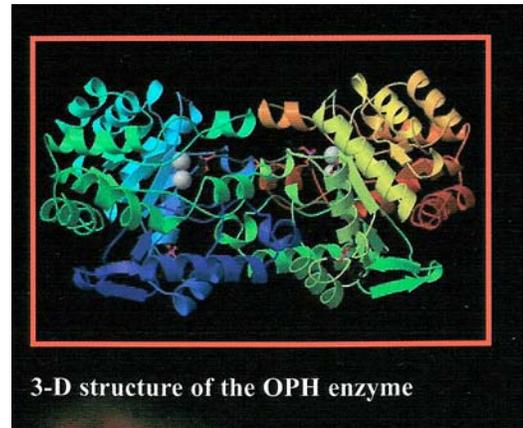


Biotechnology Team

Edgewood Chemical, Biological Center
Soldier Biological Chemical Command
MacNamara Life Sciences Bldg
Aberdeen Proving Ground, MD 21010

Mission

- Conduct basic and applied research in areas of biotechnology (enzymology, molecular biology, microbiology and biochemical engineering)
- Conduct focused investigations on Chemical and Biological Warfare (CBW) agents and their products, explosives/propellants, and other materials of military significance
- Provide quality-controlled products and services for customers in CBW decontamination, detection, personnel protection, and other biotechnology oriented areas



Products and Services

- CW Agents Neutralization and Biodegradation
- Enzymatic Decontamination of CW Agents
- BW Simulants Production, Validation and Testing
- Natural Products-based BW Decontaminant and Test Plan Development
- Development of Novel DNA Probes for Emerging BW Agents
- PCR Assay Optimization for BW Detection
- Validation of BW Detectors
- Development of enzyme-based CW sensors
- Development of enzyme-based surface protection against CW agents

CW Neutralization/
Biodegradation

BW
Simulants

Enzyme-based CBW
Decontamination

Natural Product
BW Agent Decontamination

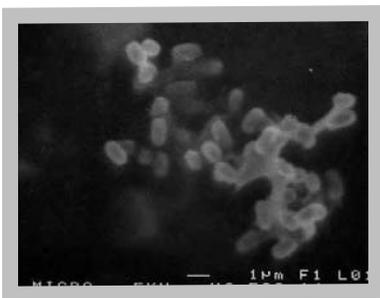
Neutralization and Biodegradation

The Biotechnology Team (BTT) biodegradation group is available to develop biologically based solutions to decontaminate CW agents, detoxify hazardous materials and reduce the hazardous characteristics of industrial process and wastewater. Our goal is to reduce the toxicity of hazardous materials and wastes to levels that permit water reuse or discharge into a sanitary waste treatment facility.

- BTT maintains a suite of automated New Brunswick Fermentors, In 1 to 10-Liter capacity
- BTT uses Sequencing Batch and Immobilized Cell Bioreactors to provide biotreatment solutions
- We have on-site scale-up capability to 1200-gallons for SBR reactors and 1000-gallons for ICB's
- BTT has experience integrating advanced oxidative processes (AOP) into a biologically based solution for your material disposal needs.
- BTT has a complete analytical suite available to fully characterize materials, process intermediates and effluent streams.
- Toxicity Assessment of Feed and Effluents for Chemicals of Concern Complete In-house Analytical Support.
- BTT has experience with CW agents, explosives, propellants and chemical neutralents.



Commercial and institutional research programs can be sponsored through Cooperative Research and Development Programs and Laboratory Testing Agreements.



BW Simulants

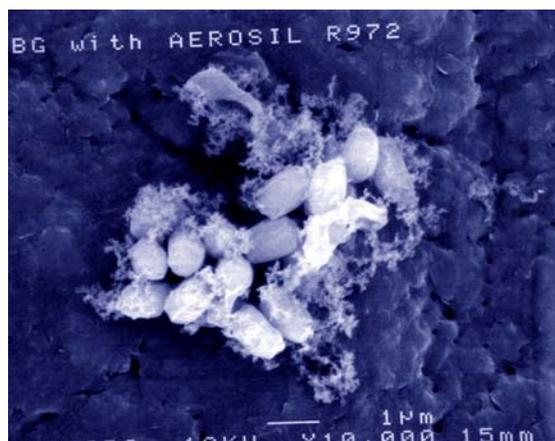
Our Goal is to provide quality, reproducible, and standardized BW simulant organisms

Essentials

- BW simulants are critical to bioterrorism detector development
- Standardized production and methods ensure consistency
 - Decreases variation in BW simulants from development through testing
 - Enables QA/QC characterization
 - Provides uniformity and performance of challenge material during Testing & Evaluation
 - Ensures the reproducibility and relevance of bioterrorism detectors.

CLEAN BG SPORES

We can provide quality BG as shown below and with further processing we can increase the level of spore purity to meet your mission requirements.



Available On Request

- Other Bacillus species and strains such as *B. subtilis*, *B. cereus*, and *B. thuringensis* in spore and vegetative forms
- Simulants for other BW agents
- Simulants grown under various conditions
- Simulants grown on various media
- Various purity grades
- SCP certified (Microbiologist)

CREDENTIALS

Our team of microbiologists has: 20 years combined practical laboratory experience

- 7 years active duty military (Chemical Officer)

PROFICIENCY IN:

- quality control and assurance
- biotechnology/clinical diagnostics

- military standards and practices

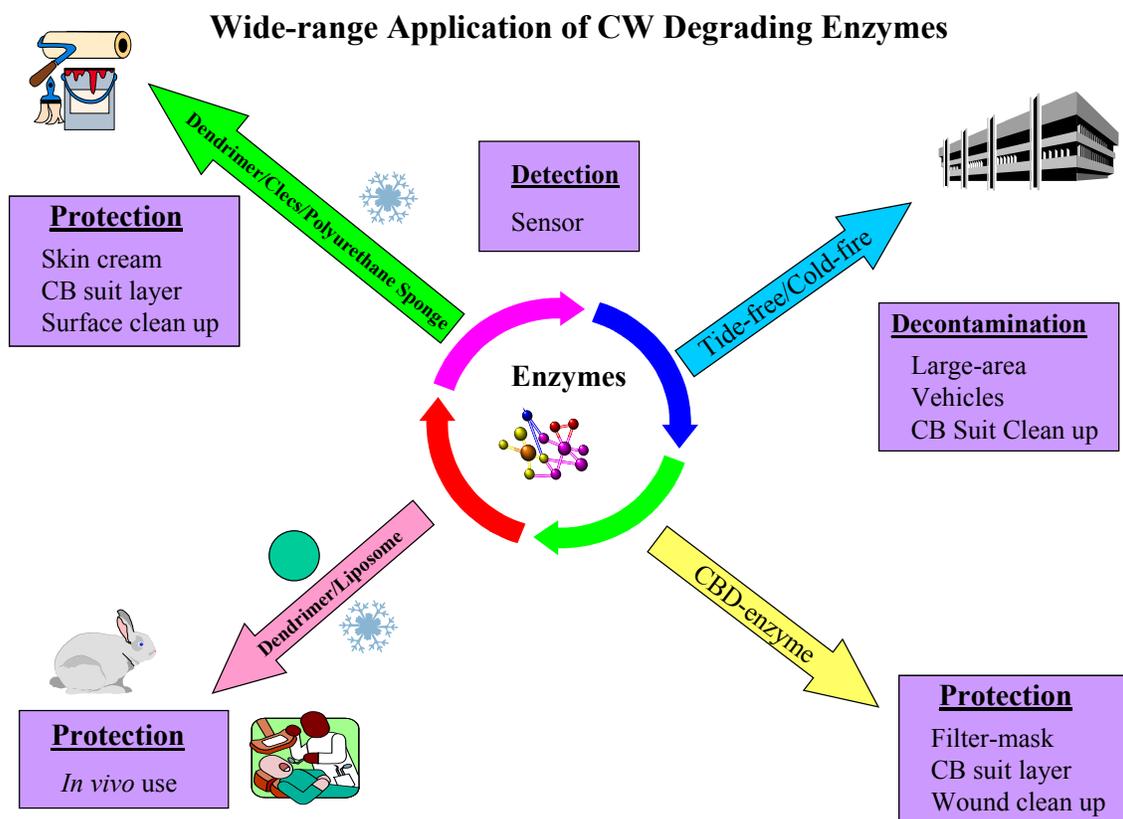
Enzyme-based C/BW Decontamination

GOAL

Develop Full-spectrum C/BW Decontaminant.

WHY ENZYMES?

- Catalytic
- Non-corrosive
- User-friendly
- No environmental impact
- No material incompatibility issues



Current Product

- Detoxify broad-range of G- & V-type agents and pesticides
- Partially effective against S-mustard

- Available in dry powder form with 2-years shelf life
- Reduced logistical burden of transport and storage
- Active in diverse matrices, e.g. fire-fighting foams, degreasers, and detergents
- Dual-use for military and civilian applications

FUTURE CAPABILITY

- Increased effectiveness against S-mustard
- Develop capability against BW agents, e.g. anthrax spores
- Product improvement through optimization and stabilization of various enzymes in the formulations
- Wide-range applications, including detection, surface decontamination, and individual protection through enzyme immobilization into fabrics, matrices, and masks

CREDENTIALS

- Team of highly skilled, results-driven, and motivated biologists, biochemists, and molecular biologists with over 40 years of combined experience
- Over 30 peer-reviewed publications, technical presentations, and 3 patents
- Several teaming agreements with universities, other governmental agencies, and private industries

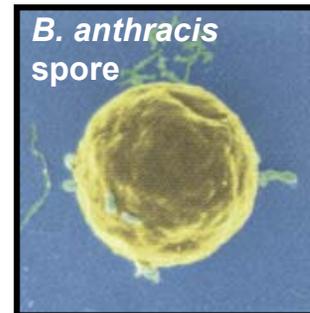
PROFICIENCY IN

- Identification, cloning, and over-expression of genes
- Site-directed mutagenesis of genes
- Enzyme purification and stabilization
- Development of enzyme assays and product analysis
- Enzyme production stream-line

Natural Product BW Agent Decontaminants

Objective:

- Exploit the effectiveness of an array of environmentally benign candidate natural product-derived materials as decontaminants on realistic BW agent surrogates and agents
- Determine the relative magnitude of decontaminant activity
- Find safe and effective non-toxic, non-corrosive, and non-polluting replacements for standard noxious biological decontaminants compatible with CW agent decontaminants so as to permit formulation of a full spectrum BW/CW agent formulation



Relevance:

- Many natural products are found in food products and therefore not expected to be noxious or corrosive as decontaminants
- Numerous natural product antimicrobials exhibit a significant vapor pressure, which would promote their use for sensitive equipment and hospital decontamination
- The proposed effort will provide a defining national technology to protect our military and domestic infrastructure against determined terrorist threats.



Project Description:

- The lytic range of bacteriocins, low molecular weight peptides, essential oils and their active components, biosurfactants, enzymes, and other natural products are being examined on several strains of *B. anthracis*, *Yersinia* and *Francisella* spp.
- Materials such as water, non-porous surfaces, and building materials exposed to simulants have been treated with natural products and assayed for viable survivors to evaluate treatment efficacy and limits of this technology
- Treated simulants will be visualized by a variety of microscopes to document bactericidal and sporicidal damage. Antimicrobial effects will be compared to effects associated with standard biological decontaminants.



End Product:

- A natural product BW agent decontaminant formulation and report documenting efficacy and elaboration of the technologies developed.