

Rick Whitman, Radiation Safety Officer at US Customs, outlines the main CBRNe threats facing first responders



## Learning from the past

CBRNe topics are the source for many training scenarios for first responder and for specialty teams in our time. Training often takes on a single topic at a time, however. A review of historical events can provide insight into taking on and surviving a multiple hazard. In our time the single topic event will be rare and the multi-hazard event commonplace. But first, a primer on the single topics.

Chemical items are most often in liquid form. Some, when dried or crystallised become less stable. High instability can result in varying degrees of explosive material if conditions are appropriate. Chemical items often present fume hazards either alone or as they mix with surroundings if released. The rise of many organic items and the transport in quantity in tanker trucks, sailing vessels or railroad cars can make for a large event, especially for the railroad and highway routes which are often in or adjacent to large cities.

Biological items can exist in normal air conditions (aerobes) or where there is no air (anaerobes). Some, such as anthrax, can be dried or even frozen and return to "life" when conditions become favourable. Some can infect humans directly; some, like malaria, work through secondary hosts, but the emerging fear is for a transgenic outbreak, such as avian influenza. The difficulty with biological items is that biological agents vary dramatically in how quickly they spread and how acute the effect may be; as an example, compare the results of a common cold to Ebola.

Radioactive items, also called isotopes, have existed in any real concentration for just over 100 years. Most often these are in a "sealed source" condition, but medical isotopic material

is typically in a liquid state. Isotopes have characteristic energy and decay time, called a half life, making it possible to identify most commodities fairly quickly. Radioactive items continue to decay regardless of temperature, weather or most other factors. Isotopes cannot be burned or destroyed.

Another kind of radiation is found at fixed locations in hospitals, industry and even with bomb squads. This radiation is generated from X-rays and includes other systems such as fluoroscopes, Cathode Axial Tomography and even baggage type systems. The energy comes from electricity and when turned off the radiation ceases.

Explosives, unlike media portrayals, require initiation, most often by a blasting cap, in order to cause a detonation.

### Mixing it up

And now some scenarios relevant to mixed hazard. If a commercial company took delivery of transmission fluid and a forklift with this material collided in a warehouse with swimming pool bleach, a spontaneous fire could result leading to the liberation of chlorine gas. If nearby weather conditions included dense fog with no wind, the effects of the chlorine gas release could be magnified.

A fire at a research laboratory presents a special case. Often large quantities of organic materials are present and typically compressed gas, such as oxygen, is present. If the laboratory contains frozen tissue samples containing a biological agent, cutting power to the building could be a first step to losing control of that agent. The downwind hazard, water from the fire scene and the residue in the building afterward may all present a hazard.

In another currently debated topic, a vehicle delivering liquid radiation isotopes is on scene and becomes either an intended or even unintended victim of a bomb explosion. In some scenarios, washing down streets is recommended; however, if the isotope is the most common medical commodity (Technetium-99m) taping off an area for less than two days should solve the problem. If it were another item, spraying buildings and streets could lead to other difficulties.

Recent discussions among the Homeland Security Panel of the Health Physics Society ended with an unexpected recommendation. Adverse information is often released or announced on television and radio by a Mayor or other authority, but his may be less appropriate than the local meteorologist. The public trusts weather announcers.

### Recommendations for trainers

Always re-examine on-scene information, as conditions may change during an incident.

Gain contact with the owner/operators of facilities early during a response.

Train inspectors should insist on appropriate signage, storage, updated inventory, segregation of materials, security and accountability.

First responders should be trained to look for a Dangerous Goods Declaration. Water on many chemical fires spreads the problem without extinguishing the fire.

Plan to take samples of the air, water, etc. during an event.

Record all the information available and take digital photographs.

Seek the involvement of public health experts if biological or harmful fumes are released.

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