



The Journal of the American Ambulance Association

May/June, 1989 Vol. 9, No. 3

## Chemical Accidents and Emergency Care: Health Consequences for the Paramedic

By Anna Law, M.D. and Gerald T. Lionelli

Emergency care workers confronted with a chemically related incident must often act quickly, with little or no information as to the toxicity of the substances involved. Although precautions are generally followed to avoid acute, life-threatening exposures to concentrated fumes or vapors, evidence is gathering that repeated chemical exposures at quite low levels may also have adverse health effects. Consequently, it is important that EMTs (as well as EMS providers) recognize the symptoms of low-level contamination and the methods by which it may be treated or prevented.

According to a Department of Labor spokesman, more than 550,000 chemicals are in current use. Many are specifically designed to resist decomposition by heat, abrasion, or chemical reaction, and cannot be easily metabolized to the point of excretion by the body. A number are fat-soluble and tend to lodge in the adipose (fatty) tissues of the body, a process known as bio-accumulation. Exercise, stress, fatigue, illness, or normal metabolic processes routinely cause these compounds to be released from adipose tissues into the blood, resulting in contamination of body organs and organ systems. (Drug residues also store in fat, and their release may trigger the phenomenon of "flashback", or reactivation of the drug.)

### PRECAUTIONS

Safety experts have suggested a number of guidelines which emergency rescue personnel may follow to reduce the likelihood of occupational exposures, among them:

1. As a general rule, some type of protective gear should always be worn. When there is any doubt about a substance, the most complete protection available should be employed. Remember that at fire sites toxic gases can be present long after the smoke has cleared. Gases created by burning synthetic furnishings include hydrogen chloride, hydrogen cyanide, carbon monoxide, and acolin, all of which are harmful, and some of which are fatal. Sight and smell are not adequate methods of detecting their presence, and must never be relied upon.

2. Protecting the respiratory tract is a primary consideration. Inhalation provides toxic materials with a direct path to the bloodstream and body organs and systems. Serious contamination may occur immediately. Respirators should not be removed until the risk of airborne contamination is eliminated. This means that respirators should not be removed until the worker is safely away from the contaminated zone (in the "safe zone") and his protective outerwear has been removed and containerized. As always, check the wind direction before removing respirators.

3. Remove contaminated clothing. It is *not* advisable to bring such clothing home for cleaning. (This has been discovered to be a primary route by which occupationally encountered toxic materials enter the home.)

Leather cannot be fully decontaminated—boots, once saturated, will continue to expose the wearer even after they have been washed and dried.

4. Eating, smoking, and drinking at emergency sites provide additional routes through which toxins may enter the body

5. If dermal exposure does occur (especially to tissues around the eyes, mouth, or genitalia), it is important to rapidly wash and decontaminate before skin penetration takes place. Soap and water are usually effective for this purpose.

6. If contaminated garments are not removed from a person being sent to a hospital, the likelihood of skin and respiratory absorption is increased not only for the patient, but also for those treating him. Decontamination should take place as soon as possible following exposure.

7. If the patient must be transported while wearing contaminated clothing, the driver and other medical staff should be protected against toxic vapors and dermal exposure.

### **SYMPTOMS OF TOXIC BIO-ACCUMULATION**

Despite routine precautions, it is possible that, over time, low level exposures will occur, with a resultant accumulation of toxic compounds in adipose tissue. Among the most common symptoms of toxic bioaccumulation are fatigue, headaches, muscle and joint pain, nervousness, memory loss, impaired coordination, gastrointestinal discomfort, insomnia, and diminished cognitive function. Chemically exposed persons often exhibit these symptoms in "clusters".

A study reported at the 1988 meeting of the American Public Health Association addressed the neurological damage experienced by firefighters exposed to hazardous chemicals (PCBs and their thermal byproducts) at a transformer fire. A team of researchers led by Dr. Kaye Kilburn of USC's Environmental Sciences Laboratory discovered that both the exposed firefighters and a control group of firefighters not present at the fire manifested neurological deficits. This strongly suggests the possibility of a gradual build-up in the body of harmful compounds. "It is interesting to speculate that the continuing neuropathy observed may, in some cases, be due to the persistence of these compounds in the adipose tissue", the researchers noted.

Kilburn and his associate Dr. Megan Shields, a Los Angeles physician, found that a detoxification method developed in the 1970's by L. Ron Hubbard enabled them to alleviate some of the adverse health effects they had observed. In the last decade, the

Hubbard method has become the only method of human detoxification in broad clinical use. Reports published by the Royal Swedish Academy of Sciences, the World Health Organization's International Agency for Research on Cancer, and others, have shown it to be a safe and effective method of reducing body levels of common environmental contaminants and alleviating the symptoms associated with exposure to them.

The program is administered under medical supervision and employs a regimen of exercise, vitamins (including niacin), and low-heat sauna to mobilize stored toxins and facilitate their excretion through normal body channels. Physicians in the U.S. have treated nearly two thousand persons manifesting signs and symptoms of chemical exposure with this methodology.

Dr. David E. Root, a specialist in occupational medicine in Sacramento, specializes in treating chemical exposures. "Many approaches have been used to address this problem," he observes. "These methods do not, however significantly reduce body burdens, he adds, "which requires an enhanced mobilization of toxic fats into circulation, followed immediately by forced excretion. It is this sequence and the manner in which it is accomplished which makes the Hubbard method so effective."

Research relating to the health consequences of chemical exposure is ongoing. There is strong evidence that the combination of adequate protection from routine exposures and treatment measures such as detoxification will greatly reduce the likelihood that emergency healthcare workers will face chemical barriers to good health and professional success.

Anna C. Law, M.D., FA.C.E.P., is currently the Medical Director of the Emergency Department and the Paramedic Liaison Physician at Queen of Angels Hospital in Los Angeles.

Gerald T. Lionelli, M.S., is a project manager for the Naval Energy and Environmental Support Activity (NEESA), where he is developing a Navy-wide Risk Assessment program.