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

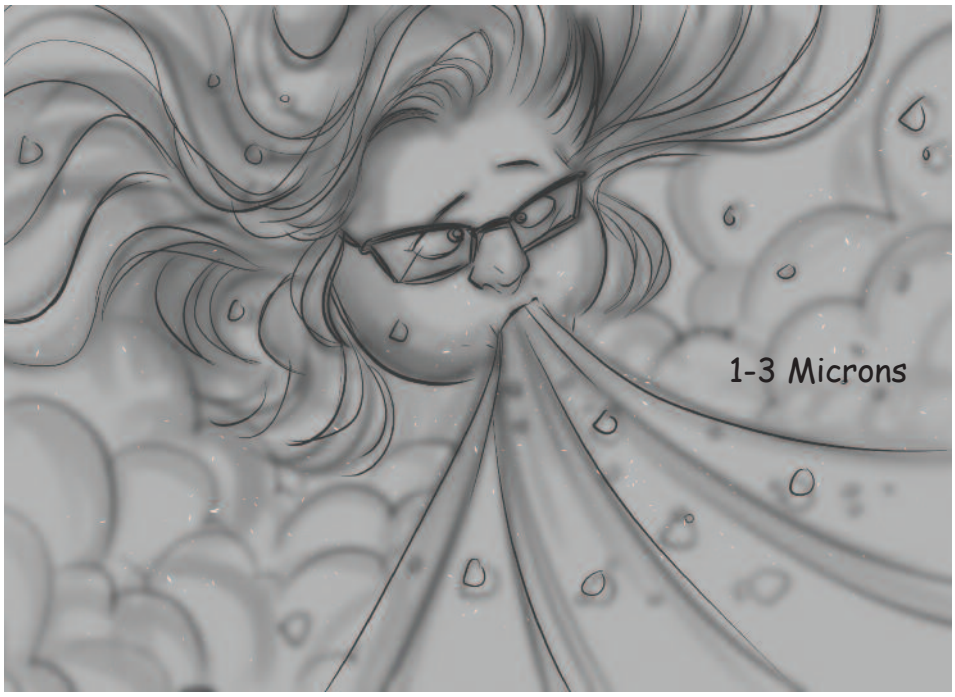
Keeping you safe!

This column is intended to provide operational guidance to the hazmat/CBRNE community regarding the selection and performance of equipment and tactics. This time we are focussing on emergency response to pharmaceutical based agents (PBAs).

PBAs are a class of incapacitating agents; they have licit purposes in the medical community but can be used for illicit purposes as weapons to cause incapacitation, injury or death. Drugs intended for pain management or anaesthesia are common, with those designed for deep sedation or anaesthesia being the most problematic. Opioids, belladonna alkaloids, and benzodiazepines are all examples of materials which can be used as PBAs. The most widely known case of PBAs being used offensively occurred on 23 October 2002 when Russian Special Forces employed an aerosolised mixture of carfentanil and reminfentanil via a theatre's ventilation system, resulting in the deaths of at least 170 people.

Toxicology

PBAs tend to be solids or liquids that are released as aerosols. The primary threat to the public and emergency responders is respiratory due to the inhalation of airborne particulates or droplets suspended in air. Many PBAs tend to be small (1-3 microns) and can therefore stay lofted in air for several hours without external influence (open windows, air conditioning, etc). Many also have electrostatic characteristics which allow small volumes to become airborne naturally. Deposited particulates are readily resuspended in air from clothing and surfaces. Like many organic compounds, most PBAs decompose at elevated temperatures (greater than 350°C) therefore they do not pose significant vapour phase threats.



While inhalation is the predominant route of exposure to concern emergency responders, ingestion and dermal absorption routes should not be ignored. These routes of entry must be protected to minimise or eliminate the sources of exposure. Early signs of exposure will likely be depressed respiration and lethargy.

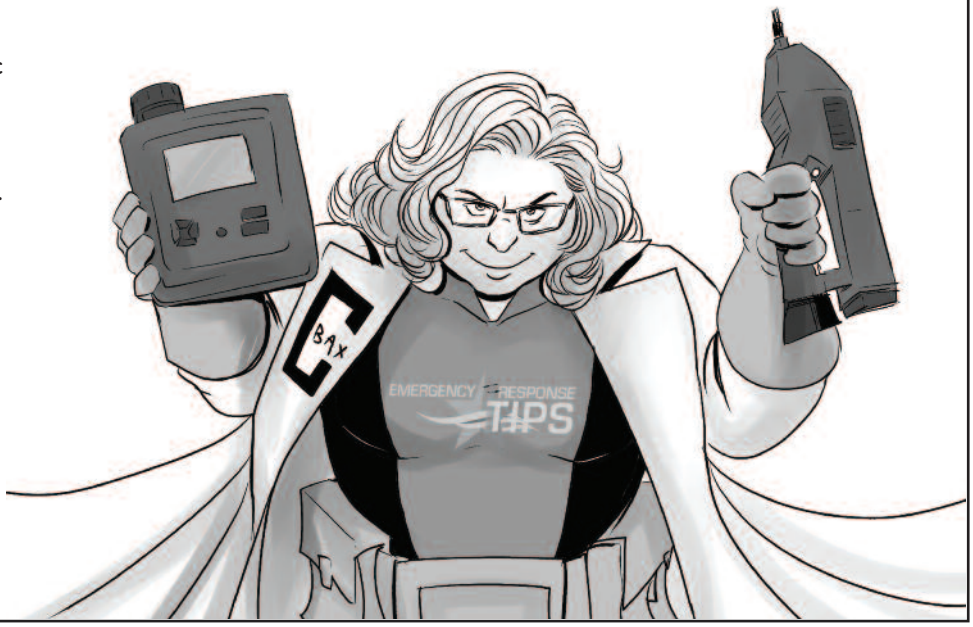
Detection

Field detection is divided into two categories – trace detection for detect-to-warn and detect-to-protect applications and bulk detection for identification and threat confirmation. Detect-to-warn and detect-to-protect technologies should offer continuous sampling, fast responses (seconds), and simple to use devices, while the detect-to-identify technologies at both trace and bulk levels can utilise batch sampling, slower response times (minutes), and more complicated interfaces.

Trace detection and estimated quantification of the PBAs at levels of toxicological interest (nanograms) can be accomplished via various techniques including flame spectrophotometry using the Proengin AP4C instrument. Many PBAs contain nitrogen (exceptions include propofol and sevoflurane) and both airborne and solid/liquid samples can be detected on the AP4C nitrogen channel.

Unique identification at trace levels can be accomplished using high pressure mass spectrometry such as the MX908.

Bulk technologies such as Raman, FTIR, and colorimetric can be used for confirmation and identification of larger sample volumes ranging from high micrograms to milligrams. Trace technologies such as gas chromatography mass spectrometry can be used to identify at trace levels but at the cost of speed of analysis, which takes many minutes. When selecting detection systems relying on inbuilt libraries to aid identification, it is important to ensure that the library includes a broad range of relevant PBAs.



Protection

The protective clothing and accessories chosen should meet suitable standards (NFPA 1994 in the US) and should be selected considering the task, its duration, location, situation, hazard and potential for contact. The minimum recommended respiratory protection for an operational response to events involving PBAs is a P100 (or FFP3) full-face respirator when up to one gram of visible product is evident and upgrading to self-contained breathing apparatus at larger amounts or high purities. The chemical protective clothing required for PBAs is generally nitrile gloves and duty uniforms at the low levels (grams) and particle tight ensembles at larger amounts or when intentionally aerosolised.

Keeping you safe!

Decontamination

The single most important factor when dealing with PBAs 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 PBAs minimised. If contamination of the eyes and mucous membranes is suspected, they should be flushed immediately with copious amounts of saline solution or water to minimise the dose.

Areas of direct skin contact with any PBAs should be immediately washed with soap and water. Apply a skin safe, low pH soap to the skin surface using a sponge or wash cloth using 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.

If an expedient decontamination method is not available, an emergency decontamination procedure can be employed using a non alcohol based, low pH wipe to remove as much potential contamination as possible.

To enhance your readiness to manage incidents involving threats from PBAs it is essential to engage with your security, public health, and police agencies to identify the likely PBA threats. This information ensures your agency and allied responder approaches and training are contemporary and appropriate for your operational context.

Remember, a safe and effective response to events involving PBAs includes:

- Detecting, and if possible, identifying the PBA or agent used.
- Minimising opportunities to generate airborne particulates.
- Minimising opportunities for unexpected exposures.
- Wearing the appropriate respiratory and dermal protection.
- Ensuring appropriate field expedient decontamination is available and minimising exposure by flushing mucous membranes or washing skin as soon as practical following exposure.

Until next time,

CBax away!

Images are courtesy of Phil Buckenham
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