS), which is the largest personnel parachute project in DOD, will be simulated. ATPS is expected to replace 40-year-old technology currently being jumped by Airborne Warriors, the T-10 parachute, whose performance will also be simulated as a base line.

The primary technical areas in the Grand Challenge project include the coupling of computational fluid dynamics (CFD) software and computational structural dynamics (CSD) software in order to simulate the interactions between a parachute system and the surrounding flow field. All airdrop systems encounter highly complex FSI phenomena as they deploy, inflate, reach steady state conditions, and ultimately provide a soft landing. Without an accurate representation of the inflated parachute shape, the FSI phenomena make it impossible to accurately predict the pressure distribution on a canopy surface. At the same time, the parachute’s shape cannot be determined without an accurate representation of the pressure distribution (and other loadings) acting over its surface. Therefore, even in terminal descent, the fluid dynamics and structural dynamics are intimately coupled. If you add the time-dependent dynamics associated with all parachute systems, the complexities become apparent. The high fidelity modeling approach undertaken involves the numerical coupling of

CFD software and CSD software. These coupled FSI models are required to capture the physics of the complex dynamic phenomena associated with all airdrop systems. The CSD software is used to model the canopy, suspension lines, and payload, while the CFD software is used to predict the fluid dynamics (i.e., pressure field, velocity field, etc.). The ability to tackle this challenge requires significant HPC resources. Applications and focus areas include most airdrop systems and associated phenomena used within DOD. Natick researchers will lead the project with significant research to be conducted at Rice University by the Team for Advanced Flow Simulation and Modeling (T*AFSM), the University of Connecticut, and Worcester Polytechnic Institute.

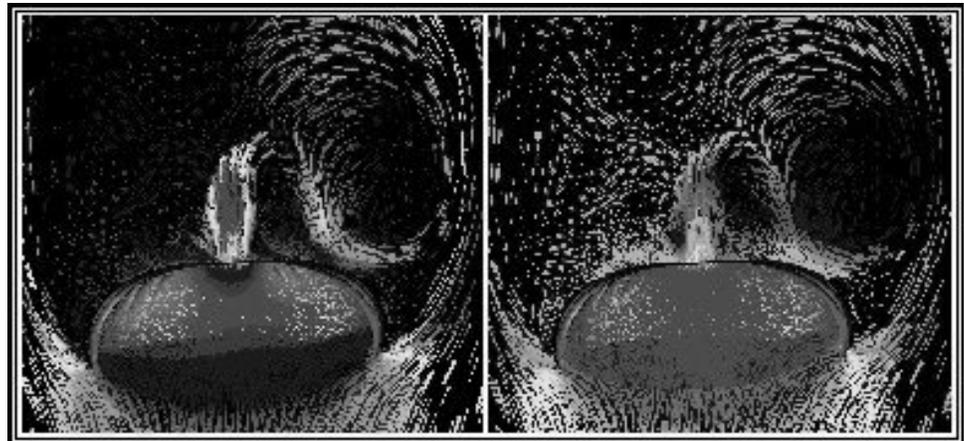
We have started to apply the 3D coupled FSI code to systems of interest to the Army and the Air Force. The ultimate goal is to use these tools to minimize feasibility testing of new systems, assist in determining the capabilities of all

systems, and ultimately to reduce the life-cycle cost of all DOD Airdrop Systems. The ATPS system model will be validated via ATPS developmental testing data and simulations of the ATPS system in various environmental conditions (gusty winds) with and without user control of the system. This Grand Challenge project will allow this research team, with the HPC community, to push the state-of-the-art in airdrop system modeling and showcase the values and return on investments realized by DOD HPC resources.

Preliminary simulations with this 3D FSI capability have been applied to predict the FSI behavior encountered during the unsteady terminal descent of an Army T-10 personnel parachute. These simulations are being extended to study the response of round parachutes to riser pulls and releases (control line operations to produce limited maneuverability).

The figure below shows the computed flow field in and around a T-10 canopy with a single-riser released by 3 feet. Here, the front of the canopy has been clipped from the image to show the flow field inside the canopy. In this case, extension of the riser attached to 7 of the 30 suspension lines on the right side of the canopy results in a pressure distribution that produces a driving force that will cause the parachute to drift to the left.

For additional information, please contact Dr. William White at Edgewood, Commercial 410-436-3058, DSN 584-3058, or email william.white@sbccom.apgea.army.mil, or Mr. Keith Stein at Natick, Commercial 508-233-5079, DSN 256-5079, or email keith.stein@natick.army.mil



ASSEMBLED CHEMICAL WEAPONS ASSESSMENT (ACWA)

Providing testing and evaluation support

The United States government is committed to destroying the stockpile of millions of chemical weapons it has stored at nine U.S. Army sites. At the end of the Cold War, a broad consensus developed that these weapons must be destroyed, as did contentious debate about how. Should they be incinerated or are there safer and more publicly acceptable destruction technologies?

In 1996, the Congress and the President, responding to public concerns about the safe destruction of chemical weapons, established and later expanded the Assembled Chemical Weapons Assessment (ACWA) Program (Public Laws 104-208, 105-261, and 106-79). Through ACWA, the U.S. Department of Defense (DOD) was charged with identifying and demonstrating two or more alternative technologies to incineration.

ECBC's Toxic Agent Chambers Team has provided testing and evaluation support to the ACWA Program since FY99. Our Toxic Chamber Team's efforts were an essential element in the technical evaluation of proposed demilitarization technologies. Efforts were conducted in

accordance with the technical criteria used to evaluate all alternative technologies.

The two Toxic Agent Chambers used in the ACWA Program are capable of conducting explosive, toxic, and chemical testing in a 32-foot diameter by 20-foot high contained environment.



Toxic Chamber

Each chamber complex includes Resource Conservation and Recovery Act (RCRA) compliant liquid handling and storage systems, exhaust air filtration systems, auxiliary power, data collection instrumentation, and remote systems monitoring and control. In addition, one of the chambers has an adjacent chemical surety laboratory to meet the test analytical requirements.

Two technologies were demonstrated: the Eli Eco Logic Gas-Phase Chemical Reduction process (which is aimed at the dunnage or residue), and the AEA Silver II (2-kw system) process (which targets the mixture).

For the Gas-Phase Chemical Reduction process, a non-incineration disposal technology, testing was conducted on chemical weapons waste streams of liquid and solid waste including carbon, contaminated pentachlorophenol (PCP) dunnage, demilitarization protective ensemble (DPE) suits, fiberglass rocket firing tubes, 4.2 mortars with a 30 percent mustard heel, and pure liquid GB agent.

The Silver II process demonstrated at the Chamber E3566 conducted testing with DMMP (dimethyl methylphosphonate), CB (chlorobenzene), VX, HD, and GB. The Silver II process is an electrochemical process that used nitric acid, silver nitrate, and de-ionized water along with a battery cell to neutralize organic materials through oxidation and reduction. Over a period of time the organic material is neutralized through oxidation and electrochemical reduction.

To supplement the Chamber technical staff, during the non-

surety testing at both chambers, additional operators and technicians were obtained through contract. A total of seven contract technicians and operators worked at the chambers for 5 months, teaming with ECBC chamber technicians. For 3 months during surety work, a total of six chemical agent qualified operators were provided by ECBC's CB Services Directorate to team with the Chamber technicians. ECBC's Environmental and Field Testing Team provided three electronics technicians to operate and troubleshoot the control systems during testing for both chambers.

In January 2000, we began preparations for the testing of the two technologies. For the ACWA program, we completed the testing of the two technologies in the toxic chambers in September 2000.

For additional information, please contact Mr. Frank DiPietro, Commercial (410) 436-2223, DSN 584-2223 or email frank.dipietro@sbccom.apgea.army.mil



Liquid Filter System



Thermal Reduction Bath Process

CB PROTECTIVE FIELD DUTY UNIFORM

New suit helps block chemical and biological agents

by Curt Biberdorf

Just 25 microns thick, the selectively-permeable membrane found in the Chemical Biological Protective Field Duty Uniform resembles plastic wrap, yet it's a potent barrier against weapons of mass destruction.

The new lightweight, one-piece uniform will be issued to the U.S. Special Operations Forces beginning next year for use during the threat of a chemical or biological agent attack on the battlefield, said Quoc Truong, project officer for the uniform at the Natick Soldier Center (NSC).

The membrane replaces carbon. Variations of carbon-composed materials have been manufactured since chemical weapons were used in World War I. Carbon works, but it has several drawbacks.

"Carbon acts like a sponge," Truong said, a physical scientist at NSC's Individual Protection Directorate. "When it reaches its holding capacity, it's no good. In heavy contamination, soldiers would have to carry extra suits to change into."

Heft is another setback. With the cellulose-based selectively-permeable membranes, the suit

weighs nearly half as much as the Joint Service Lightweight Integrated Suit Technology (JSLIST) overgarment, the military's most modern protective suit. Instead of absorbing, the membranes block all known liquid, aerosol and vapor agents. At the same time, the polymer-based membrane allows moisture vapor from sweat to escape and evaporatively cool the body.



The CB Protective Field Duty Uniform eliminates the need for a protective overgarment.

A protective overgarment becomes unnecessary, although this suit would not become the regular duty uniform, said Truong. The regular Battle Dress Uniform is still more comfortable than any protective suit.

Truong compared the filtering and blocking process to shaking a woven basket filled with sand and marbles. The "marbles" represent chemical or biological molecules while the "sand" represents water molecules. The membrane is sandwiched between the inner liner and outer layer of either a nylon or heavier Nomex/Kevlar fabric. Because a tear in the fabric would render the suit ineffective, extra attention was focused on creating an abrasion and puncture-resistant material.

Extensive laboratory testing at NSC, ECBC, and Dugway Proving Ground proved the reliability of the material.

In May 1999, soldiers at Fort Lewis, WA., tested prototype membrane suits along with the JSLIST for comfort. In June, Marines tested the uniform for durability.

Truong said Hawaii was used as the test site because of the harsh

environment with sharp surfaces. Marines successfully practiced amphibious assaults with the waterproof uniform.

“Soldiers like them very, very much,” said Truong. “You do sweat, but it’s much less than with a (Battle Dress Uniform) and JSLIST. Its light weight adds to the perception of comfort.”

Besides being worn over the duty uniform, previous versions of chemical biological protective ensembles consisted of a jacket, pants, and rubber gloves and boots. The Chemical Biological Protective Field Duty Uniform covers everything from head to toe. The only piece missing is the protective mask.



Gloves are integrated into the suit and allow sweat to escape.

A heavy-duty water and vapor proof zipper with thick, rubbery black plastic to form a tight seal opens at the front. Users step into the pant legs with “feet,” slide their arms into the sleeves that have protective gloves attached to them, and close the zipper. The feet and gloves offer a seamless seal from the neck down. From the neck up,

after the user dons the protective mask, the front flap with a rubberized brim slips snugly around the mask face. Then the back flap joins the front flap with a zipper closing across the head from ear to ear.

Overboots are unnecessary. Troops slip their covered feet directly into their combat boots. Selectively permeable gloves will replace the currently used butyl rubber gloves, which would ordinarily fill with sweat after a short wear time. Directly above each glove is another zipper opening to allow troops to take out their hands when dexterity is required.

Adjustable straps at each side of the waist can be fastened to provide a closer fit. A pocket on the left sleeve is slanted for easy reach. The front zipper conveniently opens from both ends with two sliders to allow users to don and doff the garment, and also take care of bodily functions. The thin, flexible material is easy to launder and uses less package volume.

Applications beyond the military include police and fire departments involved with domestic terrorism preparedness, medical employees who are exposed to bacteria and viruses, and industrial workers, who may be exposed to industrial chemicals, insecticides and pesticides. Truong said federal law enforcement agencies are preparing to test a modified-version of the suit to see how they might benefit from it.

Cellulose-based selectively-permeable membrane technology

was developed with the help of Acordis Research GmbH, Obernburg, Germany. W.L. Gore and Associates, Inc. in Maryland developed its amine-based selectively permeable membrane with Natick’s guidance.

The final contract was awarded to Acordis Research to develop a selectively-permeable coating for seamless glove application, while Texplorer is working with Natick to convert cellulose-based selectively-permeable fabric laminate to garments for human testing and evaluation.

For additional information, please contact the SBCCOM Public Affairs Office at Natick, Commercial (508) 233-5945 or DSN 256-5945, or visit our web site at <http://www.sbccom.army.mil>.

CHEMICALLY AND BIOLOGICALLY PROTECTED SHELTER

New shelter blocks contaminants

by Curt Biberdorf

Forward-deployed Army medical units will have extra capability to treat patients contaminated from nuclear, biological or chemical weapons with the Chemically and Biologically Protected Shelter (CBPS). Developed at the U.S. Army Soldier and Biological Chemical Command in Natick, MA, the new shelter is used by a treatment squad, medical company, and a forward surgical team.

The CBPS is a self-contained system with five major components: an expanded capacity Humvee; a



hard-walled lightweight multi-purpose shelter (LMS) attached to the bed of the Humvee; an airbeam-supported chemically and biologically-resistant soft tent shelter attached to the back of the LMS; and a high mobility trailer

with a 10-kilowatt tactically-quiet generator.

After the trailer is positioned and



detached, the unit is ready to set-up.

A fabric cover over the Humvee tailgate is opened and a pulley system lowers the tailgate that allows the soft shelter to roll out into position. Then the four-soldier medic team unfolds the soft shelter and inflates the air beam assemblies forming six arches. A rib air inflation system fills the

beams within minutes and needs only 3 pounds per square inch to erect the shelter.

“The low-pressure fabric airbeams are being used for the first time in a production item,” said Andra

Kirsteins, CBPS systems manager. “They improve the speed and ease of deployment over traditional tent frames with their low weight and simple operation.”

From the time the CBPS stops, set-up time in a non-threat area must be performed in 20 minutes. Medics exceeded this requirement by being fully mission-capable and able to receive their first patient within 7 minutes of driving on site. The CBPS is highly mobile and can relocate up to three times per day.

The CBPS provides 300 square feet of space and can process 10 patients per hour in a chemical and biological threat environment. Unlike regular tents, the soft tent shelter is treated to resist chemical and biological agents. The fabric also can be decontaminated.

“A normal tent will absorb chemical agents. It would normally go right through the fabric,” Kirsteins said.

The CBPS can operate in a chemically-contaminated environment of minus 25 to 120 °F while maintaining an internal temperature of 60 to 90 °F.

Up to seven systems can be connected together by unzipping a door-sized portion of the tent from the right or left-side walls. A passageway connector is attached, connecting one CBPS to another. Three CBPS are connected to form a forward surgical team.

The CBPS has separate entrances for ambulatory and litter patients. Each entrance is an airlock which forces out any lingering contaminated air from soldiers entering the shelter.

Patients and personnel are decontaminated before they get to the CBPS, and the tent remains pressurized when operating in a contaminated area.

CBPS were sent to Aberdeen Proving Ground, MD, for reliability and limited user-testing in July and August.

They then went through testing for operational effectiveness at Fort Drum, NY, in October and November. Production models are scheduled for delivery beginning in June 2001.

For additional information, please contact the SBCCOM Public Affairs Office at Natick, Commercial (508) 233-5945 or DSN 256-5945, or visit our web site at <http://www.sbccom.army.mil>



JOINT SERVICE GENERAL PURPOSE MASK (JSGPM)

A lightweight protective mask system being developed to protect U.S. forces from all future CB threats

by John Maruscak

The Joint Service General Purpose Mask (JSGPM) will be the military's next generation chemical and biological protective respirator, replacing the Air Force and Navy MCU-2A/P series mask and the Army and Marine Corps M-40 and M42 series masks.



An Army-led program, the project taps into the U.S. Army Soldier and Biological Chemical Command's more than 50 years of experience in mask and soldier equipment development. The Project Manager for Nuclear, Biological and Chemical Defense Systems partnered with Avon Rubber and Plastics, Inc., of Cadillac, MI, Project Manager-Soldier Systems, Natick Soldier Center, and the Edgewood Chemical Biological Center for this mask program.

Improved performance against chemical and biological agents, toxic industrial chemicals, and

nuclear fallout; improved field of view and equipment compatibility; reduced weight and bulk, and significantly reduced breathing resistance are program goals.

“The joint-service management sought to make the mask more comfortable,” said COL Stephen Reeves, Project Manager for Nuclear Biological Chemical Defense Systems. “It’s lighter than the current M-40 or MCU-2/P masks and easier to see through than previous masks.”

Some previous masks had binocular eyepieces, but the joint service mask has a single eyepiece, according to Reeves. “This gives the service member much greater field of view,” Reeves said. “We’re testing this vision piece to ensure it will interface with night vision equipment, any weapon-sighting systems, as well as individual weapons.”

He said the filter technology is perhaps the largest and most radical change. “One objective is to reduce breathing resistance by half,” he said. “This means it

won’t be so tiring to use because it will take less work to breathe.”

Filter designers, Avon and its subcontractor, Guild Associates, are looking at several different filter media, a radical departure from the traditional filter bed.

The ability to make a smaller canister and shape it in different configurations to fully integrate it into the mask helps with increasing the field of view and improving the equipment compatibility.

Extra features of the mask are color-coded repair parts for easy identification, a filter shelf-life indicator, the ability to safely and quickly change filters while in a contaminated environment, and an improved drinking system for easier use and greater flow of liquids.

The new mask is fully integrated into the warfighter’s combat ensemble for the next generation. The mask was tested with the current Land Warrior system at the Human Engineering Research Laboratory at Aberdeen Proving Ground, MD.

A unique and innovative modeling and simulation test fixture was developed that allowed more

realistic form, fit, and function of the mask during evaluations using live agents, ensuring maximum real-world protection.

All maintenance will be performed at the operator and unit level with limited repair using replacement parts. The repair parts will be reduced from about 36 for the current mask to 12. Total ownership costs will be cut by at least 50 percent.

The development team is attempting to do whatever is necessary to ensure that the mask will satisfy servicemembers.

“Keeping the lines of communication open between product developers and those who will ultimately use the mask is paramount,” said Capt. Matt Seipt, project officer for the Marine Corps. “The JSGPM team is exactly that—a team—and to that end I am confident the final result of this program will truly be a mask that satisfies, and even goes beyond, service expectations.” The mask is scheduled for fielding beginning in 2006.



One of the main driving parameters of the JSGPM program is to improve equipment interface compatibility of the protective masks with current and development equipment. The Avon/DOD team has kept this key performance parameter clearly in focus throughout this Program Definition Risk Reduction development phase. All the concepts thus far have been evaluated against many items of equipment and in particular the sighting devices of small arms.



One such compatibility trial took place at the Armament Test Facility (ATF) located at the U.S. Army Armaments Research, Development and Engineering Center (ARDEC) at Picatinny Arsenal, NJ, last December. The mask development team included representatives from Avon, SAIC, U.S. Army Research Laboratory, and PM-Nuclear, Biological and Chemical Defense Systems.

The live firing, small arms and range facility support was provided by the ARDEC. The trials were conducted on 12 December with the objective of subjectively determining the effects of the

various JSGPM concept configurations on small arms sighting system compatibility. Since the concepts had different configurations and locations of components, by analyzing the data, the best combination of each could in theory produce the mask with the best interface compatibility.

Three mask concepts were examined with several different weapon and sighting systems. Digital photos and subjective rifle firer comments were evaluated to determine the effect of the mask system on head posture while firing each weapon system.

Approximately 700 rounds of small arms ammunition were fired during the trials. Some of the observations noted were:¹ The sighting system used with the weapon system also has an effect on the ability to sight the weapon while wearing a mask. Sighting with iron sights is most difficult because the eye must be close to the weapon causing more possibility for filter and stock collisions.

Other sighting systems in general are elevated some distance from the top of the weapon and provide some standoff from the stock. The surface area and flat design of the M16 stock created the most difficult sighting scenario with the two-filter version. These problems were not as pronounced with the one filter mask versions examined.

¹Report on the Live Firing Small Arms Interface Trials at Picatinny on 12 December 2000, by David Pike, Avon, and Dan Barker, ARL-HRED.

Additionally, the M4 presented itself to be more problematic than the contoured machine gun stocks. The M4 was less problematic than the M16 because it's stock took up less surface area.

A big problem with a large multi-service multi-functional Joint Service Integrated Product Team (JSIPT) is to adequately communicate information to the members. How many times have you heard "I don't know what's going on." Well the JSIGPM System Manager, Mr. Richard Decker, has made it a point that the JSIPT will make a concerted effort to keep everyone informed and involved. Although this is a difficult task, current technology has helped, and through the use of e-mail, facsimile, conference calls, and video teleconferences (VTCs), we think that we are doing a pretty good job.

Recently, the JSIGPM program held an IPT meeting at the Avon Technical Products facility in the United Kingdom (UK). As you can imagine the System IPT is a pretty large IPT, and not everyone can travel to England even though we need full involvement of the IPT members. The solution was a multi-site VTC. With the help of the VTC facilitators, Mr. Bud Roe and Mr. Marty Pezzella, a VTC broadcast from Avon in the UK was linked with the Service sites of Brooks AFB, TX; Naval Coastal Systems Station, Panama City, FL;

The contractor felt this type of real use trials is invaluable to the designers and additional trials are planned as the concepts get more defined and frozen. All this effort

shows our team's focus on the warfighter's ability to improve comfort and improve compatibility for increased lethality in an NBC environment.



Marine Corps Systems Command, Quantico, VA; and SBCCOM at Aberdeen Proving Ground, MD.

The entire meeting was available to all members of the JSIPT who wanted to attend at their local site, meeting Mr. Decker's team goal. We also could have included the Avon site in Cadillac, MI, and the Defense Contracts Management Command in Grand Rapids, MI, as well.

The VTC capability is an asset that more programs could use as a tool for informing and exchanging ideas at a small cost when compared to travel costs.

Everyone marveled at the quality of the video and audio transmission over such a long distance and among so many sites. The charts shown on the various projectors

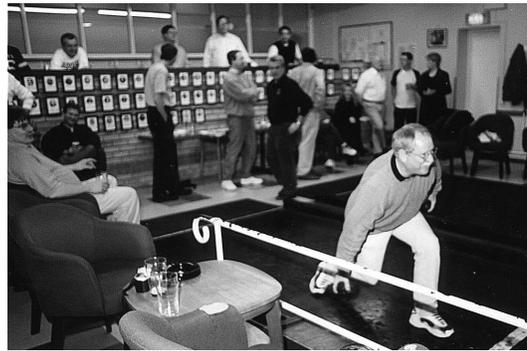
were seen simultaneously at all sites. With hardly any noticeable lag, everyone felt like they were a part of the meeting in England and not just a spectator watching a TV show.

The meeting was an excellent opportunity for the Avon/DOD team to see the progress made so far at this critical stage of the concept and design analysis and for the Service representatives to provide Avon feedback based on the service operational experiences. This meeting served as a pre-design baseline review setting the stage for the baseline review (Event C), not to be confused with Milestone C, scheduled for May 22, 2001.

Although the travel is tiring, the team did have some time for team

bonding with a friendly game of “Skittles.”

I thought they were talking about some candy until I saw the photos. Skittles is like bowling with duckpins. No one is saying who won or lost but I think the home lane advantage was a deciding factor.



For additional information, please contact Mr. John Maruscak, Commercial (410) 436-6541, DSN 584-6541 or email john.maruscak@sbccom.apgea.army.mil

FIELDINGS...

	<p>APS 3, Goose Creek, SC</p> <p>POC: Peter F. Annunziato AMSSB-PM-RNN-O, DSN 584-2362</p>	<p>Jul 01</p>
	<p>511th MP Co., Ft. Drum, NY 194th MP Co., Ft. Campbell, KY 984th and 59th MP Co., Ft. Carson, CO 978th MP Co., Ft. Bliss, TX 1-506 Inf, 2nd, 142nd, 557th, 55th, 188th, 57th, and 552nd MP Co., Korea 988th MP Co., Ft. Benning, GA Ft Riley, KS Ft. Hood, TX Ft. Lewis, WA Ft. Leonard Wood, MO</p> <p>POC: Henry St.Pierre AMSSB-PM-RNN-O, DSN 584-5527</p>	<p>Apr 01 Apr 01 May 01 May 01 Jun-Jul 01</p> <p>Jul 01 Aug 01 Aug 01 Aug 01 Sep 01</p>
	<p>Chemical School, Ft. Leonard Wood, MO 21st and 101st Cml Co., Ft. Bragg, NC 181st and 340th Cml Co., Ft. Hood, TX 371st and 413th Cml Co., Ft. Jackson, SC</p> <p>POC: Randal H. Loiland AMSSB-PM-RNN-O, DSN 584-2806</p>	<p>Jun 01 Aug 01 Sep 01 Sep 01</p>
	<p>Korea Japan</p> <p>POC: Dan Liedtke AMSSB-RSO-DTM (RI), DSN 793-6822</p>	<p>Apr - May 01 Apr - May 01</p>



Improved Chemical Agent Monitor

Hawaii
Alaska

POC: CPT Scott Morris
AMSSB-PM-RNN-T, DSN 584-6551

Jun 01
Sep 01



M22 Automatic Chemical Agent Alarm

Ft. Bragg, NC
Ft. Lewis, WA
Ft. Lewis, WA
Ft. Hood, TX
Heidleberg, GE

POC: CPT Scott Morris
AMSSB-PM-RNN-A, DSN 584-6551

Apr 01
Jun 01
Aug 01
Sep 01
Sep 01

END ITEM UPDATES...

NBC DEFENSE EQUIPMENT

In December 2000, COL Reeves, LTC (P) Welch, and Mr. Annunziato visited the Centech Facility in Hugo, OK. COL Reeves received commemorative plaques from the State of Oklahoma and the Mayor of Hugo and special thanks from the Choctaw Nation of Oklahoma for the Office of the Project Manager for NBC Defense Systems' support in stimulating the economy of Hugo and the county. PM NBC's contribution includes \$13.1M in contracts for the Modular Decontaminating System, the Light Vehicle Obscuration Smoke System, and Chemical Agent Monitor Battery Packs.

Reconnaissance, Detection, and Identification –

M22 Automatic Chemical Agent Alarm – The U. S. Nuclear Regulatory Commission issued a new Registration Certificate to SBCCOM for the M22 ACADA, which eliminates the requirement for annual radiation wipes for the user and the need for radiation wipes when direct support maintenance operations are performed. This action reduces the work and cost burden for the user and maintenance personnel and eliminates the potential of NRC license violations due to units not conducting the annual wipe test program. This effort took over 3 years.

M256A1 Chemical Agent Detector Kit – The Detection/Decon Core Team and the Walter Reed Army Institute of Research (WRAIR) have proposed the formation of an Integrated Product Team to embark on a joint “in-house” project to build and test proof-of-concept prototypes of the new immobilized enzyme technique developed by the WRAIR that could improve the nerve agent detection of the M256A1 Chemical Agent Detector Kit. A technical proposal for this project was submitted to the Technical Support Working Group.

Joint Biological Point Detection System – The ECBC Environmental Quality Office conducted a Life Cycle Environmental Assessment for the Joint Biological Point Detection System. The Public Notice (Finding of NO Significant Impact) was published in two local newspapers (The Aegis of Harford County, MD, and the Baltimore Sun).

M272 Water Test Kit – The Configuration Control Board and the Configuration Manager extended the shelf life of

the M272 Water Test Kit from 5 to 6 years. After real-time surveillance testing, the water test kit is confirmed to have a reliable shelf life of at least 6 years. A message will be sent out to inform field users and storage depots of the shelf life extension. Real time surveillance testing will continue on kits 6 years and older to determine if shelf life can be extended further. Savings will be realized as a result of this shelf life extension as procurement of new kits can be delayed.

Individual Protection –

M40/42 Series Mask – A total of 12,424 universal second skins were free issued as contingency stock by the Individual Protection Team. This project is to ensure units that received the original M40/M42 Masks with the single-piece hood received the universal second skin designed to interface with hooded overgarments and the quick doff hood. Units that were fielded the M40A1 mask received the quick doff hood and universal second skins. There is a balance of 3,166 universal second skins ready for release upon request by authorized users.

M43 Chemical-Biological Aviator Protection Mask –

- A meeting between the Mask Core Team and Individual Protection Materiel Team was held in January to review proposed criteria changes to the mask Preventative Maintenance Checks and Services table to extend mask serviceability. The revised criteria relaxes eye lens, hood, and blower acceptability and proposes two fixes for mask blower cracks. Additional information to include possible testing of the proposed fixes was deemed necessary to validate the new criteria. The revised criteria will be placed in the Technical Manual

and disseminated by Maintenance Advisory Message, Chemical News Letter Article, and posting on the Army Electronic Product Support Web site.

- Mine Safety Appliances (MSA) Co. contacted the Mask Core Team in February regarding notched lenses to pursue prove-out of lens replacement methods. An MSA representative indicated that the government-owned, contractor maintained lens molds are in good condition. There will be approximately 16 weeks lead time for delivery of lenses after receipt of order, including three weeks set-up time.

M48 Chemical Biological Apache Aviator Mask – A change of Letter Requirement from the U.S. Army Aviation Center, Ft. Rucker, AL, accepts the mounting of the motor blower in the Apache cockpit in lieu of on the aviator's body.

Joint Services General Purpose Mask (JSGPM) – In January, we visited AVON Technical Products and CBD Porton Down, UK, to finalize PDRR program and design considerations prior to EDT/IOT&E. We met with Avon mask test personnel to review and compare European respiratory protective device test standards and requirements in relation to test procedures that will be

used during EDT evaluations of the JSGPM in the United States. The visit to Porton Down provided an opportunity to see a working version of a digital breathing simulator that we are attempting to replicate for use at ECBC.

Collective Protection –

200 CFM Gas and Particulate Filter Unit (GPFU) – As a result of the operating and support cost reduction (OSCR) project performed on the GPFU, an Engineering Change Proposal (ECP) for the redesigned packaging of the GPFU was approved. The next step is to incorporate the ECP into existing and future contracts with an anticipated significant savings in GPFU unit price.

Joint Transportable Collective Protection System (JTCOPS) – In December 2000, Natick Soldier Center personnel briefed the Joint Systems Integration Group (JSIG) on the new Block I acquisition strategy and schedule. Block I adds chem/bio collective protection to five existing shelter types using new technologies, components, and materials. The JSIG agreed to the strategy and will waive certain Operational Requirements Document requirements for Block I. The JSIG will fund a Mission Area Analysis and Mission Needs Assessment in FY02 for JTCOPS Block II, which develops a new integrated system using advanced technology that optimizes all sub-systems.

OBSCURATION AND DECONTAMINATION SYSTEMS

Obscuration –

M8 Floating Smoke Pot Technical Data Package (TDP) Update – An ECP updates the TDP to the current improved configuration. This configuration is the result of a Red Team Root Cause Analysis of the problem with lids blowing off the old pots and a year-long investigation and testing effort by a Blue Team to correct the problem. The ECP was approved pending some minor administrative corrections. Production Control Audits will be done at Pine Bluff Arsenal on the new and modified parts per the latest TDP.

Smoke Generating Systems, M56 – The M56 follow-on production contract was awarded to General Dynamics Robotic Systems in December. The M56 is the U.S.

Army's first visual and infrared large area smoke generator. It was type classified in September 1994.

Smoke Generating System, M58 – A shipment of black flange covers from the M58/58 IR ejector and M58 turbine exhaust arrived in January from the commercial supplier, Sinclair & Rush. The covers are used to prevent water and dust from entering the ejector and turbine exhaust during storage. A recent ECP allows the covers to be added to the RPSTL, which authorizes replacement in the field if the cover is lost or damaged. Previously fielded units will receive the new covers as part of a sustainment package, which also adds the Supervisory Control Unit to the unit's Authorized Stockage List. Shipment of this package to the field began immediately.

Decontamination –

DS2 – Edgewood Chemical Activity - Seneca Enclave and SBCCOM-Rock Island DS2 Managers coordinated with the Defense Ammunition Center (DAC) to test current 14-liter configurations of Army DS2 for compliance with United Nations Performance Oriented Packaging (POP) criteria. The tests demonstrated compliance thus allowing shipment of the items without having to purchase replacement overpacks. This will result in significant cost savings when stocks are shipped. DAC will issue a POP symbol that will be applied prior to shipment.

G-Agent Decontamination Cloth – This project is to develop a reactive membrane comprised of microfibers and catalysts that break down chemical warfare agents. An enzyme, Organophosphorus acid anhydrolase (OPAA), exhibits hydrolytic activity against different G-type nerve agents and pesticides. We fused a cellulose binding domain (CBD) to the OPAA protein through genetic engineering. The recombinant CBD-OPAA retains approximately 60-80% of the enzyme activity against DFP and is stable over a 6-month period. Since cellulose is an integral component of various cotton fabrics including filters, sponges, cotton, and gauze, the CBD-OPAA could be immobilized onto these materials through the CBD. To demonstrate this, we delivered CBD-OPAA to a researcher at Natick, for covalent attachment to non-woven cotton fabrics and to electrospun cellulose acetate. CBD-OPAA significantly increased the protection capability of these fabrics when used to decontaminate surfaces exposed to organophosphorus agent. Results of this project were reported at the Scientific Conference on Chemical and Biological Defense in March and at the ACS Annual Meeting in April 2001.

M295 Decontamination Kits – Representatives from SBCCOM (RI) and TACOM (RI) held an initial IPT meeting to develop an acquisition strategy for procurement of sorbent powder. We will provide the sorbent as government furnished material to Pine Bluff Arsenal (PBA) for production of M295 Decon Kits. The IPT determined that a request for proposal (RFP) will be issued for the known quantity, which has committed funding. The contract will also contain a provision for a 100% option. This will be the first time to procure sorbent using a competitive RFP.

M21 Decontaminant Pumper –

- A contract modification was approved to address the hardware modifications for the M21 DP. This modification covers the 62 units comprising the basic contract award and the 71 additional units, which were awarded through an option quantity clause.

- The U.S. Environmental Protection Agency (EPA) approved a request from PM Obscuration and Decontamination Systems to allow for the importation of Lombardini engines for use with the M21 Decontaminant Pumper. The need for this action stemmed from strong evidence from the engine manufacturer that the specific engine would not comply with the Tier 1 emissions requirements for small diesel engines. The EPA is phasing in emission requirements for engines within this power range as part of a clean air initiative.

Chemical and Biological Protected System (CBPS) – In December, the Natick Soldier Center participated in formal acceptance of CBPS systems. Defense Contract Management Agency, St. Louis, signed DD-250s for three CBPS units produced by Engineered Air Systems, Inc. under contract to SBCCOM. A total of 113 CBPS systems are under contract; these three systems are the first of many units to be sent to Pine Bluff for holding prior to fielding.

Joint Service Sensitive Equipment Decontamination (JSSED) Program – The milestone package was sent to the Deputy for Acquisition and Readiness for concurrence. This milestone package supports Block I of the program to satisfy the JSSED Joint Operational Requirements Document, J5-002-1. All four Services actively support this program.

HELP LINES/TOLL-FREE NUMBERS

	<i>Telephone No.</i>	<i>fax no.</i>
Chemical Equipment	Germany 0130810280 Korea 0078-14-800-0335 CONUS 1-800-831-4408	1-410-436-3912 (TOLL CALL)
Smoke/Obscurants	1-888-246-1013	1-410-436-2702 (TOLL CALL)
Environmental Quality	1-410-436-6588 (TOLL CALL)	1-410-436-8484 (TOLL CALL)
Operational Forces Interface Group (OFIG)	1-508-233-5341 (TOLL CALL) DSN 256-5341	

PARTNERING...

COOPERATIVE R&D WITH INDUSTRY AND ACADEMIA

Recent significant achievements and actions in our continuing commitment to *technology transfer* follow:

Cooperative Research and Development Agreements (CRADA)

In January -

A new CRADA with Guild Associates was signed. This joint effort will involve testing of ASZM-TEDA carbon against five hard to remove toxic industrial chemicals.

A new CRADA with EAI Corporation was signed. This joint effort involves work to support Homeland Defense efforts, including assessments, training, and exercises.

An existing CRADA with Battelle-Edgewood Operations was modified to add Chemical and Biological Analysis and Safety and Health Risk Management. This successful CRADA supports the Homeland Defense program and ECBC research and development efforts.

In February -

EAI Corporation signed a contract with the Samyang Chemical Company for production of the first international Biological Integrated Detection System (BIDS) variant prototype for the Republic of Korea. Mr. Park (Samyang Chemical Company) signed the contract with EAI and presented them with a check. EAI then presented a check to SBCCOM under a CRADA to develop a commercial BIDS variant. MG Doesburg, Mr. Zarzycki, Mr. Parker, and Mr. Berry accepted the CRADA task and check for SBCCOM. MG Doesburg, Mr. Park, and Mr. Speranzella (EAI) gave short speeches on this groundbreaking development effort. SBCCOM entered into a CRADA with EAI in 2000 to commercialize the BIDS technology and to export the Domestic Preparedness training. The Korean prototype is the first task of the BIDS-variant portion of the CRADA.

A CRADA with Chesapeake PERL (C-PERL), Inc., was signed. The objective of this CRADA is to determine whether the gene expression possessed by C-PERL is a suitable medium for the production of antibodies in insect larval protein expression systems.

ECBC will receive funds to cover costs necessary for work under this CRADA, with Maryland's Technology Development Corporation providing primary funding.

Testing Services Agreement (TSA)

Two TSAs were signed with Scientific Applications and Research Associates (SARA), Incorporated, to test performance and safety characteristics of proposed experimental pyrotechnic formulations.

A TSA was signed with Tensegra Inc. to perform particle penetration and pressure drop measurements on experimental polymer filters.

A TSA was signed with Scott Health & Safety to test respirator canisters manufactured by Scott against GB and the simulant DMMP.

TDA Research, Inc., was awarded a Phase I Small Business Innovation Research (SBIR) from another government agency for evaluating the activity of polyoxymetalate catalysts against CW/BW agents. Consequently, a TSA was executed between TDA Research and ECBC for support of that effort. Under this Agreement,

R&T Directorate's Environmental Technology Team will evaluate the performance of these catalysts against unique avirulent bacterial surrogates including *B. anthracis* strains.

Barringer Instruments, Inc., wishes to evaluate an alternative ionization chemistry for their SABRE 2000 detector. To do so, they require the unique capabilities of the Applied Chemistry Team to test the detectors against live agent. As a result, a TSA was executed in which Barringer will pay ECBC to perform the testing.

A TSA with Barnebey Sutcliffe Corporation was executed so that four of their gas absorbers could be tested for DMMP life, rough handling, and airflow resistance by ECBC's Quality Evaluation Laboratory.

Since ECBC has the only technology transfer signatory authority at the Edgewood Area of SBCCOM, we executed a TSA for PM Obscuration and Decontamination Systems (PM ODS) with United Defense LP (UDLP). UDLP funded PM ODS to test the "Stretch" M113A3 an additional 3,000 miles beyond the scheduled 2,000-mile U.S. Army testing.

Patent License Agreement (PLA)

Guidelines for developing a licensing agreement for private sector commercialization of the Responder Assets Management System (RAMS) were agreed to by SBCCOM's Patent Counsel, the Oak Ridge National Laboratory, and their operating contractor

BWXT Y12/Bechtel Enterprise. The operating contractor will prepare the agreement for concurrence by SBCCOM. The agreement will provide for the installation and support of RAMS in U.S. cities by a private contractor on a reimbursable basis. The agreement will provide the government with full and open rights for no cost use of RAMS at military sites and other government facilities.

A non-exclusive PLA was signed with Orbital Sciences Corporation. It authorizes Orbital Sciences to use Army-owned inventions related to mass analyzing samples by a Quistor. They plan to use the inventions in commercial sales of mass spectrometers. The license will be royalty bearing for the Army and will include earned royalties based on sales, pass-through royalties for any sublicensing, a license execution fee, and minimum royalties.

An exclusive PLA was signed with Purified microEnvironments for the Transportable Glovebox System. Ms. Monica Heyl, Mr. Charles Henry, and Dr. Dennis Reutter are the inventors of the Transportable Glovebox System.

Patents

The Patent Office issued five new patents to ECBC employees at Edgewood this quarter. January was an especially productive month with four new patents. That is almost half as many as we received in all of 2000. Below you will find a thumbnail description of each patent.

Patent number 6,177,266 entitled: "Rapid Identification of Bacteria by Mass Spectrometry" issued 1/23/01 to Thaiyalnayaki Krishnamurthy and Philip L. Ross. The present invention relates to a method for the chemotaxonomic classification of bacteria with genus, species, and strain specific biomarkers generated by matrix assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF-MS) analysis of either cellular protein extracts or whole cells.

Patent number 6,176,239 entitled: "Advanced Chemical-Biological Mask" issued 1/23/01 to Corey M. Grove, Stephen E. Chase, and William M. Fritch, Jr. This invention relates to an advanced chemical-biological mask for protecting a wearer from chemical and biological environmental contaminants. The mask is especially suitable for military applications, but is of interest in any civil emergency situation where highly toxic substances are in the atmosphere.

Patent number 6,174,732 entitled: "Analytical Methodology for Qualitative and Quantitative Determination of Chemical Agent Vapor" issued 1/16/01 to Kwok Y. Ong, Jacob L. Barnhouse, and Juan C. Cajigas. The present invention is a method for determining O-ethyl S-(2-diisopropylanimo-ethyl) methylphosphonothiolate (better known as VX) vapor. More particularly, this invention permits the generation of a purer non-contaminated VX vapor and the analytical determination of the VX samples collected under

various relative humidity conditions.

Patent number 6,170,234 entitled: "Solid Particle Aerosol Belt and Dissemination Method" issued 1/9/01 to Raymond J. Malecki, William G. Rouse, and Samuel Morgan. The device and method of this invention provide easy handling and dissemination of the solid particle aerosol material. The invention permits the rapid and efficient dissemination of solid particle aerosol into the atmosphere for military and civilian purposes.

Patent number 6,191,696 entitled: "Alarm System for Hand-Held Chemical Monitor" issued 2/20/01 to Randall Young, Robert Gross, Mark Schlein, Peter Schlitzkus, and Vincent Younger. The device is a small, portable alarm system which can be attached to existing chemical monitors to provide an audible alarm in addition to the visual indication ordinarily provided by the chemical monitor.

POC: Office of Research and Technology Applications, DSN 584-4438, commercial (410) 436-4438, email address is techt@sbccom.apgea.army.mil Mr. Robert Gross, Acting ORTA, Commercial (410) 436-5387, DSN 584-4387, or email robert.gross@sbccom.army.mil or Ms. Donna Cannella, Technology Transfer, Commercial (410) 436-5379, DSN 584-4379, or email donna.cannella@sbccom.army.mil

TECHNICAL INDUSTRIAL LIAISON

Small Business Innovation Research (SBIR)

Three new Phase I contracts were recently awarded. They address the following areas:

- Nontoxic Biodegradable Nanomaterials and Biomaterials Signature Reduction
- Hand-Held Chemical Threat Monitor for the Soldier System
- Compact, Lightweight, Low-Cost, Permanently-Aligned Infrared Spectrometers

Recent Phase II Awards:

MesoSystems Technology was awarded a contract to develop a lightweight, man-portable system for rapid detection and quantification of CBW agents. MesoSystems is teaming with Micronics, Inc., the University of Washington, and SRI International. The team will incorporate new techniques from the field of microfluidics, combined with proven analytical methods such as upconverting phosphors combined with immunoassays and flow cytometry to radically reduce the size of a precise analytical instrument to the point where it can be easily transported by one person and used individually or in a defensive network linked by telemetry.

Microgen, Inc., was awarded a contract to develop a micro-electromechanical (MEMS) based biosensor. The proposed system offers a man-portable device with start to finish handling that eliminates operator involvement and integrates sample preparation, signal amplification, and signal detection into a single closed instrument.

Radiation Monitoring Devices, Inc., was awarded a contract to develop a miniaturized biological detector based on nanotechnology. Besides the obvious defense application, the detector is expected to have even more impact in the commercial marketplace, particularly in the food and health industry.

Phase II Proposals:

DOD SBIR Solicitation 01.1

closed on 10 Jan 01. The solicitation included three ECBC topics. They were:

- Mass Customization Biomanufacturing Process
- Optimized OPO Converter for Solid State Standoff CB Sensors
- Colorimetric End-of-Service Life Indicator for Mask Filters

A total of 22 proposals were received on these three topics and are currently being evaluated.



Broad Agency Announcement

The Edgewood BAA 2001 is available on SBCCOM's worldwide web site at <http://www.sbccom.apgea.army.mil/RDA/baa01.htm>. Paragraphs addressing Collective Protection, Respiratory

Protection, and Decontamination were added. The BAA provides a mechanism for industry to present new technologies and concepts to the Edgewood technical staff.

For additional information on the Technical Industrial Liaison Office at Edgewood, please contact Mr. Ronald P. Hinkle, AMSSB-RAS-C, Commercial (410) 436-2031 or DSN 584-2031.

INTERNATIONAL COOPERATIVE R&D

The Technical Cooperation Program (TTCP)

Chemical Biological Radiological (CBR) Defense Group Technical Panel-11

In November 2000, the Natick Soldier Center participated in the annual meeting of Tech Panel-11 on Low Burden, Integrated CB Protective Equipment at the Defense Science and Technology Organization, Melbourne, Australia. Representatives from the United States, United Kingdom, Canada, and Australia attended. Information was exchanged on science and technology and developmental programs ongoing in each country. Specific discussions included improvements to the vapor systems test, physiological assessment of developmental ensembles from each country currently being carried out in Australia in cooperation with TTCP Human Factors Group TP-6, aerosol test methods, and concepts for low burden respirators compatible with future soldier systems.

NATO, Land Group 7 (LG/7) Challenge Sub-Group (CSG) Meeting

In January, SBCCOM/ECBC hosted the semi-annual NATO LG/7 CSG meeting. The CSG objective is to develop a consensus between NATO countries on issues involving CB challenge levels, including toxic industrial chemicals and releases other than attacks. Several of the topics from past meetings included availability of experimental data for model validation, development of BW scenarios, agent persistency, data on evaporation from surfaces, CB agent pick-up and transfer, modeling of epidemics, BW re-aerosolization, methods for vulnerability assessment, and statistical modeling of uncertainties in meteorology forecasts. The January meeting focused on chemical challenge levels. The CSG came to agreement on a number of chemical weapon systems/agent payload scenarios and the parameters required to model those scenarios. There was also a recommendation that the group be expanded to include more BW experts for future meetings.

The next CSG meeting is tentatively scheduled for June 2001 in France.

<http://www.ttcp.osd.mil>

Foreign Military Sales (FMS) Assistance to Czech Republic (CZ)

The CZ requested U.S. FMS assistance for biological detection equipment and training. The U.S. Army Security Assistance Command (USASAC) provided funds for a U.S. Requirements Determination Team to visit the CZ, in February, to clarify the CZ Army's requirements and determine available bio-detection technologies to meet the requirements. The Chief, CZ Chemical Corps and his staff briefed the U.S. Team and arranged visits to the NBC Monitoring Center; the Military Institute of Protection; and the Purkyne Military Medical Academy. The U.S. Team is preparing a final report that will define several courses of action to meet the CZ Army's first priority of equipping the chemical company with biological detection, sampling and transport capabilities

to meet their NATO Immediate Reaction Force mission. The Team will have a follow-on meeting with the Chief, CZ Chemical Corps, to discuss the proposed options.

Program Officers/ Requirements Meeting

In March, the semi-annual Program Officers/Requirements Officers (PO/RO) Meeting of the Memorandum of Understanding on Chemical, Biological, and Radiological Defense (MOU on CBR) was held at the Naval Coastal Systems Station, Panama City, FL. The U.S. delegation was headed by Mr. Jim Zarzycki, U.S. Program Officer. The agenda included a briefing on Non-Traditional Chemical and Biological Agent Action Group, briefings on ongoing International Task Forces on Detection of Hazardous Materials; Realistic CB Scenarios for Operations Other Than War, Digitization of CBR Warning and Reporting as well as Working Groups and Points of Contact Groups on Tripartite Threat Agent Assessment; Biodetection Tripartite Doctrine; Medical Countermeasures Coordinating Team; Vaccine Acquisition; Test and Evaluation; Antibody Development; Smoke and Obscurants; and JCAD. In addition, the POs authorized one new International Task Force, ITF-42 BW Threat. The next PO/RO meeting is scheduled for September at Porton Down, UK.

Mr. Michael D. Smith, SBCCOM, ECBC, met with Mr. Ken Reid, Porton Down, UK, and Dr. Jim Ho, DRES, Canada, in the United Kingdom in February/Mar to attend

the Test and Evaluation Working Group Meeting as the Army representative. The meeting is sanctioned under the US/UK/CA MOU on CBR Defensive Materiel.

Visits

In January:

LTC Dominique Anelli, France, visited SBCCOM/ECBC to attend a meeting on the NATO Long Term Scientific Study on Decontamination.

Mr. Alexander Grabowski, Germany, visited SBCCOM/ECBC to attend the NATO Joint Editing of Draft 2, Long Term Scientific Study on CB Defense and to conduct actual business and the road ahead for 2001 for U.S./GE Integrated Technology Team on Decontamination in conjunction with DEA 1116 (Defense Against Chemical Agents).

Messrs. James Kettle and Robert Shayer, United Kingdom, visited SBCCOM/ECBC to attend a meeting on the International Task Force #40: Toxic Industrial Chemicals Operational and Medical Concerns. This invited visit took place under the auspices of the U.S./UK/CA MOU on CBR Defensive Material.

In February:

MG Aharon Zeevi, BG Avraham Ovadia, and two others from the Israeli Defense Force visited SBCCOM/ECBC. MG Zeevi, BG Ovadia, and their delegation were welcomed by COL Newing, Chief of Staff, and presented the SBCCOM Overview. The Israeli

delegation was especially interested in the current and future activities of PM NBC Defense Systems, JBPDS, and Modular Decontamination Systems. They were also briefed on the U.S. efforts in CB Domestic Preparedness and Homeland Defense and received a tour of the Technical Escort Unit. This visit also provided the visitors an opportunity to discuss the status of current agreements and joint programs.

Mr. Peter Biggins, Mr. Paul Norman, and Miss Emma Foot from Porton Down, UK, visited SBCCOM/ECBC and the Joint Program Office to participate in a workshop/meeting at the request of The Technical Cooperation Program (TTCP) CBR Group Executive Chairman to discuss and prepare the Joint Technical Report Under TTCP, TP-10. The TP-10 meeting was held at the Australian Embassy, Washington, DC. This visit took place under the auspices of the TTCP on CB Defense.

COL Francois Campiglio, FR, COL Bill Bailey, UK, LTC Paul Benkel, GE, LTC Michael Kavanagh, AS, and MAJ John Sheahan, CA, all (TRADOC) foreign liaison officers from the U.S. Army Maneuver Support Center, Fort Leonard Wood, MO, visited SBCCOM/ECBC. COL Campiglio, senior LNO, expressed the group's interest in CB Defense Programs. The LNOs were briefed on current 6.4 NBC Defense Programs of the JPO Bio and PM-NBC Defense Systems, including Smoke and Homeland Defense Programs. They also received a tour of the Process

Engineering Facility. They were impressed with the visit, the information provided, and the level of interaction provided by our personnel.

Ongoing During 2001:

Mr. Friedrich Goettel and six others from Germany will visit SBCCOM/ECBC, Anniston Army Depot, AL,

and General Dynamics Land Systems, Inc., MI, on an intermittent basis. The purpose for these visits will be to attend FOX NBC meetings and participate in tests to be carried out. These visits will take place under the auspices of the MOA on Logistic Support for the NBC Reconnaissance System.

POCs: Dr. George R. Famini, (SBCCOM RDA), Commercial (410) 436-2552/5376, DSN 584-2552/5376, email george.famini@apea.army.mil; Susan Luckan (ECBC), Commercial (410) 436-5252, DSN 584-5252, email susan.luckan@apea.army.mil; and Tom Tassinari (NSC), Commercial (508) 233-4218, email Thomas.Tassinari@natick.army.mil

INTERNATIONAL AND NATIONAL MEDICAL AND NON-MEDICAL EXPERTS COME TOGETHER AT CHEMICAL BIOLOGICAL DEFENSE RESEARCH CONFERENCE

The premiere conference on chemical biological defense research

by Kelly Buckingham, Joanne Coale, Donna Cannella, and Joann Brucksch

On March 6-8, international military and medical and non-medical experts came together to discuss chemical biological (CB) defense at an annual conference held in Hunt Valley, MD. This year's conference was jointly sponsored by the U.S. Army Soldier and Biological Chemical Command (SBCCOM) and the U.S. Army Medical Research and Materiel Command (MRMC). This is the largest conference in the area on CB defense research. More than 280 people attended, including participants from Poland, the Netherlands, Singapore, and the United Kingdom.

Although the CB Defense Research Conference has been held for more than 19 years, it was the first time that the conference brought medical and non-medical researchers together to discuss CB defense issues. Researchers from industry, academia, and other government agencies attended the conference. Organizations represented included the Edgewood Chemical Biological Center (ECBC), the U.S. Army Research Laboratory, the Walter Reed Army Institute of Research,

the Medical Research Institute of Chemical Defense (MRICD), the Oak Ridge National Laboratory, the University of Texas, and the Carnegie Mellon Research Institute.

This year's meeting brought together for the first time both medical and non-medical scientists involved with CB defense research.

For the last two days of the conference, there were two concurrent sessions where more than 60 presentations were presented and participants could choose which ones they wanted to attend. Presentation topics included medical protection/training and education, decontamination, new technologies, emerging threats and medical and individual protection against chemical-biological agents. For a listing of all the presentations and presenters, please see page 44.

This year's keynote speaker was Dr. Anna Johnson-Winegar, Deputy Assistant to the Secretary of Defense, Chemical and Biological Defense. She

commented on the importance of CB defense to both the warfighter and our homeland. She thanked the scientists in the audience for the contributions they had made in protecting our warfighters. In commenting on Homeland Defense, she stated, "The very nature of a civilian population—especially in a free and open democratic society—makes chemical and biological weapons both very effective and deadly."



Dr. Anna Johnson-Winegar

A first day focal point of the conference was a panel discussion on "CB Defense: Can it be Achieved with Current Projected Needs?" The panel focused on the importance of medical and non-medical researchers working together. Currently, SBCCOM and MRMC are coordinating on several



Panel moderator: Dr. I. Gary Resnick; Panel members: COL James Romano, MRICD; Dr. Carol Linden, MRMC; Mr. Jim Zarzycki, ECBC; and Dr. Ray Mackay, ECBC.

projects including low-dose chemical agent toxicology and in support of Homeland Defense. In addition, researchers from ECBC and MRICD were jointly awarded Army R&D Achievement Awards for their work in applying nanotechnology toward the development of chemical protective skin creams.



Mr. Jim Zarzycki

A highlight from the panel discussion included a discussion on the future of CB Defense. Mr. Zarzycki, as the Technical Director of an Army Research, Development and Engineering Center, spoke about the importance of chemical and biological

protection in the Army Transformation. He stated that the Future Combat Systems and the Objective Force Warrior programs will use technologies from the CB defense program. He commented on detection technologies and the emphasis on NBC battlefield information management and stated, "Our goal should be not only to field chemical and biological detectors, but to network those sensors into an integrated situational awareness system."

Other issues presented at the discussion included medical biological research, the applicability of non-medical science and technology (S & T) Tech Base in supporting the military, and the current products developed to meet the challenges of CB defense. COL James A. Romano, Commander, U.S. Army Medical Research Institute of Chemical Defense stated that he is proud of the products, such as CANA (Convulsive Antidote for Nerve Agents), because they are in the hands of soldiers. He stated, "We have developed later echelons

of medical care. This should tell us what we need to do and what technology will allow us to do."

In addition to the presentations and panel discussion, a wide array of posters were displayed during the entire conference that showcased research in the areas of personal protection, vaccines, forensics, toxicology, and decontamination. A poster session was held on March 7, in which anyone who had a poster set up was present to answer questions participants had on the posters.

MG Parker stated, "People must join arm in arm, mind in mind, and make their research count for the nation."

MG Parker, Commander of the MRMC, noted that the conference presented a great opportunity to learn and share what each community is doing individually. He stated, "It is a time to learn that no one command, no person or entity, has the knowledge and capability to solve the problems. People must join, arm in arm, mind in mind, and make their research count for the nation."

For additional information, please contact Ms. Dorothy Berg, Commercial (410) 436-4883, DSN 584-4883 or email dorothy.berg@sbccom.apgea.army.mil

TEAM APG BIOTECHNOLOGY SHOWCASE 2001

Biotechnology resources for business

by Donna Cannella

The Showcase was held on January 25, 2001, at the Edgewood Area Conference Center and Seminar Area. The U.S. Army Soldier and Biological Chemical Command (SBCCOM) and its Edgewood Chemical Biological Center (ECBC) served as the tenant host for the showcase. This showcase displayed Aberdeen Proving Ground's (APG) research facilities to biotechnology firms that may have interest in forging research and development partnerships with the Army. The APG Science and Technology (S&T) Board and the Maryland Technology Development Corporation (TEDCO) jointly sponsored the showcase. The APG Business Development Office (BDO), directed by Mr. Blake Sajonia, served as the installation's facilitator for this showcase. Over 100 industry representatives from biotechnology firms in Maryland, New York, Ohio, Washington, North Carolina, and Pennsylvania attended the showcase, met with APG scientists, and toured three SBCCOM laboratories.

MG John C. Doesburg, Commander of SBCCOM and of the U.S. Army APG Garrison, welcomed industry representatives to the installation and to the showcase. Mr. Brian Simmons, Chairman of the APG S&T Board

and Technical Director of the Developmental Test Command, gave an overview of the efforts of the S&T Board and the broad expanse of resources on the installation. Dr. Steve Fritz, a TEDCO principal, highlighted TEDCO's efforts at promoting the State's technology industries and particularly the state's Federal laboratories through forums such as the Team APG Biotechnology Showcase 2001. The APG showcase was the third showcase event TEDCO had sponsored since it launched a new program to promote partnerships between Federal laboratories and Maryland technology firms.

Dr. James J. Valdes, ECBC's Scientific Advisor for Biotechnology, spoke to biotechnology capabilities and expertise across the proving ground, providing a snapshot of current research efforts underway at ECBC, the U.S. Army Medical Research Institute for Chemical Defense (MRICD), the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM), and the U.S. Army Research



Mr. Dennis C. Lukens, an ECBC scientist, conducts research in the PEF.

Laboratory (ARL). ECBC researchers Dr. Kevin O'Connell, Dr. Joseph J. DeFrank, Dr. Jun Park, Dr. Jennifer Sekowski, and MRICD researcher Dr. John Schlager made oral presentations to the industry audience.

A poster session followed the morning talks with displays and exhibits offered by scientists and technologists from SBCCOM, MRICD, CHPPM, and ARL as well as displays by the APG Business Development Office and Maryland's TEDCO. A working lunch provided an opportunity for dialogue and interaction among APG scientists and industry representatives. The final portion of the showcase consisted of tours of the Process Engineering Facility

hosted by Dr. James J. Valdes and ECBC biotechnologists, the McNamara Life Sciences Research Laboratory hosted by Dr. Joseph J. DeFrank and Dr. T. C. Cheng, and the Surface Spectroscopy and Electron Microscopy Laboratory (locally known as MicroLand) hosted by Dr. Erica R. Valdes and Ms. Angela R. Farenwald.

The formation of Government-private sector partnerships began with the 1986 Technology Transfer Act and was reinforced with DOD Directive 5535.3 of May 1999, DOD Domestic Technology Transfer Program. These policies require Federal laboratories to seek opportunities to share technological expertise with industry, universities, and state and local governments.

Of the technology transfer program, Blake Sajoria stated,

“The technology transfer program is an outstanding opportunity for both Federal labs and the private sector.” And Dr. James J. Valdes stated, “We concentrate on solving military problems, but here we have the capital investment and the efficiency to use the bio lab for the private sector and commercial companies. Small companies don’t have bio process capabilities and they can’t risk that much investment.”

As a direct result of this showcase, one Cooperative Research and Development Agreement (CRADA) was finalized, and three other CRADAs are in the formation state. A fifth company is interested in a patent licensing agreement with the U.S. Army Research Laboratory.

An expanded, follow-on event, APG’s Technology Showcase: “A

Partnering Event for Businesses and Universities,” will be held on June 12-13, 2001, at APG, MD. This showcase will highlight resources across the installation and partnering opportunities in the following technology areas: biotechnology, chemistry, material sciences, physics of failure, environmental sciences, automotive engineering and testing, high performance computing, health and medicine, imaging, robotics, modeling and simulation, test technology, and training resources. Information on this showcase can be obtained online at <http://stb.apg.army.mil> or by calling the APG Business Development Office at (410) 273-0607.

SAVE THE DATE...		June 12 and 13, 2001	
		Aberdeen Proving Ground, MD Edgewood and Aberdeen Areas	
Learn more about			
Technology opportunities for industry and academia in Biotechnology, Chemistry, Materials Sciences, Physics of Failure, Environmental Sciences, Automotive Engineering, High Performance Computing, Health and Medicine, Imaging, Robotics, Modeling and Simulation, Test Technology and Training Resources			
Visit			
Biotechnology Labs, Life Sciences Labs, Chemistry Labs, Applied Research Labs, Test and Training Facilities			
Who Should Attend			
Business and university representatives interested in accessing cutting edge capabilities and facilities at Aberdeen Proving Ground (APG).			
		Aberdeen Proving Ground's Technology Showcase	
		A Partnering Event for Businesses and Universities	
		FOR MORE INFORMATION: http://stb.apg.army.mil 410.278.1267	
			
		Sponsored by: APG Science & Technology Board Northeastern Maryland Technology Council (NMTCC)	

6TH BIENNIAL ALTERNATIVES SYMPOSIUM

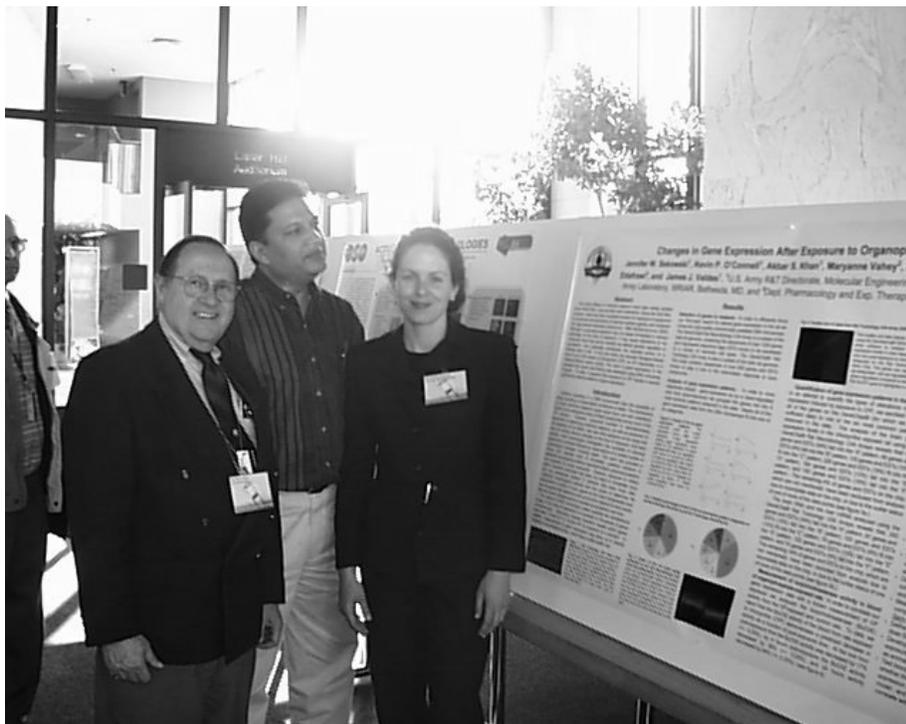
Alternative Toxicology Methods for the Millennium – Science & Application

by Dr. Harry Salem

The 6th Biennial Alternatives Symposium, entitled *Alternative Toxicology Methods for the New Millennium – Science & Application*, was held in late November 2000 at the Lister Hill Center at the National Library of Medicine in Bethesda, MD.

The 160 registrants, who nearly filled the 176-capacity auditorium, were very excited about this symposium because it was to present, for the first time at any alternatives symposium, a session on neurotoxicology and the role of imaging as well as the state-of-the-art in toxicogenomics, transgenics, dermal, and ocular toxicology.

Mr. Michael Parker, Deputy to the Commander of the U.S. Army Soldier and Biological Chemical Command (SBCCOM), presented the welcoming address and opening remarks in which he outlined SBCCOM and its predecessor organizations' early support and participation in this very important phase of toxicology and life sciences. He noted that our vision of this field, prompted by ethical, financial, and social pressures as well as good science issues, was initiated by our first two conferences: in 1990, entitled *DOD Initiatives in Alternatives to Animal Testing*, and in 1992, entitled



Current Concepts and Approaches in Animal Test Alternatives. These initiatives were instituted prior to 1993 when the National Defense Authorization Act directed the Secretary of Defense to establish aggressive and targeted programs to replace, reduce, and refine (the 3Rs) current uses of animals (House Report 102-527-102D, Congressional Second Session). We have since supplemented the 3Rs with a fourth "R" of responsibility in our initiatives.

These biennial conferences continued with prestigious

cosponsors joining us along the way. This conference was cosponsored by SBCCOM, the National Institute of Environmental Health Sciences (NIEHS), the U.S. Army Medical Research Institute of Chemical Defense (MRICD), the U.S. Army Center for Health Promotion & Preventive Medicine (CHPPM), the U.S. Navy, the U.S. Air Force, Xenogen Corporation, The Gillette Company, the Humane Society of the United States, DermTech International, Interagency Committee on Neurotoxicology (ICON), Interagency Coordinating

Committee on the Validation of Alternative Methods (ICCVAM), the National Capital Area Chapter – Society of Toxicology (NCAC-SOT), and the Association of Government Toxicologists (AGT).

The co-chairmen for this conference were Dr. Harry Salem and Dr. Eugene Olajos, SBCCOM, and Dr. William Stokes, NIEHS. The keynote address was presented by Dr. Anne Sassaman, Department Director of NIEHS; and the dinner speaker was Dr. James MacGregor, Director, FDA Center for Drugs who presented the “Biotechnology Revolution and the Evolution of Regulatory Toxicology.”

In addition to the 3.5 days of cutting edge scientific presentations, over 30 poster presentations were exhibited and staffed during the conference. Papers were presented by researchers from SBCCOM, MRICD, CHPPM, ECBC, Defense Advanced Research Projects Agency, U.S. Navy, U.S. Air Force, Yale, Harvard, Johns Hopkins, Massachusetts Institute of Technology, University of Michigan, Food and Drug Administration, and the Environmental Protection Agency.

Since the conference, Dr. Harry Salem, Chief Scientist for Life Sciences at SBCCOM, was

contacted by Dr. Martin L Stephens, Vice President for Animal Research Issues of the Humane Society of the United States. Dr. Stephens had attended the conference and exemplified the quality of the program, and stated that it merits a larger audience. He informed Dr. Salem that the Humane Society of the United States is coordinating the Fourth World Congress on Alternatives, which will be held in 2002 in New Orleans. Dr. Stephens invited Dr. Salem, SBCCOM, to participate in the development of the World Congress.

For additional information, please contact Dr. Harry Salem, Commercial (410) 436-3034, DSN 584-3034 or email harry.salem@sbccom.apgea.army.mil

SYMPOSIA...

In November:

Mr. Len Guldenpfenning and Mr. Dale Gustafson participated with several other DOD agency participants in the **Model 204 Shelf Life Extension Program, Business Process Review and Re-engineering Workshop** at the Defense Supply Center. The purpose of the meeting was to re-examine the current shelf life extension on-line program to make the program simpler and more user friendly. The new program will have added functionality and use interactive web-based applications.

In January:

Dr. Steven Harvey presented a poster entitled "Phosphotriesterase Mutants with Enhanced VX and G-agent Activity" at the **APG Biotechnology Showcase**.

The Military Operations Research Society (MORS) sponsored workshop, **Chemical-Biological Weapons of Mass Destruction: Understanding the Problem**, was held at Tysons Corner, VA. Work being done by ECBC was covered in two of the presentations at the workshop. "WMD Simulators for the U.S. Army Chemical School" was presented by Mr. Charlie Woodhouse, ITT Industries, to the Training Simulations and Models Working Group and "Simulation Based Acquisition Overview" was presented by Dr. John White,

ECBC, to the Simulation Based Acquisition (SBA) Working Group.

The **Cold Weather Decontamination Working Group** convened to further define cold weather decontamination methodologies and associated temperature ranges and provide the first responder community expert opinion on decontamination of chemical victims without creating additional casualties from hypothermia related issues. Representatives from DHHS, USARIEM, USAMRICD, USAERDC, APG Fire Department, SBCCOM, New York, Baltimore, Washington DC, Boston, Chicago, Anchorage, University of Toronto and the University of Minnesota Hypothermia Laboratory attended the meeting. Important information regarding cold shock and hypothermia and its effect on cold weather decontamination methods was discussed and will be captured in the final cold weather decon report.

In February:

ECBC's Decision Analysis Team (DAT) helped organize and conduct the **Modular Emergency Medical System (MEMS) Con 2001**, under the Homeland Defense Biological Weapons Improved Response Program. This 2-day conference brought in high-level subject matter experts from around the country. It was the culmination of 2 years of work to develop the MEMS. DAT support for this effort provided decision analysis processes and tools to design, verify, and validate critical MEMS components. DAT has developed a

desktop MEMS simulation model, and planning is underway to use the model to help communities develop and tailor their own mass casualty response systems.

Natick Soldier Center participated in a **FEMA Region I Weapons of Mass Destruction (WMD) Support Conference** of New England Region National Guard and Reserve Emergency Planning Liaison Officers. Presentations were given by FEMA Region I WMD Program Coordinator, Commander 1st Civilian Support Team, Commanders National Guard/Reserve NBC Units, and 804th Medical Battalion. Our efforts related to equipment standards development, National Protection Center, Homeland Defense, Domestic Preparedness and Improved Response Programs.

The National Institute of Packaging, Handling and Logistics Engineers (NIPHLE), International Safe Transit Association (ISTA) and the Institute of Packaging Professionals (IoPP) held a combined conference 26 Feb - 2 Mar, in Orlando FL. Representatives from ECBC's Standards, Specs, and Packaging Team attended this conference and participated in a Panel Debate on "Government Use of Industry Standards," a controversial topic on the use of commercial packaging for military items. The on-going Pilot Program to incorporate commercial packaging practices in several contracts was discussed in terms of actual performance.

In March:

The **2001 Scientific Conference on Chemical and Biological Defense Research** was held in Hunt Valley, MD. The following is a listing of the titles of the presentations and the authors:

1. Efficacy of a Recombinant Plague Vaccine Candidate - LTC Gerald P. Andrews (U.S. Army MRIID).

2. Development of a GMP Process for the F1-V Vaccine - Bradford S. Powell, Narayanan Parthasarathy, LTC Gerry P. Andrews, John Hewetson and Judy Pace (U.S. Army MRIID).

3. Marburg Virus and the Y2K Toolbox for Vaccine Construction - Alan Schmaljohn and Michale Hevey (U.S. Army MRIID).

4. Bioscavengers as a Pretreatment for Nerve Agent Exposure - David E. Lenz (U.S. Army MRICD).

5. Neuroprotection for Nerve Agent-Induced Neuronal Damage - COL Jonathan Newmark (U.S. Army MRICD).

6. Efficacy of Laser Debridement with Autologous Split-Thickness Skin Grafting in Promoting Improved Healing of Deep Cutaneous Sulfur Mustard Burns - John S. Graham (U.S. Army MRICD); Kevin T. Schomacker and Robert D. Glatter (Massachusetts General Hospital); Crystal M. Briscoe and Ernest H. Braue, Jr. (U.S. Army MRICD); and Katherine S. Squibb



The last 2 days of the conference included concurrent sessions being held in two locations with 60 oral presentations and 87 poster sessions.

(University of Maryland at Baltimore).

7. Medical Countermeasures Against Pulmonary Agent Poisoning - Alfred Sciuto (U.S. Army MRICD).

8. Development of Vaccines for Preventing Botulism - Leonard A. Smith and LTC(P) Ross LeClaire (U.S. Army MRIID).

9. Progress in Developing an Active Topical Skin Protectant - Ernest H. Braue, Jr. S. T. Hobson, E.K. Lehnert, N. Lewis, C.R. Nalls-Braue, B.F. Doxzon, R. T. Simons, P.A. DiLeonardi, T.L. Nohe, and J.S. Graham (U.S. Army MRICD).

10. Education and Training Efforts in Medical Chem-Bio Defense - COL Theodore Cieslak (U.S. Army MRIID); COL Dan Dire, (U.S. Army War College); and COL Jonathan Newmark (U.S. Army MRICD).

11. Trace Chemical Vapor Detection by Photothermal Interferometry - Paul M. Pellegrino, Nicholas F. Fell, Jr., and James B. Gillespie (ARL).

12. Passive Standoff Detection Team at SBCCOM Results from the Owl Field Test Nevada Test Site 31 July through 11 August 2000 - James O. Jensen, Agustin I. Ifarraguerri, Alan Samuels, William R. Loerop (U.S. Army SBCCOM); Richard Matta (Future Systems Branch, Langley AFB); Avishai Ben-David (Science and Technology Corp.); James W. Yang (GeoCenters, Inc.); Christopher Gittins and William Marinelli (Physical Sciences Inc.); Thomas Gruber and Dustin Grim (Mesh Inc.).

13. Linear Discriminants for the IR Detection of Bioaerosols - Dennis F. Flanigan (SymSpec).

14. Development of a CB Resistant Durable, Flexible Hydration

- System - Peyton W. Hall, Frank T. Zeller, John W. Bulluck, and Michael L. Dingus (Texas Research Institute).
15. Carbon Single Walled Nanotubes - Activation for Optional Adsorption Properties - John Yates, Jr. (University of Pittsburgh).
16. Evaluations of Personal Chemical Protection for Patrol and Tactical Law Enforcement - Paul D. Fedele, Stephen M. Marshall, and William A. Lake (U.S. Army SBCCOM).
17. Protection Factors of Impermeable Suits Degrade in Time - Jan Medema, Hein Jager, and Huub Oudmayer (TNO Prins Maurits Laboratory, The Netherlands).
18. Development of Self Decontaminating Textiles with Microporous Membranes - John Walker, Heidi Schreuder-Gibson, Walter Yeomans, Francis Hoskins, and Derek Ball (U.S. Army SBCCOM - Natick Soldier Center); Tu-Chen Cheng (U.S. Army SBCCOM - Edgewood CB Center); Ray Yin (ARL); and Craig Hill (Emory University).
19. Structure and Reactivity of the Phosphotriesterase Active Site - Morris Krauss (Center Advanced Research Biotechnology).
20. Using Models to Improve Concepts of Medical NBC Operations: Strategy and Projects Status - William Klenke (SHERIKON Support to AMEDD C&S/OTSG).
21. Aptamer-Based, High Throughput MEMS Sensor for Automated Screening and Detection of Biological Threat Agents - James P. Chambers (University of Texas at San Antonio); James J. Valdes and Michael T. Goode (U.S. Army SBCCOM).
22. Critique of Test Methodologies for Biological Agent Detection and Identification Systems for Military and First Responders - David Trudil (New Horizons Diagnostics).
23. Rapid and Simple Enzyme-Amplified Amperometric Recognition of DNA - Doron Gal, C. N. Campbell, and N. Cristler (University of Texas at Austin); WM. Lagna (U.S. Army SBCCOM); and A. Heller (University of Texas at Austin).
24. Analysis of Biomedical Samples for Verification of Chemical Warfare Agent Exposure - J. Richard Smith (U.S. Army MRICD).
25. The WRAIR Protocol: Advantages for Replacing Current Cholinesterase Monitoring Programs - Shawn R. Feaster, S.L. Poveda, R.K. Gordon, and B.P. Doctor (Walter Reed Army Institute of Research); C.R. Clark, H.F. Slife, B.J. Lukey, and J.R. Smith (U.S. Army MRICD); R.J. Swatski and R.E. Reistetter (U.S. Army CHPPM).
26. Detection of Biological Aerosols by the Application of Matrix-Assisted Laser Desorption/Ionization to On-line Aerosol Time-of-Flight Mass Spectrometry- C.E. Kientz, B.L.M. van Baar, and R.W. Busker (TNO Prins Maurits Laboratory); M.A. Stowers, A.L. van Wuijckhuijse, and J.C.M. Marijnissen (Technical University Delft, the Netherlands).
27. A Biosensor for the Real-Time Specific Detection of Bacteria and Viruses - Andrew W. Cotton, Elaine Perkins, and David Squirrell (DERA, CBD Porton Down, UK).
28. The Prototype Remote Illness and Symptom Monitor (PRISM) - David Lesley (DERA, CBD Porton Down, UK)
29. Integrated Systems for Biological Agent Identification - COL Erik A. Henchal (U.S. Army MRIID).
30. Development of Medical Countermeasures to Sulfur Mustard Vesication - William J. Smith and Michael C. Babin (U.S. Army MRICD); Robyn C. Kiser and Robert P. Casillas (Battelle).
31. Midazolam: An Improved Anticonvulsant Treatment for Nerve Agent-Induced Seizures, John H. McDonough (U.S. Army MRICD).
32. Control of Nerve Agent-Induced Seizures is Critical for Neuroprotection and Survival - Tsung-Ming Shih, S. Duniho, and John H. McDonough (U.S. Army MRICD).
33. Anti-Viral Therapy of Smallpox, Monkeypox, and Genetically Modified Orthopox Viruses - John Huggins (U.S. Army MRIID).

34. An Alamar Microplate Assay for the Germination of *Bacillus globigii* Spores Using Phosphate Buffered Saline (PBS) and d-Glucose - Darin L. Steele and James M. Robertson (FBI HAZMAT Response); and Lisa S. Collins (U.S. Army SBCCOM).
35. Automated Inhalation Toxicology Exposure System - Chad J. Ray, Justin Hartings, and Louise M. Pitt (U.S. Army MRIID).
36. Utility of Respiratory Vaccination with Recombinant Subunit Vaccines for Protection Against Pneumonic Plague - Douglas S. Reed and Jennifer Smoll (U.S. Army MRIID).
37. Polyoxometalate Complexes that Catalyze Heterogeneous, Ambient-Temperature Aldehyde Autoxidation - Jeffrey T. Rhule, Bao Do, Kenneth I. Hardcastle, and Craig L. Hill (Emory University).
38. Determination of Thiodiglycol in Groundwater Using Solid Phase Extraction Followed by Gas Chromatography With Mass Spectrometric Detection in the Selected Ion Mode - Bruce A. Tomkins and Gary A. Sega (Oak Ridge National Laboratory).
39. Low-Level Sarin Exposure: Science and Policy - Kelley Brix (Department of Veterans Affairs)
40. Interaction of Exposure Concentration and Duration in Determining Acute Toxic Effects of Sarin Vapor in the Rat - Robert J. Mioduszewski, James A. Manthei, Ruth A. Way, David C. Burnett, Bernardita P. Gaviola, William T. Muse, Sandra A. Thomson, Douglas R. Sommerville, and Ronald B. Crosier (U.S. Army SBCCOM).
41. Analysis of Rat Blood Samples for Agent Biomarkers After GB Inhalation Exposure - E.M. Jakubowski, and L.S. Heykamp (EAI Corporation); R.J. Mioduszewski, J. Manthei, R. Way, D.C. Burnett, B. Gaviola, W. Muse, J. Anthony, H.D. Durst, and S.A. Thomson (U.S. Army SBCCOM) and C. Crouse (Geo-Centers Inc.).
42. Guinea Pig Model for Low Dose Chronic Exposure to Nerve Agent - Chessley R. Atchison, Cathleen Holmes, Suzanne Akers, Connie R. Clark, Steven Duniho, and Kevin Armstrong (U.S. Army MRICD).
43. Development of a Behavioral Assessment model in Guinea Pigs to Study the Effects of Low Dose Subacute Exposures to Chemical Warfare Nerve Agents - CPT(P) Maurice L. Sipos, Vicky L Smrcka, Sarah E. Zinkand, David W. Kahler, Anita K. Moran, and Chessley R. Atchison (U.S. Army MRICD).
44. Nanomaterial Antimicrobial Agents - James R. Baker, Jr. (University of Michigan).
45. Directed Evolution of the Active Site of Phosphotriesterase Toward the Detoxification of a Broad Spectrum of Organophosphate Nerve Agents - Frank M. Raushel, Craig Hill, Karin Lum, and Wen-Shan Li (Texas A&M University).
46. Decontamination of Surfaces Typically Found in a Public Office after Contamination with a Biowarfare Simulant - Laurel O'Connor (U.S. Army SBCCOM).
47. Novel Photocatalysis and Processes for Destruction of Chemical Warfare Agents (CWA) and Toxic Organics Associated with Military Activities - Panagiotis Smirniotis (University of Cincinnati).
48. Decontamination and Detoxification with Sponges - Richard K. Gordon (Walter Reed Army Institute of Research).
49. Principles of Casualty Decontamination - COL Jonathan Newmark (U.S. Army MRICD).
50. *Burkholderia pseudomallei* Kills the Nematode *Caenorhabditis elegans* Using an Endotoxin Mediated Paralysis - J.A. Jeddelloh (U.S. Army MRIID).
51. Analysis of Host Cell Gene Expression in Filovirus-Infected Primary Human Monocytes - Kevin Anderson, C. Xiang, and H. Alterson (U.S. Army MRIID); D. Reynolds (NCI-FCRDC); M. Bittner, Y. Chen, G. Gooden, P. Meltzer, and J. Tent (NHGRI-NIH); J. Mikovits and H. Young (NCI-FCRDC).
52. Study of Murine Pulmonary Responses to Aerosolized Ricin by cDNA Array Technology - Luis DaSilva, Mark Dertzbaugh, Dawn Cote, Ralph Tammariello, Mark Martinez, and Louise Pitt (U.S. Army MRIID).

53. Concepts for Injectable Nanoparticles for In Vivo Removal of Overdose Toxins from Blood - Richard Partch (University of Florida).

54. Changes in Gene Expression After Exposure to an Organophosphorus (OP) Agent - Jennifer W. Sekowski, Kevin P. O'Connell, Akbar S. Khan, and James J. Valdes (U.S. Army SBCCOM); Maryanne Vahey, Martin Nau (Walter Reed Army Institute of Research); and Maha Kahlil and Mohyee E. Eldefrawi (University of Maryland School of Medicine).

55. Countermeasures to Biological and Chemical Threats - Steven Kornguth and Walter Zielinski (The University of Texas at Austin); James J. Valdes (U.S. Army SBCCOM); and Gordon Boezer (Institute for Defense Analyses).

56. Development of a Genome Fingerprint Database to Identify Genetically Engineered Microbes - Luther Lindler and Xiaozhe Huang (Walter Reed Army Institute of Research).

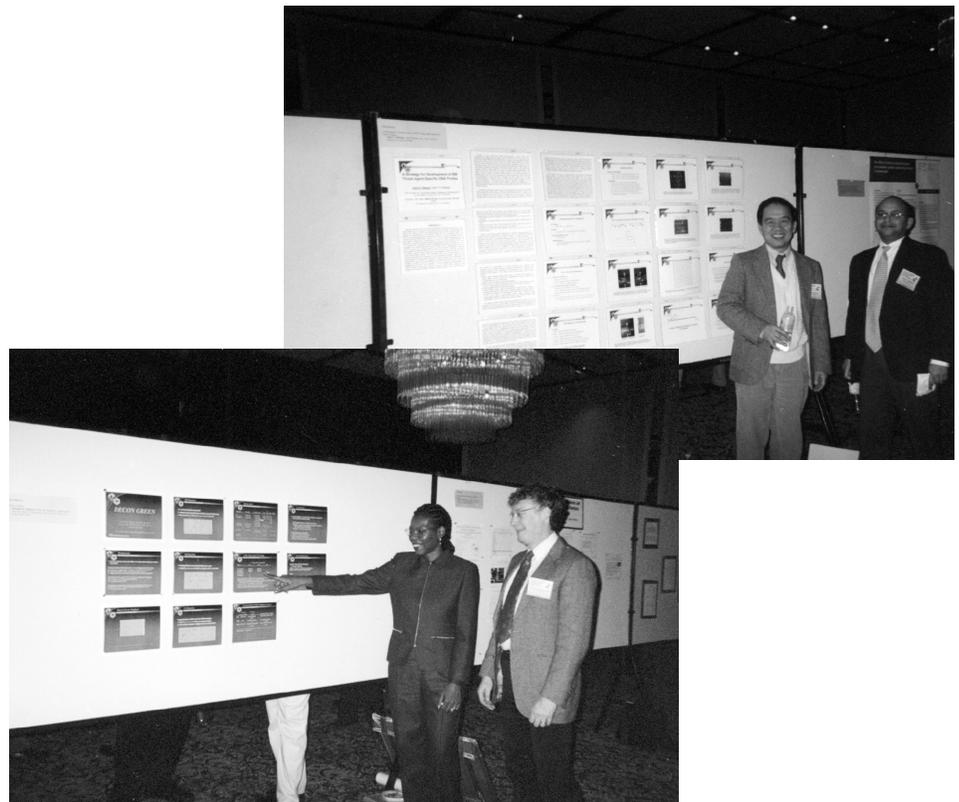
57. Global Gene Analysis of Various Biological Threat and Infectious Agents Using PBMC as Reservoirs of Historical Information: Implications for Therapy and Rapid Diagnostics - Rina Das, Christiano Cummings, Chanaka Mendis, and Roger Neill (Walter Reed Army Institute of Research); George Ludwig (U.S. Army MRIID), Rasha Hammamieh, David Hoover, Chrysanthe Paranavitana, Apsara Dhokalia (Walter Reed Army

Institute of Research); David C.H. Yang (Georgetown University); Luther Lindler, Xiaozhe Huang (Walter Reed Army Institute of Research); Erik Henchal (U.S. Army MRIID); and Marti Jett (Walter Reed Army Institute of Research and Georgetown University).

58. An Emerging Biological Threats Database - Frank J. Lebeda and Luis DaSilva (U.S. Army MRIID); George Karypis (University of Minnesota); and MAJ Charles B. Millard (U.S. Army MRIID).

59. Technological Solutions to the Fundamental Problems For Vaccines Relative to Biological Threat Agents - Stephen Albert Johnston (Southwestern Medical Center).

60. Quantum Chemical Studies on Acetylcholinesterase for Investigating Emerging Nerve Agents - Margaret M. Hurley (ARL); J.B. Eright, (U.S. Army SBCCOM - Natick Solder Center); G.L. Lushington, (OSC); and W.E. White (U.S. Army SBCCOM- Edgewood CB Center).



Upcoming:

Dr. Bill Seegar was invited by the government of Israel and the Tel Aviv University to participate, as a

leading international authority in satellite tracking and monitoring, in an international meeting of 25 countries to discuss the use of global tracking systems to assist the peace process in the Middle East.

<i>Upcoming Conferences</i>		
<i>Date and Place</i>	<i>Title</i>	<i>POC</i>
<i>14-18 May 2001 Orlando, FL</i>	<i>International Workshop on Applications of Enzymes in CB Defense</i>	<i>Dr. Joseph DeFrank (410) 436-3749</i>
<i>19-24 May 2001 Fort Knox, KY</i>	<i>Armor Conference</i>	<i>Ms. Joann Brucksch (Edgewood Area) (410) 436-5383 Mr. David Emond (Natick Area) (508) 233-5865</i>
<i>4-7 June 2001 Tampa, FL</i>	<i>Special Operations Forces APBI</i>	<i>Ms. Joann Brucksch (Edgewood Area) (410) 436-5383 Mr. David Higgins (Natick Area) (508) 233-5866</i>
<i>12-13 June 2001 Aberdeen Proving Ground, MD</i>	<i>Aberdeen Proving Ground's Technology Showcase</i>	<i>Mr. Robert Gross (410) 436-5387 http://stb.apg.army.mil</i>
<i>June 2001 Edgewood, MD</i>	<i>Scientific Conference on Obscuration and Aerosol Research</i>	<i>Dr. Edward Stuebing (410) 436-3089</i>
<i>15-19 June 2001 Stockholm, Sweden</i>	<i>International Symposium on Protection Against Chemical and Biological Warfare Agents</i>	<i>Ms. Brenda Eckstein (410) 436-2879</i>
<i>9-13 July 2001 Ft. Leonard Wood, MO</i>	<i>Worldwide Chemical Conference</i>	<i>Ms. Brenda Eckstein (410) 436 2879</i>

DOMESTIC PREPAREDNESS TEAM WINS HAMMER AWARD

The DP Program achieved results Americans care about

A realistic assessment of the national security of the United States will say that we are at a greater risk for domestic terrorism than ever before. The World Trade Center bombing of 1993 and the Oklahoma City bombing of 1995 have become symbols of our shared need to prepare and practice a response to acts of terrorism involving nuclear, biological and chemical weapons of mass destruction.

The Domestic Preparedness (DP) program is one answer to that call. A federally-funded effort mandated by the Nunn-Lugar-Domenici legislation of 1997, the Domestic Preparedness program is instructing the first responders of 120 cities around the United States in proper procedures for handling chemical and biological incidents of terrorism.

Since program inception, the U.S. Army Soldier and Biological Chemical Command (SBCCOM) provided leadership. The team has broken new ground in knowledge transfer, instruction techniques, and interagency cooperation since the first city training held in Philadelphia in 1997.

The DP program expeditiously transferred much needed Nuclear, Biological and Chemical (NBC) defense knowledge from the Department of Defense (DOD) to



state and local emergency responders.

Traditional bureaucratic transfer processes were streamlined so that the applicable knowledge was gathered, packaged, and delivered in a speedy, comprehensive manner that remained focused on the customer. The Domestic Preparedness program also cut through red tape by expediting the delivery of specialized protection, detection, and decontamination equipment to the communities.

- A practice of “Team Teaching” was used, wherein respected local emergency responders were teamed with federal agency subject matter experts to form credible, locally accepted instructor teams that provided students with the twofold

benefits of the local knowledge and specific technical expertise.

- The leadership of the DP program enabled six partnering federal agencies (Department of Health and Human Services [DHHS], Federal Emergency Management Agency [FEMA], Department of Justice [DOJ], Department of Energy [DOE], Environmental Protection Agency [EPA], and Department of Defense [DOD]) and their regional representatives to network with local community emergency responders and establish crucial working relationships that will prove to be invaluable during future incidents, emergencies, and projects requiring collaboration between federal, state, and local authorities.

The Domestic Preparedness program is designed and executed to achieve the most significant impact on the safety of America's population with the most efficient use of federal, state, and local resources. For example, the courses incorporate a modular structure that allows city trainers to teach other responders after completing the Domestic Preparedness course work, allowing for a geometric growth of the initial course impact.

In response to the customers' needs, the DP Program provides the required assistance in a new and novel fashion. The program is a total package, delivering:

Comprehensive training: The training is provided over a pre-defined time period at the city. The DP training course work is customer focused and addresses the additional information required by emergency personnel to successfully participate in an NBC emergency response.

Multiple exercises: A novel concept that reinforces training through application. The tabletop and functional exercises are an integral part of the overall training concept.

Training equipment packages: The equipment packages support the "train-the-trainer" concept by allowing the cities to replicate the instruction for their own personnel.

Comprehensive suite of support services: SBCCOM's services complete the total customer package by providing assistance for further support and information

that may be needed long after the training and exercises are over.

The DP Program achieved results Americans care about. With training completed in over 87 of the most populated areas of the United States, our nation's emergency responders are significantly more prepared to respond to a terrorist incident involving weapons of mass destruction. This equates to more than 24,000 individual trainers trained across the United States. The "train-the-trainer" concept provides a force multiplication as additional emergency personnel are trained at the local level. This is demonstrated by those cities that have had sufficient time to follow through with the DP program intent by training their personnel in the NBC emergency response techniques promoted by SBCCOM. The DP program has also completed 86 Chemical Weapons Tabletop Exercises, 51 Biological Weapons Tabletop Exercises, and 44 Chemical Weapons Functional Exercises. The DP program CB HelpLine has received more than 3,662 calls from all 50 states and U.S. territories over the past 3 years.

Through techniques that make the most efficient use of resources and cross over traditional divides that have hampered cooperation between federal, state, and local agencies, the Domestic Preparedness program pioneers a new way for government agencies to interact in the next century. As a result, the citizens of America live in safer cities and are reassured that they are protected by a trained



The **Hammer Award** is former Vice President Al Gore's special recognition to teams of federal employees (not individuals) who have made significant contributions in support of the President's National Performance Review (NPR) principles. Those principles are:

- putting customers first
- cutting red tape
- empowering employees, and
- getting back to basics.

The Hammer Award is the Vice President's answer to yesterday's government and its \$400 hammer. Fittingly, the award consists of a \$6.00 hammer, a ribbon, and a note from Vice President Gore, all in an aluminum frame. The award recognizes new standards of excellence achieved by teams helping to reinvent government.

About 1000 Hammer Awards have been presented to teams comprised of federal employees, state and local employees, and citizens who are working to build a better government.

and prepared support infrastructure.

For additional information, please contact Mr. James Warrington, Commercial (410) 436-8607, DSN 584-8607 or email james.warrington@sbccom.apgea.army.mil

MAGNET SCHOOL PROGRAM

Leveraging DOD resources for the enhancement of excellence in secondary education

The U.S. Army's Edgewood Chemical Biological Center (ECBC) recently hosted a group of Harford County educators as part of an education initiative to place a high level math and sciences center in the new Aberdeen High School. The group was invited to learn about the opportunities the Aberdeen Proving Ground (APG) can provide to students in the math, science and technology areas.

Twelve teachers and a number of administrators from Harford County attended the event held on February 8, 2001. The interaction between ECBC staff and the local educators will help guide and design accurate curriculums for the new center. The group toured several facilities, including several analytical laboratories and engineering facilities.

The construction of the new Aberdeen High School, which is scheduled to begin in July 2001, offers a unique opportunity for a partnership between Aberdeen High School and APG. This partnership can establish the new school as a prototype for science and math magnet schools linked to the Department of Defense. Students in the magnet program will gain the foundation needed to acquire college degrees in the areas

of expertise used at APG and other high technology industries around the country. Staff from facilities at APG would be used to enrich the magnet program through specialized teacher training, mentoring, guidance of student projects, guest lecturers, apprentice programs, special seminars, and team projects.

“During our visit, we had the opportunity to dialogue with many professionals and learned much about the mission, operation and resources of the Proving Ground,” said David Volrath, Aberdeen High School Principal, in a letter to the Commander at APG, Major General Doesburg. “Such a positive experience gives us great hope for the future partnership that is emerging from the efforts of the national Magnet Math and Science School Educational Specifications initiative.”

Other U.S. Army organizations at APG that are involved with the magnet program include the U.S. Army Aberdeen Test Center, U.S. Army Research Laboratory, U.S. Army Developmental Test Command, U.S. Army Soldier and Biological Chemical Command, U.S. Army Ordnance Center and School, and the U.S. Army Center for Health Promotion and Preventive Medicine.

Because this program offers an excellent opportunity to leverage DOD resources to enhance the excellence in secondary education, our Maryland representatives Barbara A. Mikulski, Paul S. Sarbanes, and Robert Ehrlich, Jr., sent a letter to President George W. Bush on February 21, 2001 (enclosed). They asked the President for his support of this “novel joint venture.” They further asked that the President direct the Department of Defense and the Department of Education to establish a joint committee to develop a national program of Defense and Education Partnerships.

For additional information, please contact Dr. James J. Savage, Commercial (410) 436-2456, DSN 584-2456 or email james.savage@sbccom.apgea.army.mil

United States Senate

WASHINGTON, DC 20510

February 21, 2001

President George W. Bush
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear Mr. President:

As part of your education plan, you have raised the idea of math and science partnerships to improve instruction and curriculum. In line with these proposed initiatives, we are writing to ask for your support of a novel joint venture, which is already underway, between the Department of Defense and local school officials in Aberdeen, Maryland.

Our DOD research and development centers, including Aberdeen Proving Ground, have scientific and technical resources far beyond the capability of any school. In our view, students with an aptitude for science and math could benefit substantially from access to these resources and the significant expertise available at our military lab facilities. Aberdeen High School and community leaders in Harford County have made a terrific start in this regard. Through a technology innovation challenge grant, Harford County has established plans for a science and math magnet high school which will be supported with the extensive scientific and engineering resources present at the Proving Ground.

Since its inception, it has been envisioned that this school can serve as a prototype for similar alliances between other high technology Department of Defense research and development laboratories and their surrounding schools. In our view, such a program presents significant advantages for national defense as well as education. Indeed, having schools with formal links to our military labs will aid in attracting the best and brightest personnel to work at DOD facilities; increase familiarity with our military installations and enhance community support for them; and assist in retention of both military and civilian personnel at a time when government has difficulty competing on salary alone.

Again, we think this concept holds great promise, not only for our schools, but also for our national defense. It is also our view that, by using Aberdeen as a prototype, this objective can be accomplished quickly, effectively, and at minimal cost. In order to further this effort, we request that you direct the Department of Defense and the Department of Education to establish a joint committee to develop a national program of Defense and Education Partnerships. We also ask that you designate appropriate staff to lead such an effort and have them meet with us as soon as possible so that we can help to facilitate this project in Aberdeen and on a national scale.

Thank you for your attention to this matter. We look forward to your response.

Sincerely,



Barbara A. Mikulski
United States Senator



Paul S. Sarbanes
United States Senator



Robert Ehrlich, Jr.
Member of Congress

PEOPLE...

The Edgewood CB Center recently hired **Dr. Jose-Luis Sagripanti** into an S&T position as **our Senior Research Advisor (Biochemistry)**. Dr. Sagripanti will be running the Center's Biological Level 3 (BL-3) Laboratory. The BL-3 Lab has several unique qualities, including a high surety level and integration with a variety of biological and chemical research capabilities. The BL-3 will allow cutting edge Army research on pathogens of military interest, leaving enough installed capacity to perform work for other government agencies or private companies. There are only 33 S&T positions within the U.S. Army, and the Center now has two such prestigious scientists. Dr. Sagripanti brings to his new position BL-3 experience as well as experience from the Food and Drug Administration and the National Institutes of Health. Dr. Sagripanti can be reached by email to joseluis.sagripanti@sbccom.apgea.army.mil or by telephone at (410) 436-3431.



On March 9, Mr. Jim Zarzycki, Director of ECBC, hosted Ms. Vicky R. Armbruster, Program Manager, Joint Program Office for Biological Defense. Ms. Armbruster visited ECBC to recognize members of the Molecular Recognition Team for their work in critical reagents. Critical reagents are chemicals used to identify chemical-biological hazards in a battlefield or terrorist incident. ECBC recently established a Critical Reagent Repository to store and validate all reagents used to detect immune system and DNA-attacking agents for

the Department of Defense. Ms. Armbruster presented the awards as a result of a recent inspection of the repository. She said that the repository and reagent research are critical to United States' forces that are at risk to biological and chemical warfare attacks. Additionally, the repository is a prime example of a horizontal technology because it supports all Department of Defense biological detection and identification programs. Team members who were recognized are **Dr. Peter A. Emanuel, Dr. Jun T. Park, Ameneh Arasteh, Tracy H. Coliano, Sarah J. Cork, Jessica L. Dang, Suzanne K. Kracke, Karen S. Heroux, and Darrel E. Menking.**



Each team member received a letter and a coin. The visitors were given a tour of the repository following the awards

ceremony. Ms. Armbruster was accompanied by Ms. Elizabeth Turk, Ms. Melisa Mahoney, and Mr. Josh Burton, Camber Corporation; SETA Support to the Critical Reagents Program; and Dr. David Cullin, Critical Reagents Program Project Manager.

ENGINEER-FOR-A-DAY PROGRAM

For the past several years, the Susquehanna Chapter of the Maryland Society of Professional Engineers has sponsored its Engineer-for-a-Day Program. The purpose of this program is to acquaint local high school students interested in the engineering profession with its application in the public and private sectors of our local community. This year we hosted seven students on February 22nd. These students were from various Harford County schools. The students shadowed their

mentors (practicing engineers) as well as toured our Experimental Fabrication shop, the wind tunnels, the Computer Aided Engineering area, and the Biological Integrated Detection System production area.

During the luncheon we interactively discussed, among other things, various engineering careers, the merits of different colleges and majors, and what to expect at college.

One of the primary reasons for the success of the Engineer-for-a-Day Program has been the excellent support and cooperation from sponsoring organizations such as U.S. Army Soldier Biological Chemical Command (SBCCOM). The caliber of engineering expertise within our organization and the efforts of these sponsoring engineers have been quite instrumental in making this a meaningful experience for the students. Our Edgewood mentors included Jerry Huen, Lester Strauch, Chika Nzelibe, Kevin Wallace, John Philistine, Mark Schlein, and Ken Regiec.

PUBLICATIONS...

BOOKS, JOURNALS, AND MAGAZINE ARTICLES

Chapter 11, "Riot-Control Agents," by Dr. Harry Salem, Dr. Eugene Olajos, and Dr. Sidney Katz, was in **Chemical Warfare Agents: Toxicity at Low Levels**, edited by Satu M. Somani and James A. Romano, Jr., CRC Press (2001), ISBN 0-8493-0872-0.

"Reactions of VX, GB, GD, and HD with Nanosize Al_2O_3 . Formation of Aluminophosphonates," by George W. Wagner, Lawrence R. Procell, Richard J. O'Connor, Shekar Munavalli, Corrie L. Carnes, Pramish N. Kapoor, and Kenneth J. Klabunde was published in *J. American*

Chemical Society, Volume 123, Number 8, pgs 1636-1644.

"Agroterrorism: Agricultural Infrastructure Vulnerability," by Drs. James J. Valdes, Jurgen Von Bredow, Michael Myers and David Wagner (FDA); Larry Loomis (New Horizons Diagnostics Corp); and Kaveh Zamani (Office of the Director of Defense Research and Engineering) was published in the **Annals of the N.Y. Academy of Sciences** (Vol. 894). This paper examines vulnerabilities in the food chain and assesses current biodetection technologies.

TECHNICAL REPORTS

Published technical reports, when available, should be requested from the Administrator, Defense Technical Information Center, ATTN: DTIC-FDRB, 8725 John J. Kingman Road, Ste 0944, FT Belvoir, VA 22060-6218.

<i>Report No.</i>	<i>Title</i>	<i>Author(s)</i>
ECBC-TN-004	JBPDS/BAWS Inlet Modification Evaluation, October 2000, UNCLASSIFIED - limited.	D.G. Wise D. Carlisle
ECBC-TN-005	JBPDS/BAWS Inlet Characterization: Shipboard Configuration, October 2000, UNCLASSIFIED - limited.	D.G. Wise D. Carlisle

ECBC-TN-006	JBPDS/BAWS Inlet Efficiency as a Function of Flow Rate, October 2000, UNCLASSIFIED - limited.	D.G. Wise
ECBC-TR-065	Use of Positive Pressure Ventilation (PPV) Fans to Reduce the Hazards of Entering Chemically Contaminated Buildings, July 2000, UNCLASSIFIED - public release.	V.J. Arca
ECBC-TR-066	Development of Toxic Industrial Material Performance Requirements for the Joint Service General Purpose Mask (JSGPM), September 2000, UNCLASSIFIED - limited.	W.M. Fritch
ECBC-TR-067	Acute Inhalation Toxicity of Chemically Neutralized HD in Rats, September 2000, UNCLASSIFIED - public release.	W.T. Muse, Jr. J.S. Anthony S.A. Thomson C.L. Crouse L.C. Crouse
ECBC-TR-083	Support to Open Air Decon Testing, September 2000, UNCLASSIFIED - limited.	J. Pence B.R. Williams H.D. Durst
ECBC-TR-094	Final Report of the Development Effort of the Biological Detection Kit, November 2000, UNCLASSIFIED - limited.	P.J. Stopa
ECBC-TR-096	M-9 Chemical Paper Alternative Plastic Dispenser Feasibility Study, November 2000, UNCLASSIFIED - public release.	R.S. Young
ECBC-TR-099	Evaluation of the Quick2 Escape Mask for Use in a Chemical Biological Environment, August 2000, UNCLASSIFIED - limited.	W.D. Kuhlmann P.D. Gardner D.M. Caretti R.R. Lins R.S. Lindsay A.G. Pappas
ECBC-TR-103	Use of Fluorescein in Aerosol Studies, September 2000, UNCLASSIFIED - public release.	J. Kasavan R.W. Doherty
ECBC-TR-109	Organosulfur Compounds. III. Synthesis of 2-(Diethylamino) and 2-(Diisopropylamino)ethylthio Derivatives Structurally Related to V-Agent Degradation Products, October 2000, UNCLASSIFIED - limited.	F-L. Hsu F.J. Berg
ECBC-TR-119	JBPFD/BAWS and Sampling Train Characterization October 2000, UNCLASSIFIED - limited.	D.G. Wise J. Kesavan D.J. Weber R. Doherty D. Carlisle

