



Blue Ridge Poison Center's

Tox Talks

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Detection of Hazardous Materials in the Emergency Department

DOES YOUR FACILITY HAVE TELEMEDICINE?

The Blue Ridge Poison Control Center offers CME-accredited toxicology lectures through telemedicine. To request a topic, schedule a lecture for your staff, or more information contact Heather Collier: 434-924-5185 or HLC8E@virginia.edu.

THE UVA CENTER OF CLINICAL TOXICOLOGY associated with the Blue Ridge Poison Center manages over 500 patients each year on site in the University of Virginia Health System - from outpatient clinic visits to critically ill inpatients managed in our pediatric and adult intensive care units. In addition, over 2,000 requests are made each year for consultation with our physicians from other healthcare facilities by phone or telemedicine. Our Boarded Medical Toxicologists are internationally known for the expertise in the care of poisoned patients. Call 1-800-222-1222 24 hours a day, every day. [Cell users: 1-800-451-1428]

<http://www.healthsystem.virginia.edu/internet/medtox/cct/ccthome.cfm>

IN CHARLOTTESVILLE

Reminder: At University of Virginia Hospital, the first Wednesday of every month features toxicology Grand Rounds. For more information, contact Heather Collier: 434-924-5185 or HLC8E@virginia.edu

On August 30, 2008, eight people were hospitalized after being exposed to nitroaniline when a drum ruptured at a St. Louis, MO worksite. To make matters worse, two St. Louis hospitals were closed until officials were convinced the chemical was cleaned up in the facilities. Since the author does not have the details of the event that occurred in St. Louis, the remainder of this discussion is to emphasize toxicologic principles that may help EMS and ED recognize this condition and protect them from harm. It is not meant to be critical of the actions of EMS or ED staff. (We get enough armchair quarterbacking of our own actions!)

Nitroaniline oxidizes hemoglobin turning the protein blue instead of its usual oxygenated red color. In this state it cannot carry oxygen and is known as methemoglobinemia. It can enter the body through inhalation or skin exposure. The clinical effects can be delayed several hours from exposure. In addition to the blue (cyanotic) appearance of the skin, the oxygen sensitive brain and heart are most likely to exhibit clinical effects. This condition can be life-threatening. An important clue to its diagnosis is the lack of response to oxygen. It can be diagnosed at the bedside by recognizing a methemoglobin inducer (aniline dyes are well known to cause this condition), recognizing the toxic syndrome, and measuring an elevated methemoglobin level on co-oximetry. An antidote, methylene blue, is indicated for symptomatic patients. Once methemoglobinemia is recognized, the Regional Poison Center is available to assist with determining indications and dosage for this antidote.

Preparedness training places much emphasis on proper personal protective equipment, specific decontamination procedures and extraordinary detection equipment. Although these principles are important, it is our belief that **the single most important aspect of protection is teaching the staff to recognize situations and symptoms complexes that are likely to be**

related to chemical exposure.

Plans cannot be activated nor any ACTIONS taken unless a high risk situation is recognized. In Tokyo, following the sarin attack in the subway, the first patient to arrive walked into the ED. Over the next hour, 500 additional patients arrived by various means. For the first few hours after the event, staff did not recognize that the situation could be from a toxic chemical exposure and did not recognize the specific toxic syndrome caused by nerve agents. Because they were unaware, patients were escorted into the hospital fully clothed. A few of the staff experienced symptoms of mild nerve agent vapor exposure while caring for these patients. **RECOGNITION is CRITICAL.**

Looking for CLUES

Contamination may go unrecognized because multiple traumatic injuries, sudden unconsciousness, or unexplained cardiac arrest of victims may distract health care workers. In patients ingesting toxic substances, off-gassing of vapors from the GI tract or vomitus may harm health care workers. The true risk to health care providers exposed to hazardous chemicals is difficult to estimate because no procedure or instrument is available to rapidly and reliably detect chemical contamination on patients. Therefore, prehospital and ED personnel must be alert for high-risk situation. Triage personnel, in particular, should be trained to recognize high-risk situations for chemical contamination of patients. Nearly all ED evacuations/closures have been related to lack of early recognition and high levels of concern about the potential for secondary contamination, and not the lack of a written protocol or dedicated decontamination equipment.

Examples of situations that should raise the suspicion of a chemical exposure:

- Industrial accidents, fires or explosions
- Transportation accidents
- Agricultural accidents
- Clandestine drug laboratory accidents
- Sudden onset of illness in large groups of people from crowded areas (Especially government, political or religious places)
- Victims noticing chemical odor or vapor cloud
- Victims exhibiting signs and symptoms of specific toxic syndromes (such as methemoglobinemia)

Many chemicals can be grouped by their similar constellation of signs and symptoms that they produce in poisoned victims. Patients exhibiting these constellations of clinical effects (**Toxic Syndromes**) should alert staff to a possible hazardous chemical exposure.

The basic observations needed to identify toxic syndromes are:

- Vital Signs
- Mental status
- Pupil size
- Mucous Membrane irritation
- Lung exam for wheezes or rales
- Skin for burns, moisture and color

At this point, recognizing a toxic syndrome serves as a detection tool or early alert system for recognizing a potential hazardous chemical exposure. Recognizing these syndromes should lead staff to take protective actions. A physician assisting victims in the Tokyo sarin subway attack was quoted as saying: “We suspected the victims’ illness was some form of Organophosphate (Pesticide) agent exposure. We were puzzled as to

why it had happened in the subway” He recognized the syndrome and empiric treatment followed.

Detection Devices

Various monitoring methods are available such as vapor detection, analysis of liquid droplet on surfaces, laboratory based detection technology, and biomonitoring (e.g., cholinesterase activity).

The purpose of a chemical detection device is to alert staff to a potentially dangerous environment so they may take action such as donning PPE. In addition, detection devices could be used to determine if patients are contaminated or if decontamination procedures have been effective. Also, they could detect an attack on a facility. The ideal detection devices would be quick and easy to use, give rapid feedback, provide sensitive and accurate (few false alarms) data, and be cheap. Unfortunately, a detection device that could perform the above tasks and have the ideal qualities does not exist. Currently, chemical detection devices are expensive, require extensive training, and require maintenance and calibration. The most serious downside to chemical detection equipment is the false sense of security they create. If low level contamination is not detected by the sensor, the patient or environment may be assumed to be “clean.” On the other hand, sensors that cause many false alarms will initially scare everyone and then will likely be ignored after several alarms. To be effective, detection equipment must have continuous monitoring or a TRIGGER to begin using detection devices. The best detection devices for hospitals are a trained staff’s eyes, keen sense of awareness and use of common sense. Current recommendations are to use money and staff training time for teaching hazards recognition instead of purchasing chemical detection devices.

Use the Regional Poison Center as an information resource during a chemical emergency

In an emergency, the most immediately accessible and reliable resource for human health effects and up-to-date treatment for chemical exposure is the Blue Ridge Poison Center; a 24-hour per day, seven days per week resource. Our highly trained medical staff can offer advice on expected health effects, first-aid procedures and specialized medical treatment for any chemical emergencies. The reference resources are numerous and the experience of the staff regarding human poisonings is vast. In addition, the Blue Ridge Poison Center is part of the Center for Clinical Toxicology at the University of Virginia. The Center is directed by medical toxicologists that are immediately available for consultation in an emergency. Their role is to provide treatment recommendations to local treating physicians and provide a specialized bedside treatment service at the University of Virginia Health System.

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