Advice & Counsel

Frank Altmayer, MSF, AESF Fellow
AESF Technical Education Director
Scientific Control Labs, Inc.
3158 Kolin Ave.
Chicago, IL 60623-4889
E-mail: faltmayer@sclweb.com

Cyanide Safety – Part III: Emergency Response *(Continued)*

We began this series by discussing the high toxicity of cyanide and mentioned the primary routes of entry and health effects of cyanide exposure. In the second part, we expanded on the subject and covered worker exposure issues. This month we conclude this three-part series by finishing our discussion of emergency response and covering basic first aid.

In case of a spill

Spills need to be evaluated for size. A spill of a few gallons that is isolated and has not had a chance to mix with anything else presents limited risk of overexposure and may be cleaned up by trained personnel upon notification. This may involve the use of a bucket and mop that is used only for such spills and is cleaned after each and every use (including a final soak in a dilute solution of water and sodium hypochlorite in a ventilated area). You may prefer to use solid absorbent such as sand or proprietary materials. In any case, the spill/absorbent needs to be disposed of as a hazardous waste or treated for cyanide destruction.

In most facilities, it is the Emergency Coordinator's job to decide if a spill meets this criterion.

A spill that is large enough or any other spill that has had a chance to mix with incompatible chemicals calls for an evacuation. It is also a wise choice to evacuate any time there is any doubt as to whether it is safe to stay around a spill. Obviously, if anyone smells cyanide gas, it's also time for an evacuation.

Employees should be instructed to:

- Not allow a spill to run to a drain that goes to the sewer
- Not spray a spill with a high pressure hose
- Not allow a spill to enter a confined space, if possible

Any spill that involves the cyanide leaving the facility property boundaries needs to be evaluated to determine if a report to the National Response Center is mandated (one pound or more of cyanide in the spill is the cut-off).

Evacuation

Employees need to be trained to evacuate using the nearest exit. They must gather at a pre-designated spot that is safely far enough away from the facility. If possible, this pre-designated spot should be upwind of the prevailing direction that the wind takes at the facility. It is extremely important that employees are trained to remain at the designated gathering spot, because if employees wander off-site, it is impossible to verify that all are outside and none are trapped or injured inside.

Only after emergency response crews with protective equipment have had a chance to test the air inside the facility and confirm it is safe to do so, should employees return to their work stations.

Cyanide gas

The following is extremely difficult text to write. In case of a cyanide gas release, employees must be instructed to evacuate and while they are evacuating they should make an attempt to tell as many co-workers as possible. They must not stay around to warn or rescue others, unless of course they have a gas tight chemical protection suit on and self-contained breathing apparatus. Some facilities may want to have such suits and SCBA stored outside the facility to allow for rapid deployment after an evacuation.

If a co-worker has collapsed and they suspect it was caused by cyanide gas exposure, they must **NOT** attempt to make a rescue. They need to leave the area immediately. This is advice that is based upon experience at a plating shop many years ago, where several workers were killed by cyanide gas exposure while attempting to rescue fallen friends.

Fires and cyanide gas

Cyanide gas is flammable and will add to the heat load of any fire involving this gas. Fires where cyanide compounds are present should not be extinguished using water or carbon dioxide, as either of these reacts with cyanide to produce flammable and toxic gas. The best extinguishing media are powder or foam. Closed containers of cyanide may be cooled with water (foam has little or no cooling effect) as long as there is a low possibility of water and cyanide mixing. If there is no risk to surroundings, fire fighters may need to allow the fire to burn itself out from a safe distance.

Exposure (but not over-exposure) via eye contact

For eye contact, contact lenses need to be immediately removed prior to use of an eyewash station. Never re-use these, even if they are not disposable. Throw them into the hazardous waste bag. Use the eyewash station for at least 15 minutes to wash out all traces of chemical. Always go to an eye doctor as soon you are done with the eyewash station.

Cyanide over-exposure

A key to emergency response for cyanide exposure is to realize that:

- Cyanide exposure is best treated with specific antidotes and supportive medical care in a hospital setting.
- Time is extremely critical; first aid and medical treatment must begin as soon as possible.

- The first aid to be conducted by a non-medically trained person is only a stop-gap measure while trained professionals are called in.
- You must be wearing the appropriate personal protective equipment while conducting emergency response procedures detailed below.

Exposure via gas, ingestion or skin contact

The following are actions that can mitigate the exposure or protect you from exposure by the victim. Administer first aid while any of the below activities are conducted.

- If it is easy to do, remove a victim of cyanide gas exposure to fresh air, but do not allow this to delay application of first aid.
- Do not attempt mouth-to-mouth resuscitation as this may expose you to cyanide.
- Examine the victim for contaminated clothing which will need to be removed. Contaminated clothing needs to be placed inside a poly bag, sealed and then re-bagged and disposed of as hazardous waste.
- Do not pull contaminated clothing over the head of the victim, as this can cause additional exposure!
- Remove any jewelry that has been contaminated.
- Any skin areas that have been in contact with cyanide will need to be washed with soap and water.

First aid

The following are first aid steps to consider:

- Make sure a doctor or emergency response team has been called and that they have been informed that they are responding to a cyanide exposure.
- Have a co-worker administer artificial respiration (not mouth-to-mouth) while you administer amyl nitrite pearls from the Cyanide Antidote Kit.
- Evaluate if the victim has had any skin exposure and respond accordingly.

Amyl nitrite

The Cyanide Antidote Kit contains numerous items that are to be used by a trained medical professional. Only the amyl nitrite is for use by an untrained responder. The package contains 12 pearls and each is to be used for a total of three minutes, giving you a total of 36 minutes of treatment. That means that the emergency response team needs to know that they need to arrive within 30 minutes of an emergency call.

The Kit contains information on the use of the amyl nitrite in two places (under the lid and in the package in loose leaf format.

The amyl nitrite pearls are contained in a thin glass tube covered in paper (photo). Treatment consists of:

- Crushing the pearl in a handkerchief. In the absence of a cloth or handkerchief, use your bare fingers, but make sure you don't breathe the fumes yourself (they can make you dizzy).
- Holding the broken ampoule under the victim's nose for 15 seconds.
- Holding the amyl nitrite away from the nose for 15 seconds. This is extremely important, because continuous exposure to amyl nitrite may kill the victim!
- Repeating for a total of three minutes before changing to a new broken pearl and repeating the treatment.


Amyl Nitrite Ampule

If the victim is unconscious and not breathing, the pearl needs to be placed inside an oxygen mask while artificial respiration is conducted. If no oxygen mask is available, place a handkerchief with the amyl nitrite over the nose and apply artificial respiration (not mouth-to-mouth).

It is a darn good idea to practice first aid treatment using outdated or "pretend" amyl nitrite pearls.

The contents of the Cyanide Antidote Kit are subject to expiration (the date is on the label on the front of the kit). Make sure it is replaced before the expiration date. The maximum storage temperature is 25°C (77°F), so it needs to be stored in an air conditioned environment. ***P&SF***

Test Your Plating I.Q. #423

By Dr. James H. Lindsay

Plating Ingredients

1. The reducing agent in electroless plating is in the bath. What is the reducing agent in immersion plating?
2. What happens when the immersion plated metal *completely* covers the substrate?
3. What happens to atoms of the substrate as atoms of the coating are deposited?
4. What are the consequences of #3?
5. An advantage that immersion plating shares with electroless plating is that _____.

Answers on page 35.