

ASPR TRACIE Technical Assistance

On January 14, 2020, ASPR TRACIE hosted the webinar [Healthcare Challenges in Chemical Incidents](#) with speakers discussing the potential effects of a chemical incident and sharing recent guidance and lessons learned in assessing, triaging, and treating patients, including considerations for novel nerve agent treatment. Links to the [presentation, speaker bios, and recording](#) are available.

Due to time constraints, speakers were not able to respond to all of the questions received during the Question and Answer (Q&A) portion of the webinar. ASPR TRACIE sent remaining questions to panelists and their answers are provided in this document.

Questions for All Panelists

Note: Each response was provided by a different speaker.

1. What are the links to the resources mentioned during the webinar?

- [ASPR TRACIE Chemical Hazards Topic Collection](#)
- [HHS Chemical Hazards Emergency Medical Management \(CHEMM\)](#)
- [Primary Response Incident Scene Management \(PRISM\)](#) guidance on mass patient disrobe and decontamination during a chemical incident
- [Wireless Information System for Emergency Responders \(WISER\)](#)

Note: Each bulleted response that follows was provided by a different speaker.

2. Does the panel have any comments on the HAZWOPER requirements for healthcare to properly train first receivers on patient chemical contamination?

- First receivers must be trained to the Operations Level as specified in the HAZWOPER standard. This generally involves 8 hours of training or “to competency.” Awareness material can be separate or incorporated but required elements must be covered. Annual refresher training to ensure continued competency is required. The [OSHA first receivers document](#) does an excellent job describing the baseline expectations for protection and hazards as well as education starting on page 25.
- Hospitals and healthcare often have difficulty maintaining education and training. Healthcare facilities that are at risk of having patients present without decontamination (essentially all that provide emergency services) must be prepared to receive and decontaminate these patients. There are a variety of staffing and other approaches to meet this goal, but accrediting agencies as well as the OSHA general duty clause expect hospitals to be able to address these chemical hazards.

3. Following the shortages created by the Puerto Rico Hurricane, have we sought to ensure duplicative production facilities for basic treatments and medications?

- This has been a topic of intense discussion. Private sector vendors and manufacturers are not required to have redundancy of production in place but there are efforts being made to try to build additional capacity and manufacturing redundancy into the system. However, because this

is not publicly controlled, we will always have some vulnerabilities absent a major governmental effort to regulate the field of pharmaceutical and medical supply production.

- DHS continues to work with the Medical and Public Health Sector Coordinating Council (SCC) to address these types of issues. The SCC serves as the conduit to the private sector for critical sectors.

4. Are there plans to update the OSHA best practices for first receiver decontamination to align with the dry decontamination information provided?

- The [OSHA first receivers document](#) does not specify methods that are appropriate for decontamination. Based on the [PRISM research](#), the experimental evidence for dry decontamination is strong, and use of dry decontamination is a best practice when wet decontamination is unavailable or cannot be performed due to environmental considerations or resources available. Dry decontamination may be an initial step toward wet decontamination or all that is offered based on the resources, substance, and type of release. Having pre-made kits for dry decontamination that provide bags and a tracking scheme for clothing and valuables and a large bag under which people can undress are important for mass casualty situations.
- Advantages of dry decontamination include that it can be performed without specialized resources (any absorbent material will do) and it is synergistic with wet decontamination when performed as part of PRISM's "triple protocol" (disrobe + dry decontamination, gross decontamination, and technical decontamination).

5. Community hospitals no longer have access to cholinesterase lab testing. Should this capability be included again as sending labs off to a reference lab takes time?

- Unfortunately, the time needed to run these tests often precludes their utility in patient treatment. If a cholinergic syndrome is suspected, it should be aggressively treated regardless of laboratory results. Certainly, more rapid access to these tests may be useful especially when cases are sporadic and the differential diagnosis is wide as in the UK nerve agent cases. Since the test is not readily available at the point of care, treatment decisions should be based on observed clinical findings. Knowing which reference laboratories can perform the tests and on what timeframe can be helpful to plan accordingly.
- Agreed, although the SLUDGE toxidrome is so distinct that it should be recognized and acted on before lab confirmation.

6. Per the HHS Cooperative Agreement, healthcare coalitions are asked to submit a "complementary coalition-level annex" addressing Chemical incidents (2023). Are there any recommendations on how to address a coalition response to chemical incidents, other than through training, exercise, resource/ inventory, and an assessment? I see more of a focus on the previously mentioned areas rather than a "response" focus.

- ASPR TRACIE, in collaboration with NHPP, plans to develop a template for coalition chemical planning next year (2021) and may offer additional complementary planning resources. Our [Chemical Hazards Topic Collection](#) offers a wide range of resources for planning community operational responses. Communities have very diverse options and resources for chemical response, however all of those revolve around the goals of detection, communication, release evaluation / shelter, evacuation, and other population protection, containment of the hazard (and eventual control), field decontamination and treatment, hospital decontamination and

treatment, and definitive medical care. In some cases, community screening centers could be utilized and may be a component of the response. Coalition partners are all critical to a successful chemical response and therefore coalition level planning including understanding resources and roles, defining equipment and training needs, and planning exercises with a chemical component or focus are the most effective way to ensure a coordinated and safe response.

- An additional element to consider is the identification of specific organization(s) within the coalition that could provide expert advice to other coalition members during a chemical incident and to establish a process for such.
- DHS is working with the National Fire Protection Association (NFPA) on a [Community-based Response to Drug Overdose \(CReDO\) Standard](#). Leveraging the work of the NFPA-3000 Active Shooter High-threat Environment Response (ASHER, or “CR-ASHER”), we would like to see a CR-ASHER >> CReDO >> CRe-X framework for developing community-based responses to various incident types. This would provide accredited, consensus based national standards that could highlight, and institutionalize, critical coordination that must occur across various disciplines and activities at the community.

Questions for Dr. Sue Cibulsky and Dr. Mark Kirk

7. Is hybrid decontamination, sometimes known as dry decontamination, effective for patient decontamination for toxidromes?

- Dry decontamination is effective for liquid contaminants. The recommended process is 10 seconds of blotting followed by 10 seconds of rubbing the same area with any available absorbent, preferably dry, material. Dry decontamination should be initiated immediately following clothing removal; it can be performed by patients themselves, if they are provided with proper instructions and decontamination materials, before specialized equipment is set up by emergency responders. Dry decontamination can improve the outcome of subsequent wet decontamination. However, for particulate contamination, dry decontamination is ineffective. In this case and for overtly caustic contaminants, wet decontamination should be administered. Access the [PRISM guidance documents](#) for more information.

8. Do fourth generation agents (FGAs) “age” to the oximes like older agents?

- No, FGAs do not age to oximes like older agents.

9. Are Ellman assay results useful for FGA exposure if the patient doesn't have a determined baseline on file?

- The two most severely affected patients in Salisbury had very low/non-existent cholinesterase levels. Even without knowing their baseline values, such low results can be a clue, along with other information, to guide clinical decisions.

10. Can you comment on possibly using scopolamine in the treatment as a neuroprotective?

- Like atropine, scopolamine is a competitive antagonist at muscarinic acetylcholine receptors, but scopolamine crosses the blood-brain barrier better than atropine. This suggests that scopolamine might protect the central nervous system from damage due to the excess acetylcholine in nerve agent exposure better than atropine. In the cases of the patients sickened

by FGAs in the UK, we cannot determine the contribution of scopolamine, since they were treated with many drugs concurrently. Some research suggests that scopolamine can reduce seizure activity and neuropathology after nerve agent exposure. However, parenteral scopolamine is not currently available in the U.S.

11. Are there dosing charts available for first responders for the nerve agent antidotes? What are the federal recommendations for dosing?

- Information is available on pages 12-15 of the [Fourth Generation Agent Medical Management Guidelines](#) and pages 230-232 of the [National Model EMS Clinical Guidelines](#).

12. If an FGA-affected individual dies before the agent is identified, what approaches should be taken by the medical investigator?

- Guidance on management of the deceased from a chemical incident is provided at the [CHEMM website](#). One of the specific recommendations is to establish a multidisciplinary evaluation team that includes members from law enforcement, hazardous materials (HAZMAT) teams, and other relevant agencies. Representatives of these agencies should be able to either directly advise or contact other agencies with the requisite expertise to advise the medical examiner/coroner on how to manage the deceased. Immediately upon suspicion of a potential nerve agent incident, the local FBI Weapons of Mass Destruction (WMD) Coordinator should be notified. National Guard WMD-Civil Support Teams (WMD-CSTs) also possess unique training and equipment to assist local and state responders and can be contacted through a state's Emergency Operations Center. In an FGA incident, medical examiner/coroner office personnel will need to carefully adhere to proper PPE use in order to protect themselves from exposure and prevent spread of the agent.

Questions for Dr. Susan Cibulsky, HHS ASPR

13. Can you expand on the depot effect?

- Absorption of FGAs through the skin can take longer than other chemical agents, which provides greater opportunity to reduce absorption by patient decontamination. In the cases of the first two patients in the UK, application of Reactive Skin Decontamination Lotion (RSDL) several days after exposure was able to draw some of the agent out of the skin. Beyond that, we are lacking data and this area needs further study.

14. How should runoff be treated?

- Decontamination runoff should be contained as soon as possible, while prioritizing lifesaving emergency operations. Once imminent threats to human health are addressed, responders should immediately take all reasonable efforts to contain the contamination and avoid or mitigate environmental consequences. Determinations on decontamination runoff (waste) characterization, management, and disposal requirements should be made with state and/or federal (EPA) regulatory agencies and will be done on a case by case basis. Responder and health care organizations are responsible for complying with all applicable local, state, and federal regulations. Local emergency planning committees (LEPC) may be able to assist organizations in their planning for managing decontamination runoff.

- If the number of patients grossly exceeds the ability to contain the wash water, the EPA will hold those providers harmless assuming that they could not reasonably plan to contain the volume of wash water and that the local and regional EPA agencies/authorities are immediately notified. It is generally preferable to have decontamination wash water go through the sanitary sewer system where it will be treated prior to release rather than storm sewers which usually drain directly into watersheds. However, in nearly all HAZMAT cases, the toxicity of the contaminant will be diluted by the wash water to a point where it poses little hazard.

Questions for Dr. Mark Kirk, US Department of Homeland Security

15. How did they decontaminate the patient in the ICU?

- Upon admission to the intensive care unit (ICU), the patients were given a standard ICU wash with soap and water, which may not have included their hair. But once a working diagnosis of potential organophosphorus poisoning was made with skin being a likely route of exposure, they were given an intensive hair and skin wash, I believe also with soap and water. Informed by analysis of alcohol swabs of the skin at a later stage, spot decontamination was performed with RSDL.

16. How was the FGA lab tested? FGA specifically or organophosphate generically? Human lab sample or environmental?

- Blood samples were analyzed and a specific fourth generation agent was identified by the UK's Defence Science and Technology Laboratory at Porton Down, near Salisbury. Subsequently, the same agent was identified in environmental samples. In the U.S., CDC's Laboratory Response Network-Chemical (LRN-C) is a national network of CDC, local, and state public health laboratories that responds to chemical terrorism and other public health emergencies. In a suspected chemical terrorism incident or other unusual chemical incident, the LRN process can be activated by contacting the local and/or state public health laboratory.

17. Were any staff who treated the patient (at first for a non-chemical agent) affected? What did they do when they found that it was a chemical agent that they were treating?

- Standard precautions protocols worked well, preventing cross-contamination. No indications of poisoning of medical responders or hospital staff were observed. Once the FGA was identified in the patients' blood samples, the staff took additional contact precautions and limited the number of staff in direct contact with the patients. The pre-existing arrangements for civil and military cooperation to provide scientific and clinical advice were activated. A clinical expert group held daily teleconferences with hospital staff and were available 24/7 to provide advice on patient care, staff protection, and other issues. The hospital and Public Health England established mechanisms to evaluate concerned citizens (members of the public, responders, and hospital staff). Public Health England set up a dedicated help (phone) line and conducted contact tracing. Lessons from those involved in the response include the importance of strong, consistent, timely, repeated risk communication with hospital staff.

Questions for Bruce Evans and Stephen Grant

18. Are there AARs available for review on either chlorine accidents?

- The AAR from the Graniteville Train Wreck:
https://ops.fhwa.dot.gov/publications/fhwahop08014/case9_7.htm
- The AAR from the Massive Leak of Liquefied Chlorine:
<https://www.usfa.fema.gov/downloads/pdf/publications/tr-052.pdf>
- The AAR from the Rocket Fuel Plant explosion:
<https://www.usfa.fema.gov/downloads/pdf/publications/tr-021.pdf>

19. How integrated before and now after your incidents is public health/medical and HAZMAT planning?

- The implementation of HCCs has added a new line of communication and planning. The Local Emergency Planning Committee (LEPC) is typically the authority having jurisdiction to do cooperative community planning for hazardous materials. An after-action report or post incident analysis should include all the participants including public health and hospitals. The Joint Commission requires a drill for accredited hospitals, and this is a good event to build these relationships and create plans.

Questions for Bruce Evans, Upper Pine River Fire (CO)

20. What meters are you referring to and do you have any recommendations for hospitals to use?

- Hospital use of chemical monitoring meters is not advised as the concentration is so much lower than at the release scene, so usual meters and techniques are invalid and likely to cause false positives and negatives. pH paper and Geiger counters are the two most helpful detection methodologies at the hospital level. There are some advances being made in molecular “sniffers” for a wide array of materials that may be helpful at the hospital level in the future, however the price points and limitations preclude their current use.
- Often the best practice (for example in southern Florida) is to send one fire department HAZMAT team to the site and the other to main receiving the hospital. That way, meters and additional decontamination equipment operated by trained people are available to for those that self-evacuated or arrived by private vehicle. Some patients do off gas and a one-off event In Riverside California on February 19, 1994 closed an emergency room and sickened the staff. The actual cause of the off gas of the patient was never fully identified.

21. What was the name and FEMA designation for the course you mentioned?

- There are several courses offered at the [National Emergency Training Center](#) in Emmitsburg, Maryland. Additionally, the [National Fire Academy](#) offers the [Advanced Life Support to Hazardous materials incidents](#) (R-247) course focused on toxicology and street chemistry, and the [Hazardous Material Operating Site Practices](#). Finally, the American Academy of Clinical Toxicology offers an [Advanced HAZMAT Life Support for Tox-Medics](#) course. This is a program that can be delivered locally and is eligible for grant funding from federal sources. The [Center for Domestic Preparedness](#) allows users to review courses based on discipline.

Questions for Dr. Stephen Grant, Lexington Medical Center (SC)

22. When victims arrived at the hospital, did you conduct any type of environmental monitoring to determine the level of respiratory protection/PPE, or did you default to the most stringent? What is the max level of respiratory protection your hospitals use?

- Initially, there was no PPE for the first wave of self-evacuated, non-decontaminated, and critically ill patients. Staff donned gloves/masks/and some gowned, but for the most part there was no PPE in place for providers in the ED.
- There is no accurate environmental monitoring for use at the first receiver level (hospital) as unlike the scene, the concentrations are generated by the victims (primarily their clothing). Making sure to cohort them in open air or well-ventilated environments is important, as is early clothing control. PPE selection should be based on the [OSHA First Receiver Guidance](#) when the agent is not able to be quantified (most cases). Filters for acid gas, organic vapor, and HEPA or designated “first receiver” filters with additional protections are appropriate when used as directed to care for living victims arriving from a release scene.

23. What clinical testing was performed by the laboratory?

- In our case, arterial blood gas with co-oximetry which helped to rule out carbon monoxide and methemoglobin-inducing agents.

24. In the Graniteville incident, was a county EOC established? If so, was a hospital liaison at the county EOC?

- Yes, a county command center was quickly established at the perimeter of the incident. It was later pulled back because of concerns of the chlorine cloud moving or an explosion of an unruptured chlorine car occurring. A larger command center was also established 2 blocks from the hospital. We never had an ED member at the EOC.

25. How was the movement of patients from the decontamination centers at Aiken Regional coordinated with the other receiving hospitals?

- Our hospital and the county alerted them about receiving multiple non-critical patients. Because of a 30-minute transit time, they were well prepared, and one hospital met the school bus full of patients with over 20 wheelchairs and oxygen set-ups.

26. Regarding paper charts, do you recommend physician documentation that is built just for a mass casualty incident? Our facility has paper charting in our ED (for downtimes), though it is a 4-page chart. Should a more simplistic form be considered/or already exist that could be referenced?

- A 4-page paper chart that you use during down-time sounds like a good start. You want your staff to be somewhat familiar with whatever you use, so they know where and how to enter information. Obviously, clipboards and some way to match each chart to each patient is essential. As far as getting a more simplistic system, I would favor using what you have in place for downtimes, because at least some of your staff would be familiar with it.
- Many hospitals use a single page chart for disasters. Some have different charts for critical patients and “walking wounded.”