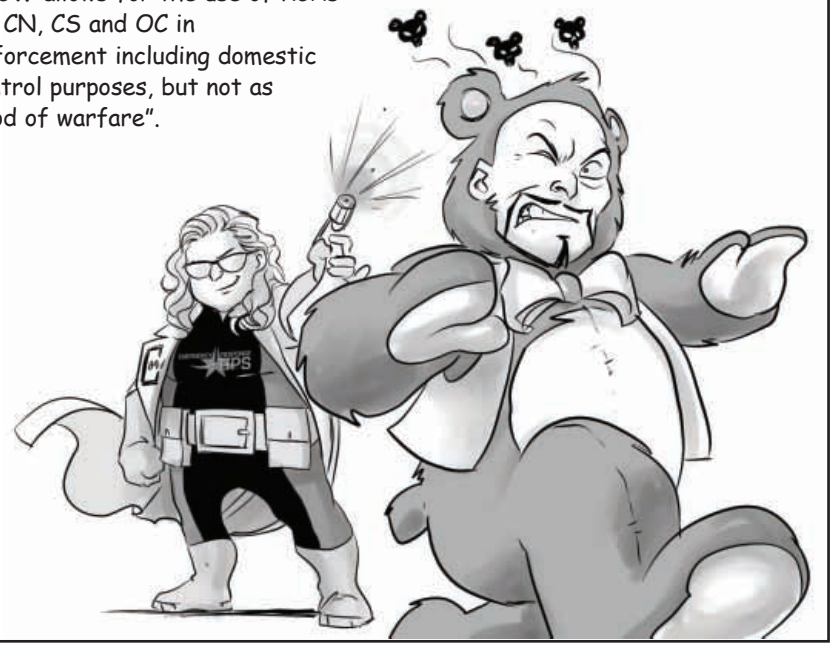
Dr Christina Baxter, of EmergencyResponseTIPS.com and Hazard3.com, offers helpful advice for first responders

Keeping you safe!

This column is intended to provide operational guidance to the hazmat/CBRNE community on the selection and performance of equipment and tactics. In this issue we are focussing on emergency response to riot control agents (RCAs).

RCAs are a class of incapacitating agents intended to disable a targeted individual or group by irritating the eyes, respiratory tract, and/or skin. RCAs are generally solids that are dispersed as aerosols. The Organisation for the Prohibition of Chemical Weapons (OPCW) has identified 17 RCAs. Of these the most common include chloroacetophenone (CN, Mace®), chlorobenzylidenemalonitrile (CS), and oleoresin capsicum (OC, pepper spray). More recently, the use of homemade pepper sprays and bear sprays have become prevalent during civil disturbances.

The OPCW allows for the use of RCAs such as CN, CS and OC in "law enforcement including domestic riot control purposes, but not as a method of warfare".



Toxicology

RCAs tend to be solids released as aerosols or as liquids. The primary threat to the public and emergency responders is respiratory, due to the inhalation of airborne particulates or droplets suspended in air. Symptoms of inhalation exposure include coughing, sneezing, wheezing and shortness of breath. Other symptoms include immediate irritation and pain to the eyes, mucous membranes and skin resulting in burning of mucous membranes, tearing eyes, blurred vision, runny nose, sore throat, and salivation among others.

Adamsite (DM) also induces vomiting. For most RCAs, the symptoms begin within seconds and dissipate after approximately 15 minutes in fresh air. For DM, symptoms begin approximately 30 minutes after exposure and continue for one or two hours after moving to fresh air. The irritancy thresholds for RCAs are generally in the microgram per cubic metre range whereas intolerable concentrations are in the milligram per cubic metre range.

Detection
Traditionally, RCAs have been hard to detect in operational environments when dispersed. RCAs in bulk containers are not difficult to identify. Bulk RCAs can be identified using such technologies as Raman, FTIR, or GCMS if the spectra are incorporated into the instrument libraries.

In the early 2000s, the Smiths Detection APD2000 was the go-to instrument for detecting dispersed pepper sprays; this product has since been discontinued. Today, the Proengin AP4C uses flame spectrophotometry to detect the presence of nitrogen-containing RCAs on its nitrogen channel and DM on both the arsenic and nitrogen channels. There are many colorimetric tubes which may exhibit cross-sensitivities to RCAs. Consider using the Emergency Response Decision Support System (ERDSS, aka Chemical Companion) to determine which tubes may be suitable.

If RCAs are dispersed, take wipe samples of hard surfaces where they are likely to be deposited and the highest concentrations should be obtained. Many factors affect the deposition concentration including distance from the release point.

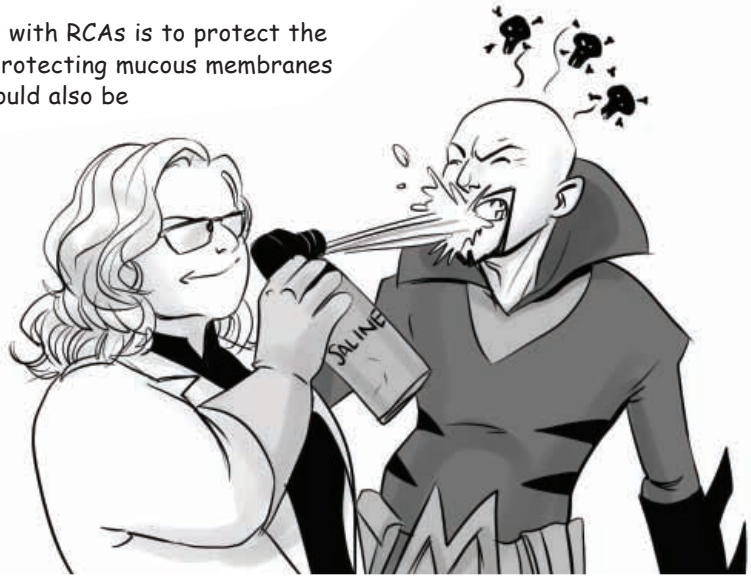
The wipe sample should then be rinsed with a solvent such as ethanol (or another high vapour pressure solvent) and the resultant sample presented to the analytical device (such as FTIR, GCMS, HPMS, etc.) for further analysis. Because there are generally low deposition concentrations resulting in low sample concentrations, sample presentation is a significant challenge for field deployable Raman instruments unless a pre-concentration step is available. Consider other techniques first unless you have access to surface enhanced Raman spectroscopy (SERS).

Protection
The protective clothing and accessories chosen should meet suitable standards and be selected with regard to the task, its duration, location, situation, hazard, and potential for contact. The minimum recommended respiratory protection for an operational response to events involving RCAs is a P100 (or FFP3) full face respirator. The chemical protective clothing required for RCAs is generally nitrile gloves and duty uniforms, preferably with full skin coverage. Operators investigating the source of the release might require a higher level of protection when sampling and mitigating the threat. In these instances, consider a particulate tight ensemble as a minimum (in the US, NFPA 1994 Class 4).

Keeping you safe!

Decontamination

The single most important factor when dealing with RCAs is to protect the respiratory tract. This is closely followed by protecting mucous membranes such as the eyes, nose and mouth. The skin should also be protected and opportunities for contact with RCAs minimised. If contamination of eyes and mucous membranes is suspected, they should be flushed immediately with copious amounts of saline solution or water. Topical ophthalmologic anaesthetic drops may be required to facilitate irrigation.



Areas of skin in direct contact with any RCAs should be washed immediately with soap (detergent) and water. Apply soap to the skin using a sponge or wash cloth with minimal pressure, rinse the body with clean water using a low-pressure application, and wipe all body surfaces until they are dry using a towel.

For frontline domestic riot control personnel, the development of an emergency decon kit for personal use is warranted. In this case, emergency decontamination kits can be employed using a highly absorbent wipe and a bottle of saline solution (or water). There is anecdotal evidence that a canister of 'canned oxygen' may be helpful for fast recovery from an RCA inhalation.

It is important to note that OC and many of the homemade pepper sprays are not readily water soluble and soap may be needed to assist in removal. Remember, for a safe and effective response to events involving RCAs:

- Minimise opportunities for unexpected exposures by wearing the appropriate respiratory and dermal protection.
- Ensure appropriate field expedient decontamination is available and minimise exposure by flushing mucous membranes or washing skin as soon as practicable after exposure.
- Detect, and if possible, identify the RCA used.

Until next time,

CBax away!

Images are courtesy of Phil Buckenham
https://philbuckenhamart.wixsite.com/philbuckenham