Biological Incident Response: Building Knowledge through Operational Testing and Exercises

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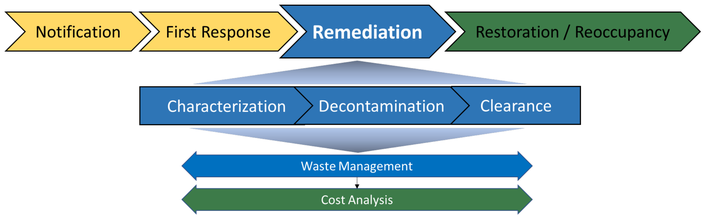
Introduction

The U.S. Environmental Protection Agency (EPA) strives to protect human health and the environment from adverse impacts resulting from incidents involving naturally occuring pathogens or the intentional release of biological threat agents. Over the last 15 years several interagency efforts have been conducted to advance the technologies used to characterize and decontaminate indoor and outdoor areas following biological contamination. Collaboration between the U.S. EPA Office of Emergency Management (OEM) and Office of Research and Development (ORD) has resulted in the execution of several field-scale exercises and operational tests that have helped identify effective methodologies to implement during an actual biological incident, as well as knowledge gaps to consider for subsequent testing. The operational tests included field-scale studies focused on sampling, decontamination, waste management, and cost analysis information for the remediation of indoor and outdoor areas as well as subway systems.

Consequence Management Focus



Problem Statements

- In 2001, letters containing *Bacillus anthracis (Ba)* were mailed to various locations throughout the U.S. The initial and residual contamination from the *Ba* spores was difficult to detect, identify, and decontaminate efficiently and quickly. In addition, the affected parties incurred significant costs to decontaminate buildings and equipment suspected of having been contaminated. Government reports and inquiries indicated that *Ba* sampling and decontamination methods were not standardized or validated and that biological agent location and characterization efforts were deficient.
- Commercial livestock production facilities and/or vehicles contaminated with highly pathogenic avian influenza (HPAI) or other foreign animal diseases could pose potential risks to human and animal health following an outbreak or incident. The operational procedures for decontaminating viruses and bacteria in complex facilities and challenging conditions are limited and knowledge gaps exist. Viable options for returning livestock facilities to pre-incident risk levels are of immediate need. Further, there is a need for rapid-clearance methods for all pathogens to facilitate the return to normal business practices as soon as possible.

Operational Tests & Exercises 2007 - 2022

General Goal:

Assess current biological incident response and remediation capabilities by investigating and improving sampling and analytical techniques and identifying practical methods to inactivate *Ba*, HPAI, or other biological contaminants in vehicles, structures, rolling stock, subway systems, and outdoor areas.

OEM and ORD Partners and Stakeholders:

- EPA Program Offices and Regions
- Department of Homeland Security, Science and Technology Directorate (DHS S&T)
- United States Coast Guard (USCG)
- Centers for Disease Control and Prevention (CDC)
- Laboratory Response Network (LRN)
- United States Department of Agriculture (USDA)
- Department of Energy (DOE) National Laboratories
- Department of Defense (DOD)
- Federal Bureau of Investigation (FBI)
- State and local stakeholders

2007-2008

Indoor Field Evaluation of Sample Collection Methods and Strategies (Idaho National Laboratory 1 and 2)

Commercial Building

2011-2012

Bio-Response Operational Testing and Evaluation (BOTE) Phase I (Operational Test) and Phase II (Interagency Exercise)

Commercial Building

2013

Methyl Bromide Operational Field Study

Residential Building

2015

The Underground Transport Restoration (UTR) Subway Railcar Decontamination

Railcar

2016

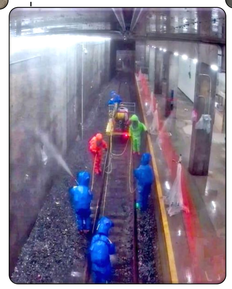
HPAI Poultry Barn Decontamination Study

Egg Layer Barn

2016

UTR Operational Technology Demonstration (OTD)

Subway Tunnel



2018

Decontamination System for Sanitizing Transport Trucks at Large Farms

Farm Vehicles

2020

Analysis for Coastal Operational Resiliency (AnCOR) USCG Vessel Decontamination

Vessel

2022

AnCOR Wide Area Demonstration (WAD)

Outdoor Areas

Approach

Research results from U.S. EPA bench-scale studies are used to develop the sampling and decontamination methods that are deployed during field-scale studies or operational tests. This is a critical step in the applied research process as it allows for a determination of whether sampling and decontamination that is effective at the small scale under controlled conditions is also effective in the real world under ambient conditions. Additionally, the field testing incorporates operational considerations that are critical for success in a real response. Operationally testing and evaluating technology performance (e.g., comparing decon efficacies on different strata) in the field allows U.S. EPA researchers to determine effective methodologies to implement during an actual biological incident.

With this information, U.S. EPA can provide On-Scene Coordinators and decision makers guidance on viable and cost-effective tactical methods for responding to biological incidents. This includes recommendations on sampling strategies that integrate U.S. EPA's data quality objective (DQO) process, and practical options for decontamination, waste management, and data acquisition.

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U.S. Environmental Protection Agency
Office of Research and Development

Decontaminants Studied

Notable Advancements & Operational Challenges

Advancements in sampling protocols, decontamination chemistries and approaches, and waste management activities have been accomplished through field-scale exercises and operational tests. These advancements can be utilized for the urban environment including buildings, transportation systems, and animal production facilities to help our nation recover from biological incidents including natural outbreaks or intentional releases.

- Evaluation of nontraditional composite sampling methods has demonstrated plausible methods that can yield a sample over a larger surface area as compared to traditional sampling methods.
- The number of samples collected for analysis using traditional surface sampling methods might exceed available laboratory capacity and manpower requirements. The U.S. EPA has developed biological sampling design tools that estimate the resources necessary for implementation and create sample plans that consider trade-offs in sampling design, alternate sampling approaches, and sampling coverage.
- For many of the most effective decon chemicals and processes, the impact of decontaminants on materials and equipment has also been studied, for both indoor and outdoor environments. Decon efficacy is directly impacted by the materials present, which in turn affects the waste management requirements for a specific site. Operational testing has not only advanced the tactical procedures for decontaminating indoor and outdoor areas, it has also allowed for a better understanding of the interconnections and trade-offs between the decon and waste management and the development of decision support tools that consider trade-offs, true costs, and time impacts.
- Difficulty of managing the vast quantities of waste that might be generated and the identification of facilities to accept the contaminated waste has been addressed by the development of a suite of waste management decision support tools.