



Homeland  
Security

DHS Symposium on Bioterrorism Risk

# S&T Chemical and Biological Defense Programs

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# S&T Chemical and Biological Division Programs

## Biological Defense

- Threat Awareness
- Surveillance and Detection
- Response and Restoration
- Forensics



## Chemical Defense

- Analysis
- Detection
- Response and Recovery
- Forensics



## Agro Defense

- Foreign Animal Diseases



# Biological Defense Program

# Bio Surveillance and Detection Program

## Objectives:

- **Provide ability to accurately detect, identify, and warn of a biological attack against the population, transportation, agricultural targets, and critical infrastructure for effective implementation of protection and mitigation strategies.**
- **Provide users with next-generation “detect to treat” and “detect to warn” sensors and assays needed to operate them.**
- **Intercept (at Borders and Customs “Portals”) potential biological materials that might be used against public or agricultural targets.**

## Customers and Stakeholders:

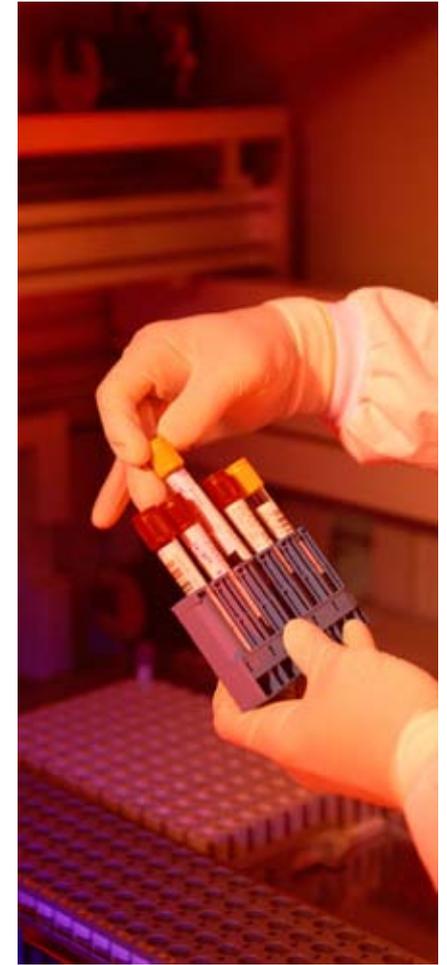
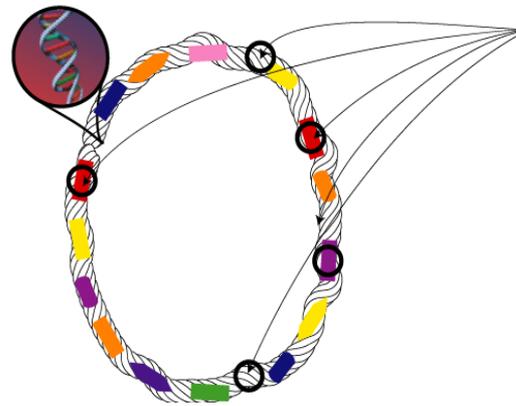
**IP, OHA, TSA (including FTA), FEMA, CBP, USSS, EPA, ATF, DoD, state and locals, ATF, FBI, USCG**

# R&D to Develop Validated, Ultra-High Specificity Bio-Detection Assays

## Goals

- Validated assays for Gen 2 & 3 BioWatch
- Operational capability to make high-confidence assays available for private sector and industry use
- Next generation assays for detecting enhanced and advanced threats

Multiple Sources



# Aerosol Biothreat Agent Environmental Monitoring

## Gen 1 BioWatch (FY03)

- Operating in > 30 cities
- Detect in 12-36hrs
- Over 3M assays without a false positive



## Gen 2 BioWatch enhancements (FY05-07)

- 4x increase in collectors in top 10 threat cities
- Critical transportation hubs and special events

## Gen 3 BioWatch (FY09-12)

- Fully autonomous, analyzes at same site it collects – 3 to 6 times daily
- Cover a major portion of US population
- Detect a smaller attack than Gen 1
- Per unit operational cost < 25% of current system



Current BioWatch collects air samples & analyzes them in LRN lab

# Threat Awareness Program

## Objectives:

**Characterize the threat posed by biological agents, anticipate future threats, and conduct comprehensive threat and risk assessments to guide prioritization of the nation's biodefense investments.**

**Strive to identify and understand threats, assess vulnerabilities, determine potential impacts, and disseminate timely information to our homeland security partners and the American Public.**

## Key Initiatives:

**Bio-Threat Characterization Center (BTCC)**

**Biodefense Knowledge Center (BKC)**

## Customers and Stakeholders:

**OHA, I&A, CBP, IP, HSC, HHS, NIAID, EPA, DoD, FBI, IC, USDA**

# Threat Awareness Program

## BioDefense Knowledge Center



**Capability to understand threats, assess vulnerabilities, determine potential impacts, and disseminate timely information for decision-making and awareness.**

Provides detailed scientific, curated analyses and 24/7 operational support for multiple Homeland Security customers

Provides enhanced information management tools available 24/7 to DHS users to more rapidly characterize and understand biological threats

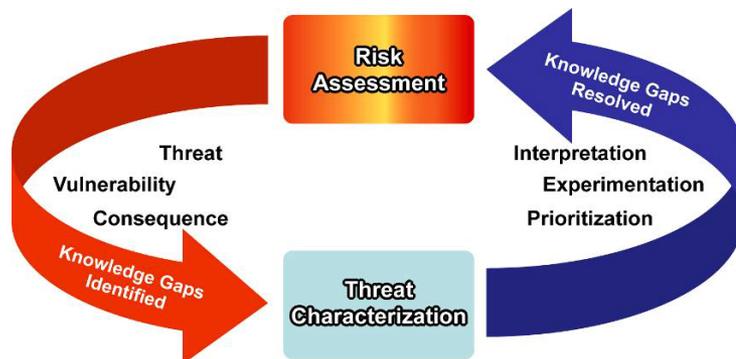
**Capability to quickly obtain current information regarding biological, chemical and integrated CBRN threats and vulnerabilities.**

**BioTerrorism Risk Assessment (BTRA):** Risk-informed investments for national strategic biodefense planning; Identify key knowledge gaps and define critical vulnerabilities

**Integrated CBRN Risk Assessment:** Risk-informed decision making for national medical countermeasure investments

**Lab Experiments and Studies:** Address key knowledge gaps on technical feasibility and vulnerability for biothreats with major operational impact

## Bio-Threat Characterization Center



# Biological Response and Restoration Program

## Objectives:

- **Provide advanced planning, Concepts of Operation, and fund exercises and training to prepare for responding to, and recovering from, a large scale biological attack.**
- **Identify/develop cost-effective response and restoration methods**
- **Decrease time required to respond and effectively restore urban areas, transit systems and major airports**

## Customers and Stakeholders:

**OHA, IP, EPA, DoD, CDC, OSHA, TSA, state and local public health and response**

# Biological Response and Restoration

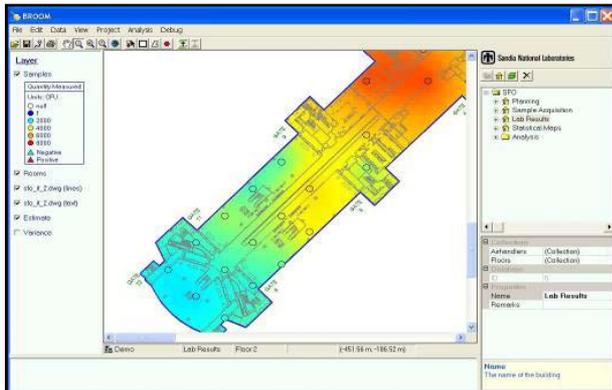
## Systems Approaches for Restoration



**Major U.S. urban areas and military installations need the capability to rapidly restore critical facilities and critical functions including high traffic areas**

- Pre-reviewed plans and protocols for transportation hubs and wide urban areas including military installations that can also serve as preparedness and training guidelines

## Operational Tools for Response and Restoration



**Major U.S. urban areas and military installations need the capability to characterize the extent and degree of biothreat agent contamination**

- Capability to characterize the extent of transport of agents indoors and outdoors
- Technologies to rapidly restore critical domestic areas and facilities rapidly and safely post attack

# Biological Forensics Program

## Objectives:

- **Conduct operational forensics analysis in support of attribution following a bioterrorist attack.**
- **Provide the tools to examine a biological agent and non-biological materials in a sample for characteristic attributes (“profile”) to provide insights to where, when and how the sample was produced thereby helping in identifying, stopping, and prosecuting the perpetrator(s).**

## Customers and Stakeholders:

**CBP, FBI, I&A, USSS, OHA, IC**

# Bioforensics Operations

## NBFAC



## National BioForensics and Analysis Center provides:

- Secure, state-of-the art, contamination free, bio-containment space for the analysis of evidentiary material;
- Validated protocols for the biological, chemical and physical 'fingerprints' that those samples may contain;
- Rigorous 'chain of custody' and quality control procedures to ensure the integrity of the sample and its analysis;
- "Spoke laboratories" to provide specialized capabilities

## Support to NBIC



## Support to National Biosurveillance Integration Center (NBIC):

- Research and development of new data sources to enhance NBIC early identification of a biological event
- Research and development of visual analytics to support NBIC analysts ability to recognize and communicate an event

# Chemical Defense Program

# Chemical Analysis Program

## Objectives:

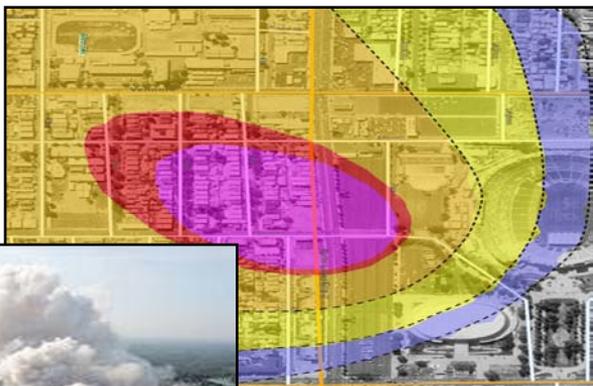
- **Better characterize the chemical threat to civilian population through risk and consequence assessments**
- **Assist in identifying risk-reduction measures**
- **Develop and verify forensic analytical tools and methodologies to enable attribution.**

## Customers and Stakeholders:

**IP, OHA, I&A, TSA, CBP, HHS, EPA, IC, FBI, DoD, USSS, ECBC**

# Chemical Analysis Program

## Chemical Security Analysis Center (CSAC)



**Capability to understand current and evolving vulnerabilities, risks and consequences for potential chemical attacks on population and infrastructure.**

- **Chem Terrorism Risk Assessment 2008**, updated biennially
- Regularly provide **summary updates** on specific chemicals
- **Chemical Infrastructure Risk Assessment:** Improved models of risk for chemical infrastructure
- **Model Large-Scale Transport Releases:** Improved models for toxic gas and chemical releases from rail cars

## Chemical Forensics



**Capability to conduct forensic analysis of terrorism and criminal incidents involving threat agents and materials for criminal prosecution and intelligence analysis.**

- Maintain operational chemical forensics capability.
- Develop and verify defensible laboratory analytical approaches for agents and precursors
- Investigate key characteristics of agent synthesis, weaponization, and use pathways

# Chemical Detection Program

## Objectives:

- **Develop chemical detection systems for facility monitoring, deployment to special events, and first responder use.**
- **Systems are tailored to a wide range of chemical agents of concern for civilian defense against acts of terrorism.**

## Customers and Stakeholders:

**IP, OHA, TSA (including FTA), FEMA, CBP, USSS, EPA, ATF, DoD, state and locals, ATF, FBI, USCG**

# Chemical Detection Program

## Autonomous Rapid Facility Chemical Agent Monitor (ARFCAM)



**Capability to protect the occupants in facilities from health threatening levels of chemical warfare agents and high priority toxic industrial chemicals**

- Fully autonomous, networkable chem monitor
- Timely warning of the presence of up to 17 CWAs, TICs
- Continuous operation
- Rapid detection and identification at IDLH PEL levels
- Currently being tested

## Lightweight Autonomous Chemical Identification System (LACIS)



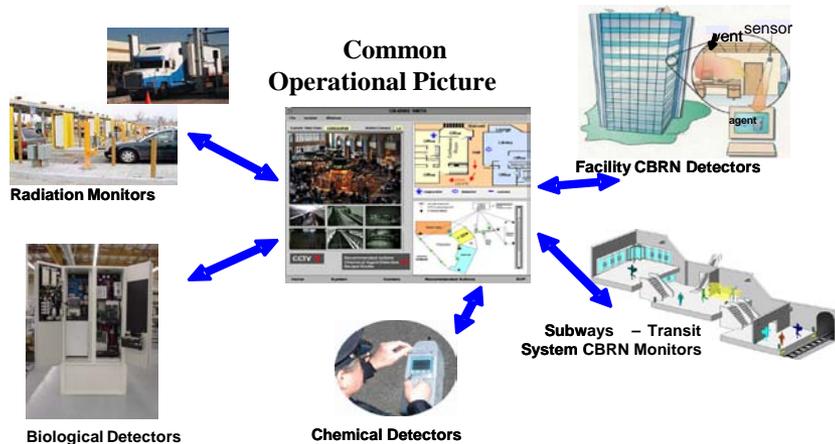
**Capability to reliably detect TICs and CWAs at IDLH levels at borders, portals, as well as other modes of people and cargo flow.**

- Hand-portable, networkable chemical monitor
- Currently being tested

**Both technologies are targeted for commercialization and availability through DHS Grants programs.**

# Chemical Detection Program

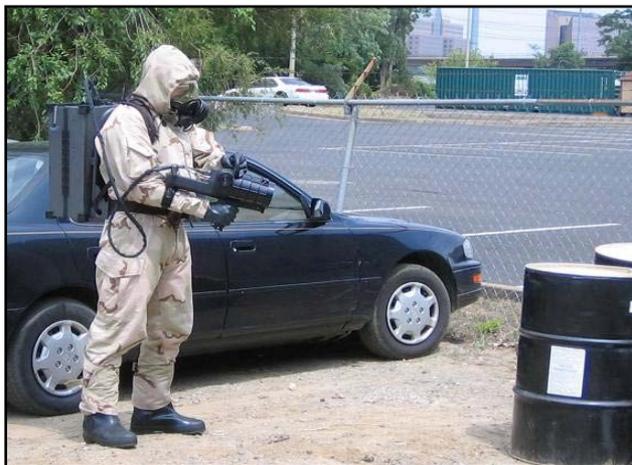
## Integrated CBRNe Detection System



**Capability to integrate the reporting of disparate chemical, biological, radiological and explosive detection/collection systems into one common operating picture.**

- Leverages open standards and communication protocols
- Enables appropriate response actions by appropriate local, state and federal officials

## Low Vapor Pressure Chemical Detection System



**Capability to rapidly survey areas to detect and identify persistent chemical threats on surfaces in order to enhance restoration of a facility to normal**

- Transportable (one-person portable), stand-off technology to detect and identify persistent chemical threats on surfaces with vapor pressures  $\leq 10^{-4}$  Torr
- Prototype to be independently evaluated in FY10

# Chemical Response and Recovery Program

## Objectives:

- **Generates capabilities for returning a chemically contaminated area to a normal condition.**
- **Supports development of technologies and guidelines for decontamination as well as analysis of contaminated areas.**

## Customers and Stakeholders:

**IP, OHA, EPA, TSA, FEMA, CBP, DoD, CDC, FBI, OSHA, USCG, state and locals, the interagency, private sector**

# Chemical Response and Recovery Program

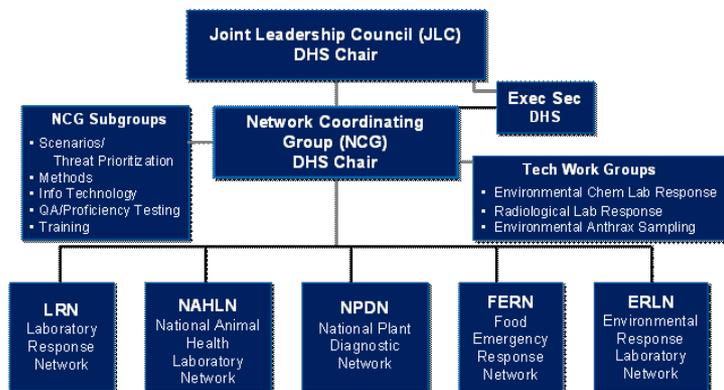
## Facility Restoration Demonstration



**Capability to rapidly recover from the release of chemical agents in critical transportation facilities**

- Minimize economic impact from facility closure
- Defensible public health decisions concerning the re-opening of major transportation facilities following a chemical agent release
- Provides guidance on sampling, analysis, decon
- Demonstration scheduled Oct 09

## Laboratory Response



**Federal, state and local agencies need capability to obtain timely and accurate laboratory data and information of natural and intentional chemical, biological and radiological incidents, to inform decision making and response.**

Common standards of performance across lab response assets

- Complete integrated response architecture Dec 09
- Build high-volume CWA environmental capability, demo, transition to EPA FY10

# Agricultural Defense Program

# Foreign Animal Disease (FAD) Program

## Objectives:

**Conduct near-term and long-term research and development programs on next-generation vaccines, diagnostics, and strategic planning and analysis tools to protect against both natural and intentional outbreaks of high priority foreign animal diseases, in close collaboration with USDA partners.**

## Customers and Stakeholders:

**USDA, FDA, OHA, IP, CPB**

## Inter-agency:

**NSTC Foreign Animal Disease Threats Subcommittee**

# Agrodefense

*Plum Island is an integral part of the DHS & USDA strategy*



PIADC is responsible for **protecting the Nation against animal diseases** that could accidentally or deliberately be introduced into the country. R&D work is coordinated to address the needs of the Nation and is executed by leveraging the expertise of **DHS, USDA/ARS** and **USDA/APHIS**.

## Net assessment of the FAD threat

- Animals as aerosol generators;
- Viral stability/survivability

## Assays & diagnostics

- National and international validation;
- Enhance diagnostics capacity
- New bioforensics capability

## Vaccines and therapeutics

- Improve on current vaccines;
- Explore vaccine alternatives;
- Develop anti-virals



# Foreign Animal Disease (FAD) Program

## FAD Vaccines & Diagnostics

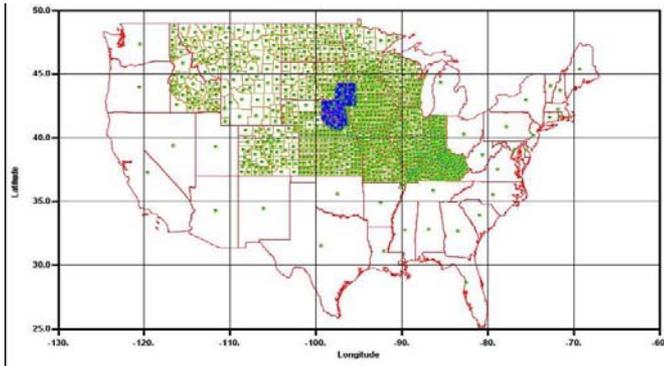


### Capability to protect and treat livestock from foreign animal disease (FAD) outbreaks

Complete testing of current generation Foot and Mouth Disease (FMD) vaccines to determine onset and duration of protection;

- Development of next-generation FMD vaccines that distinguish between infected and uninfected vaccinated animals (DIVA), and improve the onset and duration of protection;
- Development of high-throughput diagnostics to support the DIVA vaccine program

## FAD Modeling



### Capability to conduct national-scale simulations to support strategic planning and analysis of Foreign Animal Disease scenarios

Development of the Multi-scale Epidemiological and Economic Simulation and Analysis (MESA)

Workbench, a national-scale simulation to support strategic planning and analysis of FAD scenarios;

- Establish inter-agency collaborations with USDA, NIH, and NSF to enhance national capacity for FAD modeling;

# Foreign Animal Disease (FAD) Program

## Joint Agro Defense Office (JADO)



**Capability to better leverage and integrate Research and Development activities to more rapidly transition modeling, veterinary countermeasures and diagnostics for operational use.**

- Enhanced coordination of interagency strategic planning and cooperation for FAD defense R&D programs

## Agriculture Screening Tools



**Capability to rapidly detect and field identify products, pathogens and toxins that threaten the Agriculture and food industries.**

- Standardized protocols and tools to be used at ports of entry, inspection houses, plant inspection stations, and other environments such as farms and forests by multiple government agencies



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