

RECENT PRODUCTS FROM THE HOMELAND SECURITY RESEARCH PROGRAM

**MANY OF OUR PRODUCTS HAVE MULTIPLE USES,
NOT JUST HOMELAND SECURITY APPLICATIONS**

Products Supporting Sampling and Analysis

[Adaptation of the Conditions of U.S. EPA Method 538 for the Analysis of EA2192 in Water by Direct Aqueous Injection- Liquid Chromatography/Tandem Mass Spectrometry-Final \(HS 5.03.01 - 225\)](#)

Report

The objective of this study was to evaluate U.S. EPA's Method 538 for the assessment of drinking water exposure to the nerve agent degradation product, EA2192, the most toxic degradation product of nerve agent VX. As a result of the similarities in sample preparation and analysis that Method 538 uses for nonvolatile chemicals, this method is applicable to the nonvolatile Chemical Warfare Agent (CWA) degradation product, EA2192, in drinking water. The method accuracy, precision, reproducibility, linearity, detection limit and quantitation limit for EA2192 in DI water were evaluated and found to be within the acceptance criteria of Method 538.

[Considerations for Estimating Microbial Environmental Data Concentrations Collected from a Field Setting](#)

Journal Article

In the event of an indoor release of an environmentally persistent microbial pathogen such as *Bacillus anthracis*, the potential for human exposure will be considered when remedial decisions are made. Microbial site characterization and clearance sampling data might be used to estimate exposure. However, there are many challenges associated with estimating environmental concentrations of *B. anthracis* or other spore-forming organisms after such an event before being able to estimate exposure. These challenges include: (1) collecting environmental field samples that are adequate for the intended purpose, (2) conducting laboratory analyses and selecting the reporting format needed for the laboratory data, and (3) analyzing and interpreting the data using appropriate statistical techniques. This paper summarizes some key challenges faced in collecting, analyzing, and inter-

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Did You Know?

EPA is a collaborator in the Underground Transport Restoration (UTR) Project, a multiyear DHS-sponsored project. EPA is providing subject matter expert support and leading laboratory and field efforts. The project will identify potential solutions to the requirements for rapid characterization, cleanup, and clearance of biological contamination in physical structures (tunnels, stations) and rolling stock (railcars) of an underground transport system. A demonstration of selected technologies is scheduled for September 2016 at Fort AP Hill, VA. The UTR project will improve the capability for transit systems to rapidly recover from a biological release event and address a high-priority need expressed by the Transportation Security Administration (TSA) and local transit systems.



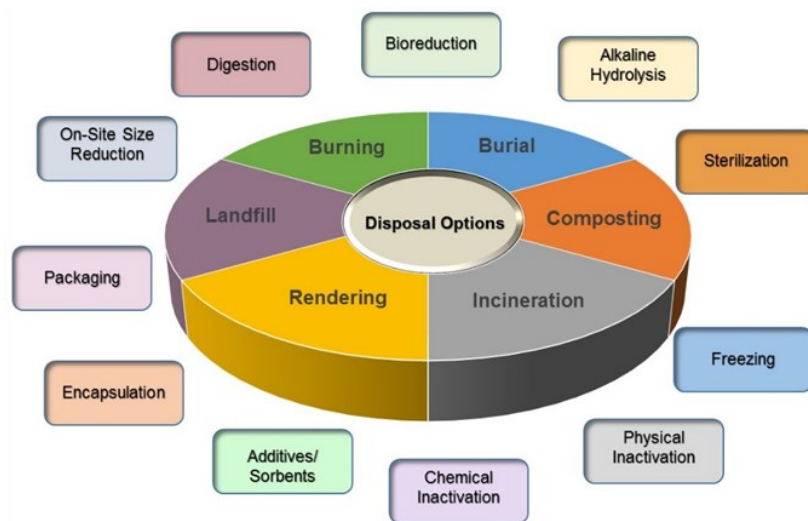
Sampling team collecting a PSU sample from Rockefeller Center Station, NYC, as part of the Underground Transportation Study (UTS)

PRODUCTS RELATED TO WASTE MANAGEMENT

[Identification and Screening of Infectious Carcass Pretreatment Alternatives](#)

Report

Managing the treatment and disposal of large numbers of animal carcasses following a foreign animal disease (FAD) outbreak is a challenging endeavor. Pretreatment of the infectious carcasses might facilitate the disposal of the carcasses by simplifying the transportation, reducing the pathogen load in the carcasses, or by isolating the pathogen from the environment to minimize spread of any pathogens



Depiction of Carcass Disposal Technologies and Potential Pre-treatment Technologies

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U.S. EPA's Homeland Security Research Program

U.S. EPA's Homeland Security Research Program (HSRP) provides scientific solutions that:

Improve water utilities' abilities to prepare for and respond to all hazards incidents that threaten public health.

Advance EPA's capabilities to respond to wide area chemical, biological or radiological contamination incidents, including those resulting from terrorism or natural disasters.

PRODUCTS RELATED TO DECONTAMINATION

[Evaluation of the Efficacy of Methyl Bromide in the Decontamination of Building and Interior Materials Contaminated with *Bacillus anthracis* Spores](#)

Journal Article

The objective of this article is to determine the required conditions for the effective inactivation of *Bacillus anthracis* (*B.a.*) spores on materials using methyl bromide (MeBr) and to obtain comparative efficacy data with three avirulent microorganisms, to assess their potential as surrogates for *B.a. Ames*.

[Sorption of Radionuclides to Building Materials and its Removal Using Simple Wash Solutions](#)

Journal Article

Urban radiological contamination may require simple decontamination methods that can be deployed for wide-area decontamination. This paper investigates factors of importance for developing such decontamination methods, focusing on cesium.

Using ammonium (NH_4^+) salt solutions, we tested the desorption of ionic cesium bound to individual components of concrete and coupons of common building materials. While the tests on concrete aggregate suggest that a concentration $>10 \text{ mM } \text{NH}_4^+$ does not improve the desorption of cesium, tests on concrete, asphalt, marble, limestone and granite monoliths showed improved decontamination factors when the NH_4^+ concentration increased from 0.1 to 0.5 M. We also found that cesium as dry particulate material could be removed quite effectively although the contamination became tenacious upon wetting the surface.

[Surface Decontamination of Blister Agents Lewisite, Sulfur Mustard and Agent Yellow, a Lewisite and Sulfur Mustard Mixture](#)

Journal Article

Sulfur mustard (HD) and Lewisite (L) are blister agents that have a high potential for terrorist use; Agent Yellow (HL) is the eutectic mixture of HD and L. Bench-scale testing was used to determine the residual amount of these chemical warfare agents remaining on three building materials (wood, metal and glass) after application of various decontaminants (household bleach, full strength and dilute; hydrogen peroxide 3% solution; and EasyDECON[®] DF200). All decontaminants reduced the amount of L recovered from coupons. Application of dilute bleach showed little or no difference compared to natural attenuation in the amount of HD recovered from coupons. Full-strength bleach was the most effective of four decontaminants at reducing the amount of HD from coupons. Hydrogen peroxide (3% solution) and DF200 did decrease the amount of HD recovered from coupons more than natural attenuation (except DF200 against HD on metal), but substantial amounts of HD remained on some materials. Toxic HD by-products were generated by hydrogen peroxide treatment. The effectiveness of decontaminants was found to depend on agent, material, and decontaminant. Increased decontaminant reaction time (60 min rather than 30 min) did not significantly increase effectiveness.

[Technical Report for the Demonstration of Wide Area Radiological Decontamination and Mitigation Technologies for Building Structures and Vehicles](#)

Report

The U.S. Environmental Protection Agency in collaboration with the Department of Homeland Security conducted the “Wide-Area Urban Radiological Contaminant, Mitigation, and Cleanup Technology Demonstration” in Columbus, Ohio on June 22-25, 2015. Five wide-area radiological decontamination technologies (including strippable coatings, gels, and chemical foam technologies) were demonstrated on an urban building. Decontamination technologies were applied to remove the contaminants from the building’s surfaces



by physical, chemical, or other methods, which in practice could reduce the radiation exposure level. In addition, several radiological contaminant mitigation technologies were demonstrated, including building and vehicle wash technologies as well as several approaches to contain wash water and radioactive particles.

Whether for mitigation (i.e., gross decontamination and containment) or decontamination, decision-makers for all response groups need a variety of options since not every technology will be applicable to a specific incident or available at a specific site when needed. Certain technologies are more effective, but not widely available, while others are less effective, but more widely available. Other factors include resource availability and the ability to treat waste onsite without transport.

PRODUCTS RELATED TO FATE, TRANSPORT OR PERSISTENCE

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[Radiological Contaminant Persistence and Decontamination in Drinking Water Pipes](#)

Report

This report documents the use the Pipe Decontamination Experimental Design Protocol (PDEDP) to evaluate the persistence of cesium, cobalt, and strontium on concrete and polyvinyl chloride (PVC) and explore possible decontamination approaches. The PDEDP is an approach for evaluating the persistence characteristics of contaminants on drinking water pipe materials and various decontamination approaches.

Pipe material coupons were contaminated and then exposed to a solution containing one of the following cleaning agents in reactors with no rotation: ethylenediaminetetraacetic acid (EDTA), tartaric acid, calcium chloride, ammonium acetate. EDTA was an effective chemical cleaning agent for cobalt on concrete. Tartaric acid also performed well for cobalt on concrete however, it formed a yellow precipitate on the surface of the coupons. Ammonium acetate and calcium chloride were both moderately effective as chemical cleaning agents for strontium on concrete. None of the contaminants were persistent on PVC pipe materials so chemical cleaning agents were not evaluated on PVC. Cesium was not persistent on concrete so chemical cleaning agents were not evaluated for cesium.

[Testing Contamination Source Identification Methods for Water Distribution Networks](#)

Journal Article

In the event of contamination in a water distribution network (WDN), source identification (SI) methods that analyze sensor data can be used to identify the source location(s). Knowledge of the source location and characteristics are important to inform contamination control and cleanup operations. Various SI strategies that have been developed by researchers differ in their underlying assumptions and solution techniques. The manuscript presents a systematic procedure for testing and evaluating SI methods.



[Modeling and Experimental Testing of Sediment Resuspension in Water Distribution Storage Tanks](#)

Report

Sediments in storage tanks have the potential to accumulate pathogens, metals, and other hazardous materials. This report addresses the potential for sediments in storage tanks to be transported back into water distribution systems. Computational fluid dynamics (CFD) models were developed and three simulation studies were conducted to provide insight into sediment resuspension processes in tanks. In addition, a pilot-scale experiment was conducted to validate the model predictions. The results of this study highlight tank operating conditions which might reduce resuspension and removal of sediments from tanks.



[Distinguishing Intentional Releases from Natural Occurrences and Unintentional Releases of *Bacillus anthracis*: Literature Search and Analysis](#)

Report

The purpose of this report was to: (1) survey the scientific literature to determine the current state of the science regarding the presence of *Bacillus anthracis* in the environment and outbreaks of anthrax; (2) identify characteristics that would enable a screening of information about outbreaks to rapidly assess whether an intentional release was a likely cause (in United States

settings) in order to inform remediation decisions; and (3) identify gaps in risk-related knowledge associated with *B. anthracis* events in the United States.

