

# Biological & Chemical Detection R&D

Dr. S. Elizabeth George

Chemical & Biological Countermeasures Division  
Science & Technology  
Department of Homeland Security

November 2, 2006



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- **Biological Detection**
- **Chemical Detection**
- **Bioinformatics & Assay Development**

# Family of Detection Technologies to Enable Enhanced Cost-Effective Bio-Countermeasures

**Detect to Protect**

**LBADS**  
Low-Cost Bio-Aerosol Detector Systems

**FBADS**  
Food Biological Agent Detection Sensor

**IBADS**  
Instantaneous Bio-Aerosol Detection Systems

**BAND**  
Bioagent Autonomous Networked Detectors

**RABIS**  
Rapid Automated Biological ID System

**Detect to Treat**



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# Bioagent Autonomous Network Detector (BAND)



Detect to Treat - Wide Area Environmental Monitoring

## *Objectives*

- **Detect-to-Treat Biological Surveillance Sensor System**
- **Build on Current BioWatch Architecture, develop 3<sup>rd</sup> Generation Sensors**
- **Significantly Reduce Total System Operating Costs**
  - o \$25K unit cost
  - o \$10K/yr operations
- **Continuous, Fully Autonomous Operation**
- **Broad Agent Coverage > 20 Agents**
- **High Sensitivity – Limit of Detection of 100 Organisms (10 ng Toxin)**
- **Single Agent False Positive Rate of  $10^{-7}$  with a goal of  $10^{-8}$**



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# Rapid Automated Biological ID System (RABIS)

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## *Objectives*

- Enable New Paradigms in Biodefense
- Provide a “detect to protect” response to attacks
- Real-time monitor for buildings and selected outdoor locations and events
- Very fast response time (< 2 minutes)
- Very low false alarm rates
- Broad and sensitive threat coverage
- Continuous autonomous operation
- Low cost of ownership
  - o \$50K unit cost
  - o \$20K ops cost/yr
- Extraordinarily Challenging Technical and Cost Goals

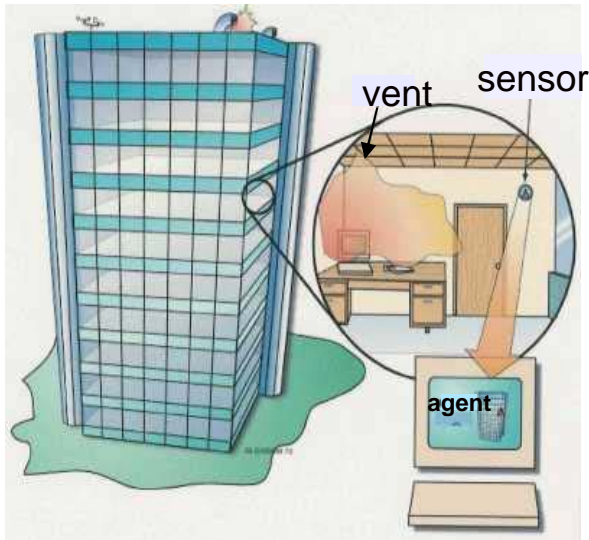


Detect to Protect - Environmental Monitoring



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# A New Set of Tools will Improve Chemical Detection and Response



**Facility Warning System  
(ARFCAM)**



**Responder Hand-held Detection Tool  
(LACIS)**

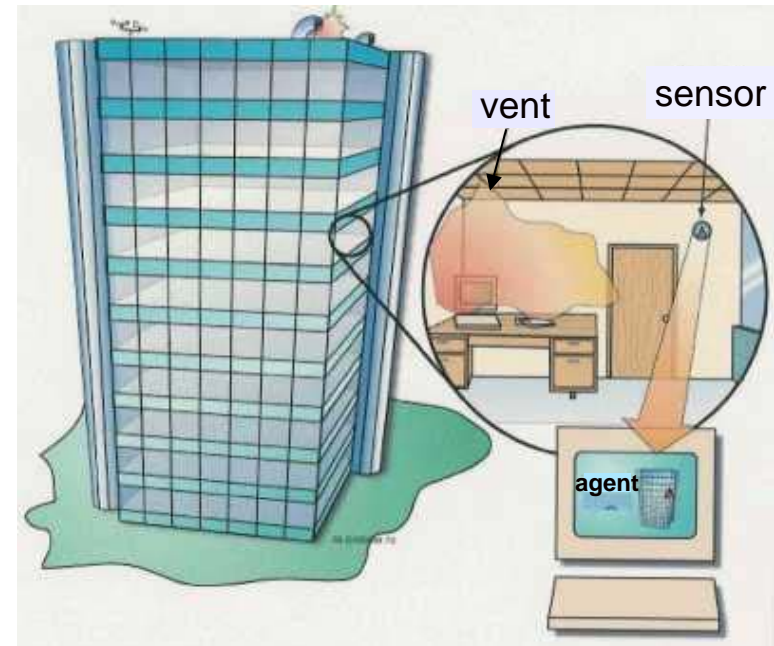
***Objective:* Develop, demonstrate, and commercialize networked capabilities to detect, and notify of, presence of up to twenty toxic chemical hazards for facility protection and scene assessment by responders**



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# Autonomous Rapid Facility Chemical Agent Monitor (ARFCAM)

**Objective:** Develop, demonstrate, and commercialize a networked capability to detect, and notify of, presence of up to twenty toxic chemical hazards for facility protection



## **Challenges:**

- ***Selectivity*** for target agents and against common backgrounds
- ***Wide dynamic range:*** IDLH to PEL
- ***Speed:*** target 15 sec (IDLH) / 15 min (PEL)
- ***System cost***



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# Lightweight Autonomous Chemical Identification System (LACIS)

**Objective:** Develop, demonstrate, and commercialize a networked responder capability to detect and quantitate up to twenty toxic chemical hazards to assess a scene for contamination and provide guidance on PPE use



## **Challenges:**

- ***Selectivity*** for target agents and against common backgrounds
- ***Wide dynamic range***
- ***Adequate performance in hand-held***
- ***System cost***



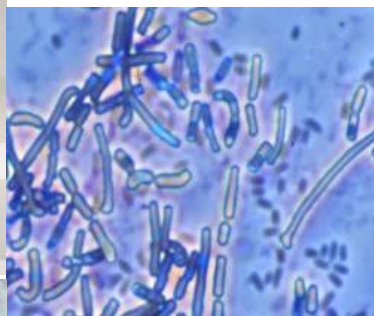
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# Bioinformatics & Assay Development

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## *Objectives*

- Provide set of tools for enhanced nucleic acid and protein based assays to support future detection systems
- Begin development of assays to address new, emerging, or engineered threats
- Create new bioinformatics tools to improve assay development
- Provide supplemental tools for forensic genotyping assays
- Enhance sample extraction efficiencies from evidence



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# Backup Slides



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# Instantaneous Bio-Aerosol Detection Systems (IBADS)

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## Objectives

- full complement of sensors for facility protection
- rapid biological aerosol detectors that may be widely distributed throughout a facility for the purpose of providing "low regret" alarms
- advanced strategies to protect individuals from exposure and reduce contamination of critical infrastructure
- Lower the cost of confirmation sensors by combining a trigger sensor with an extremely high confidence detection technology to avoid "high-regret" alarms



Detect to Protect - Facility Monitoring



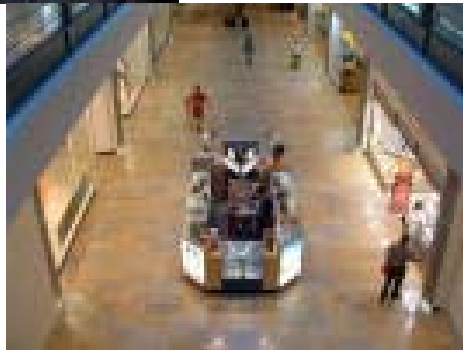
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# Low-Cost Bio-Aerosol Detector Systems (LBADS)

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## *Objectives*

- addresses need for very low cost bio-aerosol sensors (< \$1000 in high quantity production mode)
- Focus on facility monitoring
- optimized sensor systems that are characterized by the following detector metrics:
  - o Improved Sensitivity (Level of Detection)
  - o High Probability of Detection ( $P_d$ )
  - o Low Probability of False Positive ( $P_{fp}$ )
  - o Rapid Response Time
  - o Very Low Lifecycle Cost
- Interagency collaboration with DoD



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# Food Biological Agent Detection Sensor (FBADS)

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## *Objectives*

- **HSPD 9 direction – protect food supply from bio attack**
- **Major partnership with Food and Drug Administration (FDA)**
- **Rapidly detect the presence of biologic agents in liquid food products prior to entering production facility**
- **employ laboratory or portable detection methods at the manufacturing sites**
- **High-confidence detection of microbial and toxin threats**
- **Automated sample measurement and analysis**
- **Testing cycle time of  $\leq 20$  minutes**
- **Ease of use**

Detect to Protect – Food Monitoring



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