Hospitals, Hazmat teams, and fire departments have been trying to develop mass decontamination procedures and to specify equipment required to manage a major chemical, biological, or radioactive accident. However, considering that the US Army Soldier and Biological Chemical Command (SBC-COM) has developed guidelines for handling mass decontamination of victims, the question is whether these agencies (and others) are wasting valuable time, effort, and resources preparing for a mass decontamination.

Let’s take a look at three incidents of chemical leaks and the decontamination efforts that followed.

During the night of December 2, 1984, 40 tons of methyl isocyanide and hydrogen cyanide were released from the Union Carbide plant in Bhopal, India. The resulting deadly gas spread over an area of approximately 25 square miles and hung close to the ground for about four hours. It is estimated that more than 500,000 people were exposed to the gas. Approximately 6,000 died the first week after the release of the gas, with most dying in the first few hours. In the years since, more than 16,000 additional people have died from causes that have been directly attributed to the deadly gases. To this day, rumor still circulates that the release was a result of sabotage.

This incident provided a rude awakening for emergency services on the importance of preparing for a major accident involving a chemical plant. In this case, few people received medical attention during the early hours and days of the accident. Those who did make it to one of the hospitals in the region were still contaminated by traces of the gas left on their clothing and skin. Furthermore, no one was evacuated even though warning signs were evident for more than an hour prior to the release of the gas.

Three years later, on September 13, 1987, workers dismantled a cancer clinic in Goiania, Brazil. Scavengers going through the clinic found a radiotherapy assembly that still had a source containing cesium-137. They took the assembly to the home of one of the men and ruptured the unit in such a manner that fragments of it were spread over the adjacent areas, including a plot of land shared by several families living in a housing development.

The next day, they sold the assembly to a junkman, who placed it in his backyard. When he noticed that the object emitted some form of luminescence, he brought it into his house to show to family, friends, and neighbors. Later the assembly was taken back to the dump, broken into pieces, and distributed among various individuals. The assembly was left at the junkyard until September 28, while the ruptured capsule was sent to a second junkyard, where other men tried to break it open with a power saw.

Since symptoms associated with radiation exposure are slow to develop—they usually don’t become evident until hours or days after the exposure—the victims of the radiation exposure were not immediately diagnosed, but once they reported their symptoms, and information about the radioactive material release became common knowledge, the area hospitals were overwhelmed, not only with people who were truly exposed but also with those who were not exposed but feared they had been contaminated (leading to the term, “the worried well”). So great was the overflow that a nearby soccer stadium was used to assemble everyone seeking medical attention. In all, 112,800 people were evaluated for radiation contamination or exposure. Of this number, only 120 had contamination on their clothing or shoes.

In this incident, which sounds like something
from a Robin Cook novel, more than 250 people were exposed to the cesium, 28 people showed signs of radiation sickness, and 104 more had internal contamination.

During the morning rush hour on March 20, 1995, members belonging to the Aum Shinrikyo cult hid a liquefied version of sarin, an organophosphate nerve gas, on five different trains in the Tokyo subway system. They hid the liquid in soft drink containers, thermoses, lunch pails, and plastic bags wrapped inside newspapers. Each bag was placed on the floor of the subway car and then punctured by the cult members with a sharpened umbrella tip, so that the material spilled onto the floor of the subway car. As the liquid spread out and evaporated, the vaporous agent spread through the crowded subway cars and the train stations. More than 5,500 commuters were injured in the attack either directly from the sarin or as a result of the ensuing panic. Of that number, nearly 1,000 required hospitalization, and 12 people died.

Tokyo hospitals were initially informed by the fire department that they were about to receive a number of victims from a gas explosion in the subway. More than 131 ambulances and 1,364 emergency medical personnel were eventually dispatched. At least 641 victims (some were decontaminated, others were not) were transported to hospitals by emergency medical and fire department authorities. More than 4,000 people found their own way to area hospitals. A lack of emergency decontamination facilities, poor to nonexistent decontamination protocols, and insufficient personal protective equipment all resulted in secondary exposure of 110 hospital staff and 135 EMTs and paramedics.

In all three of these horrific events, the number of victims was extremely high—higher in fact than what most hospitals and communities ever envision in their planning processes. Hospitals and communities must plan for decontaminating not just small numbers of victims but very large numbers as well. SBCCOM guidelines indicate that, during a terrorist event, a community should expect to decontaminate five noncontaminated victims for every one who truly requires decontamination.

Once victims arrive at the medical facility, there will be no easy way (unless radioactive materials are involved) to determine who has been contaminated, and who is just one of the worried well. The hospital must be able to decontaminate all the victims so as to provide for their peace of mind and limit the hospital’s liability.

Once a hospital accepts the responsibility of being able to decontaminate a large number of victims, the next issue is to determine the rate at which decontamination can be performed and the required resources to sustain that rate. If a hospital has four shower stations and is capable of decontaminating one victim every five minutes per shower station, the hospital's rate of decontamination is 48 victims per hour. Even if St. Luke’s International Hospital in Tokyo could have sustained a rate of 48 victims per hour, it would have had to sustain that rate for 15 hours to decontaminate the 688 victims it received.

There are major drawbacks to decontaminating for 15 hours. Exposed victims cannot wait 15 hours to be decontaminated; they may succumb to exposure to the chemical. Furthermore, people waiting to be decontaminated will eventually become unruly. The unrest could escalate into mob violence, and the last thing needed at this juncture is a riot. Finally, the longer people remain contaminated, the greater the risk of exposing uncontaminated people. Hospital staff and emergency responders are not equipped—nor are there sufficient numbers of them—to sustain decontamination operations for 15 hours. More rapid decontamination is necessary.

Hospitals are moving in the direction of setting up portable decontamination facilities outside their emergency departments. Setting up these facilities requires additional human resources and time. Even if the hospital begins setting up as soon as an emergency occurs, the set-up will not be finished before the first victim shows up. If decontamination facilities are not available when the patient arrives at the hospital, that patient is going to find a way to get into the emergency department and get the care they think they need. Holding a number of patients outside the emergency department while staff members are setting up tents, laying hoses, and getting dressed in
level B protective suits will undoubtedly scare many patients. They may think, “If the hospital staff needs protection, what is this stuff doing to me?” This is another opportunity for mass hysteria or a riot.

The SBCCOM solution to mass decontamination is to park two fire trucks about 15 feet apart in opposite directions with the officer’s side facing the other unit, thus forming a corridor. Setting up this corridor requires only auxiliary units and minimal staff; utilization of front line apparatus and multiple crews is unnecessary. These trucks can be set up in less than ten minutes and already have the crews in place to provide assistance. The biggest problem associated with this set-up is the time needed for the units to respond from their station to the scene (or hospital). The benefit is that this does not take any special apparatus or crew—only the typical engine company found at your neighborhood firehouse.

The discharges are then uncapped and large volume nozzles placed on the discharges. Water pressure to the nozzles and elevated water distribution device should be kept at hydrant pressure (60 psi). If a nozzle, squirt, or deck gun is available on one of the trucks, it should be used with low pressure to spray water from its elevated position.

Once the victims have been directed towards the corridor, they will be instructed to disrobe near the front of the fire truck, put their clothes in garbage bags, and write their names on the bags. The unclothed victims will be directed to walk slowly through the corridor, being sprayed from every direction. They will be told to raise their arms and spread their legs, in order to have the entire surface of their bodies washed. Once they reach the middle of the corridor, they will be instructed to turn around to ensure that the water flow has had a chance to rinse off their entire body surface. At this point, gentle rubbing would be encouraged.

After the victims have moved through the corridor, they should be provided paper gowns or Tyvek paper suits for the purposes of modesty and some protection from the elements. They will then be evaluated to determine if additional medical treatment is necessary.

The SBCCOM method would remove the most contamination from the greatest number of victims in the shortest period of time, while using the least amount of resources. Although it will not completely decontaminate every victim (neither do “traditional” methods), it would make most victims clean enough for hospital staff to evaluate them more thoroughly. If a second decontamination is necessary, the more traditional decon methods can be employed.

The information and guidelines provided by SBCCOM are available because the federal government set aside Nunn-Lugar funds to enhance the capabilities of local responders to terrorist threats. SBCCOM was assigned the task of developing an Improved Response Program (IRP) for emergency responders. Under this program, SBCCOM studied emergency management guidelines and then recommended actions to be taken in response to a terrorist attack.

Cities such as Houston, Philadelphia, Virginia Beach, VA, and Washington, DC, have made these recommendations part of their WMD decontamination strategy. Other communities need to consider their strategy in light of the SBCCOM guidance. Wasting valuable resources on tent systems, portable showers, and personnel expenditures seems foolish when the SBCCOM system is an acceptable option.

The SBCCOM Homeland Defense Unit was redesignated in October 2003 and is now part of the RDECOM (Research, Development, and Engineering Command, www.rdecom.army.mil). The work described in this story was originally done by the US Army Edgewood Chemical Biological Center (www.ecbc.army.mil/index.html).

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