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technical BRIEF
INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

2019 EPA International Decontamination Research and Development Conference

INTRODUCTION

On November 19–21, 2019, the U.S. Environmental Protection Agency's (EPA's) Office of Research and Development's Center for Environmental Solutions and Emergency Response (ORD/CESER) hosted the 11th U.S. EPA International Decontamination Research and Development Conference at Sheraton Norfolk Waterside Hotel in Norfolk, Virginia. This conference is known as the largest and most recognized civilian-led conference on all issues related to cleanup following a chemical, biological, or radiological (CBR) incident. It continues to foster collaboration and strengthen research to develop strategies and technologies enabling the nation to withstand and to recover from future disasters, both natural and man-made, at a national and local level.

Figure 1. (Left) Dr. Robert Kadlec speaks during the plenary session; (Right) Conference attendees viewing the posters and technology demonstrations.

For three days, more than 300 national and international participants representing federal, state, and local government agencies; academia; industry; and non-governmental organizations (NGOs) attended 68 oral presentations and networking events, a poster session showcasing 33 posters, and a technology café featuring 11 exhibitors (see **Figure 1**). The objective of the 2019 conference was fourfold:

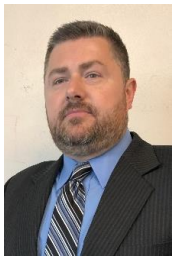
1. Bring together federal, state, and local researchers; emergency responders; U.S. and other national governments; and private stakeholders who work in CBR remediation and recovery preparedness;
2. Facilitate the exchange of information on scientific endeavors, including basic and applied research, field demonstrations, guidance/software tool development, and field applications related to CBR remediation issues;
3. Demonstrate the connection between basic or fundamental decontamination research to and applied research, as well as applied research and effective field application; and
4. Explore challenges faced by regions, states, tribes, and locals in response to natural or man-made incidents.

These objectives and the research presented therein supports EPA's mission to protect human health and the environment, and directly aligns with the Agency's proposed 2018–2022 strategic plan in developing strategies and technologies for preventing contamination and responding to emergencies.

INVITATIONAL SPEAKERS

EPA invited seven invitational speakers representing federal and local governments, private companies, and NGOs to speak at the conference. Each speaker presented innovative and provocative ideas that addressed the primary objectives of the conference.

Ms. Sara Casey, Biological Hazards Lead, U.K. Department for the Environment, Food, and Rural Affairs (Defra), represented Defra during the recent nerve agent incident in Salisbury to create technical response and recovery groups, instigate the development of sampling plans, and assist with the generation of waste strategies. Ms. Casey explained Defra's leading role in the United Kingdom's government preparedness for major chemical, biological, radiological, and nuclear (CBRN) incidents. She outlined waste management challenges faced by Defra following the Novichok incidents in the United Kingdom.



Mr. Jason Doerflein, Hazardous Materials Specialist, Marion County Public Health Department, has received extensive training in incident command, emergency response, hazardous materials, and chemical, biological, radiological, nuclear, and explosive (CBRNE) incidents. Mr. Doerflein described Marion County's Public Health Department's role in a fentanyl incident that involved an overdose within a fentanyl lab operation. Mr. Doerflein outlined the incident's notification, incident response, and remediation phases. He discussed applicable local regulations, decontamination concerns, remediation concerns, and criteria for a release of interest.

Dr. Norman Govan, Fellow and Principal Advisor, U.K. Defence Science and Technology Laboratory, has extensive expertise in conducting research at the interface of scientific disciplines (chemistry, biology, engineering and mathematics) to develop novel CBR hazard mitigation approaches. He discussed the work undertaken by the U.K. Military Task Force and the U.K. Defence Science and Technology Laboratory to address decontamination challenges in the wake of the Novichok nerve agent incidents in Salisbury and Amesbury.

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Mr. John Howard, Director, and Mr. Joe Hudyncia, Environmental Programs Specialist, North Carolina (NC) Department of Agriculture and Consumer Services Emergency Programs Division, explained how the NC Department of Agriculture and Consumer Services helped farmers dispose of poultry carcasses and saturated manure following rain and floodwaters from Hurricane Florence. Mr. Howard and Mr. Hudyncia explained how they assisted farmers in a way to protect public health and the environment, quickly getting farms back into operation.

Dr. Robert Kadlec, Assistant Secretary for Preparedness and Response (ASPR), U.S. Department of Health and Human Services, serves as the Secretary's principal advisor on matters related to public health emergencies, including bioterrorism. Dr. Kadlec outlined ASPR's mission, purpose, and how EPA and the Centers of Disease Control and Prevention (CDC) work together. He explained ASPR priorities to building readiness for 21st century threats, including strong leadership, regional disaster health response systems, public health security capacities, and the medical countermeasures enterprise. Dr. Kadlec discussed anticipated challenges and specific crises, emphasizing preparedness for different events (e.g., Ebola outbreaks, oil spills, and other environmental health hazards), and he stressed the importance of collaboration across federal, state, and local agencies to address bioincident recovery challenges.

Ms. Dana Tulis, Director of Emergency Management, U.S. Coast Guard (USGS), provides strategic programmatic oversight for the Offices of Search and Rescue, Emergency and Disaster Preparedness, and Marine Environmental Response. Ms. Tulis provided an overview of the Coastal Operational Resiliency (AnCOR) project, a collaborative project between USGS, Department of Homeland Security (DHS), and EPA focusing on post-biological incident consequence management of urban and maritime structures, assets, and surfaces. The project covers activities such as sampling, decontamination, and waste management.

SCOPE AND APPLICABILITY

Since EPA hosted the initial conference in 2005 following the Amerithrax incident, the conference has grown to include national and international participants who come together on a regular basis to discuss a range of homeland security topics. Contributions from partners and international collaborators continue to grow with each conference and themes remain dynamic. As new topics arise, they are included in the agenda for discussion.

The purpose of the 2019 EPA International Decontamination Research and Development Conference was to conduct and communicate the fundamentals and applications of science, including how current work supports EPA's mission in support of state, tribal, and local decision makers. The conference emphasizes the transdisciplinary and translational approach of EPA's homeland security research, fostering collaboration across the federal government and working with the emergency officials to implement research at a federal, state, tribal, and local level.

TOPICS AND STRUCTURE

At its core, the conference revolves around CBR detection and decontamination research. Additionally, each conference highlights recent disasters or research needs. EPA featured the following general topics at the 2019 conference:

- **Regional, State, and Local Initiatives:** Highlighting local priorities, challenges, and science and technology developments related to response and recovery efforts from intentional or accidental environmental incidents;
- **CBRN Detection and Decontamination Research:** New research data, or field activities and large-scale demonstrations related to the detection and decontamination of biological (including agricultural threat agents and biotoxins), chemical, and radiological threat agents in indoor (in facilities) or outdoor areas/materials; and
- **Cross-Cutting Topics:** Clean-up levels/risk assessment, exposure assessment, sampling/analysis of threat agents, fate/transport/containment, material compatibility with decontamination processes, tool and guidance development, waste management of threat agent-contaminated materials, water/wastewater decontamination, and systems approach to response and regulatory issues.

Special topics of the 2019 conference included:

1. **Coastal Operational Resiliency (AnCOR) project.** Presentations and preliminary findings of the EPA/DHS/USCG collaborative project focusing on the post-biological incident consequence management (sampling, decontamination, waste management, etc.) of urban and maritime structures, assets, and surfaces.
2. **Waste Management.** All hazards applications.
3. **Illicit Drug Remediation Efforts.** Opioid epidemic efforts.
4. **Disaster Response.** Big data, artificial intelligence, information sharing, mapping, and system integration.
5. **Case Studies/Applied Research.**
    a. Engaging federal, state, local responders, and industry.
    b. How does bench scale correlate to real scenarios?

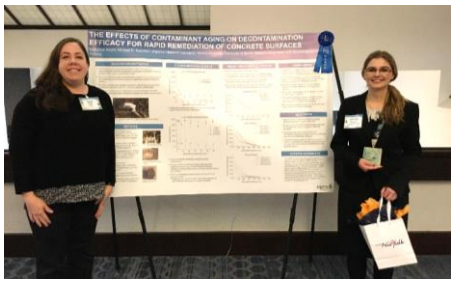

Figure 2. Dr. Sarah Taft congratulating student poster competition winner, Ms. Katherine Hepler.

New to this year's conference was the introduction of a **student poster competition**. EPA invited current students and recent graduates to participate in a poster competition to gain experience in presenting their results to a panel of judges with scientific backgrounds. Participants delivered a five-minute lightening talk to the panel. Each participant was then judged on their knowledge and presentation, as well as the poster's scientific content, visual appeal, and potential research impact. The winner, Ms. Katherine Hepler, will be invited to showcase her research as part of an official EPA Homeland Security Research Program webinar.

GENERAL AND BREAKOUT SESSIONS

This year's conference featured one plenary and seven concurrent breakout sessions. Speakers were limited to 25 minutes with 5 minutes for questions. Session topics are described below.

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1. Table form (Version 1)
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Session	Description
Plenary Session ***Cooperative efforts within homeland security, including preparedness and response partnerships.***	Presenters highlighted the U.S. biodefense enterprise and national biodefense strategy, the AnCOR project, the Skripal and Novichok incidents, and EPA's response efforts to California's wildfires.
Concurrent: Regional, State, and Local Initiatives ***Regional, state, and local priorities, challenges, and science and technology developments related to response and recovery efforts from intentional or accidental environmental incidents.***	Presenters emphasized animal carcass disposal following Hurricane Florence, fentanyl incident response and remediation, opioid epidemic response, and the teaming of federal and private sector capabilities to remediate highly hazardous chemical and biological agents.
Concurrent: Biological Agent Decontamination (1) ***Application of decontamination methods in response to biological agents.***	Presenters focused on devitalization methods for plant origin materials as quarantine treatment, decontamination using hot humid air on materials contaminated with an enveloped RNA virus surrogate, development of a dry decontamination method for mass casualty events, and laboratory decontamination using low-concentration hydrogen peroxide.
Concurrent: Cross-Cutting Innovation ***Cross-cutting topics related to restoration, including organization efforts to support regions, local initiatives, and homeland security.***	Presenters highlighted 2D nanomaterials as the next security threat, recent advances in autonomous radiation survey and sample collection, and the National Aeronautics and Space Administration's (NASA) Mars sample return planning.
Concurrent: Public Engagement ***Cooperative efforts between EPA and the public to assist with decontamination efforts.***	This session outlined measuring success beyond cleanup levels in environmental decontamination, mass casualty decontamination research, wide-area incident vehicle management and disposal, and ORD's engagement efforts with state, local, and tribal governments.

Session	Description
Concurrent: Fentanyl Detection and Cleanup ***Obstacles and solutions associated with detecting and cleaning fentanyl.***	Presenters emphasized scenario-specific opiate detector selection, evaluation of fentanyl contamination and sampling effects for remediation, screening decontaminant reactivity, and surface decontamination options for a fentanyl contaminated building interior.
Concurrent: Water Infrastructure Protection and Decontamination ***Application of decontamination methods to protect water infrastructure.***	This session hosted discussions regarding water contamination research, microbial inactivation by peracetic acid, the perfluoroalkyl substance (PFAS) effluent system, and disinfection of *Legionelle pneumophila* in drinking water biofilms.
Concurrent: Biological Agent Sampling and Analysis Methods ***Biological sampling and analysis methods, highlighting science tools, characterization and extent mapping of biological incidents.***	Presenters outlined the feasibility of a bioaerosol sampling network, comparison of sampling methods for an extended duration outdoor biological study, development of an improved concrete testing coupon for virus recovery, and an evaluation of analytical methods for detecting *Bacillus anthracis* spores.
Concurrent: Technology and Software Supporting Disaster Response ***Technology and software tools to assist disaster response.***	Presenters emphasized a virtual reality platform for training personnel on biological surface sampling techniques, EPA's CompTox Chemicals Dashboard, an open source quick response system for tracking personnel and resources, and a GIS application for developing biological sampling designs and estimating resources necessary for implementation.
Concurrent: Beyond Water Infrastructure ***Application of water infrastructure and methods to assist decontamination.***	This session highlighted stormwater models to inform recovery efforts, water wash down for decontamination purposes, and EPA's Water-On-Wheels (WOW) emergency water treatment system cart.

Session	Description
Concurrent: Biological Agent Decontamination (2) ***Application of decontamination methods in response to biological agents.***	Presenters focused on indoor vehicle decontamination using vapor phase hydrogen peroxide, using DiKlor® chlorine dioxide on diverse vehicle surface materials and to decontaminate Category A viruses, and environmental remediation methods for *Bacillus* species.
Concurrent: Chemical Agent Research ***Methods for chemical agent research and decontamination strategies.***	Presenters described unventilated monitoring to recovery following a chemical release, risk-based action levels for unique exposure scenarios in response to illegal pesticide applications, evidence-based mass casualty decontamination strategies, optimization of high-activity neutralization materials for bulk chemical agent detoxification, and relating laboratory-scale dispersion experiments to full-scale field data.
Concurrent: Waste Management ***Methods for managing and removing waste following decontamination.***	This session emphasized response to African Swine Fever and managing infected animal carcasses, using horizontal grinders on on-farm composting, simulation of incineration of waste generated from cleanup, control of emissions from combustion of cesium-contaminated biomass via sorbent injection, and disaster waste management tools.
Concurrent: Radiological Agent Research ***Radiological research and decontamination strategies.***	Presenters highlighted the MELCOR Accident Consequence Code System (MACCS) consequence analysis computer code, decontamination of sensitive equipment using non-radiological surrogates, non-destructive decontamination methodologies for mixed porous surfaces under high humidity and ultraviolet conditions, and EPA's Integrated Rad Remediation Decision Support Tool (IRRD-ST).
Concurrent: Biological Agent Decontamination (3) ***Application of decontamination methods in response to biological agents.***	Presenters focused on sensitive equipment decontamination, using low-concentration hydrogen peroxide vapor to inactivate Ebola virus surrogates, PPE decontamination using an electrostatic sprayer, and the D7 decontaminant.

Plenary Session

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Cross-cutting topics related to restoration, including organization efforts to support regions, local initiatives, and homeland security: Presenters highlighted 2D nanomaterials as the next security threat, recent advances in autonomous radiation survey and sample collection, and the National Aeronautics and Space Administration's (NASA) Mars sample return planning.

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CONCLUSION

EPA's International Decontamination Research and Development Conference continues to serve as a valuable educational, networking, and planning resource for scientists and operational experts. This event serves as a crucial communication and feedback mechanism for experts to develop and implement technologies necessary to support the left- and right of the boom. Since its inception in 2005, the conference has continued be a source of knowledge and

insight into the homeland security paradigm. Due to the success of the conference in Norfolk, Virginia, conference organizers hope to host the 2021 conference outside of Research Triangle Park, NC to continue to attract a diverse group of attendees.

MORE INFORMATION

- For more information about EPA's Homeland Security Research Program, visit the website at https://www.epa.gov/homeland-security-research.
- To view publicly released abstracts, presentations, and questions and answers, visit the post-conference website at https://www.epa.gov/homeland-security-research/epa-2019-international-decontamination-research-and-development

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DISCLAIMER

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