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EXPLOSIVE AZIDE HAZARD

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The National Institute for Occupational Safety and Health (NIOSH) is alerting you to an explosive hazard which may exist in hospital and clinical laboratory plumbing systems due to sodium azide formulated into diluents used in conjunction with automatic blood cell counters. These counters are found in over 15,000 hospitals and clinical laboratories throughout the United States.

NIOSH has recently learned of violent sodium azide-related explosions associated with automatic blood cell counters at a number of hospitals in the United States and Canada. In addition, we are aware of a violent azide explosion occurring while a constant temperature water bath in which sodium azide had been used as a preservative was being repaired. These explosions have the propensity to propel metallic fragments over a wide area and the potential for causing serious injury to exposed workers and others in the vicinity.

Sodium azide is a common preservative in many *in vitro* diagnostic products and is found in concentrations up to 0.1% in diluents used with automatic blood cell counters. After completion of the blood count procedure, the waste (containing azide) is commonly discharged into a drain used solely for this purpose, thus bathing the drain pipeline with solutions of sodium azide. Over a period of time, the azide reacts with copper, lead, brass, or solder in the plumbing system to form an accumulation of lead and/or copper azide. Lead azide is a more sensitive primary explosive than nitroglycerine and a more effective detonating agent than mercury fulminate; in comparison with lead azide, copper azide is even more explosive and too sensitive to be used commercially.

Future accumulation of lead and copper azides in plumbing systems can be retarded by thoroughly flushing any drain known to receive azides with copious amounts of water several times a day. The use of copper-and lead-free lines between the point of discharge of azide and the nearest pipe in which there is a good stream of water, or the use of azide-free reagents, may prevent future accumulation of explosive azides in plumbing. HOWEVER, THESE MEASURES WILL NOT DECONTAMINATE PLUMBING ALREADY CONTAINING EXPLOSIVE AZIDES. Procedures for the decontamination of plumbing systems containing copper and/or lead azide are enclosed.

Laboratory maintenance workers, especially plumbers, should be alerted to the azide hazard so that proper precautions can be taken. Violent explosions have resulted when plumbers have attempted to penetrate blocked azide-contaminated drainage systems with a flexible metal probe (snake) or to cut or saw azide-contaminated drain lines.

NIOSH would appreciate being advised of the details of any azide-related explosions and welcome your comments regarding the effectiveness of the enclosed decontamination procedures.

John F. Finklea, M.D.

John F. Finklea, M.D.
Director

Enclosure

DECONTAMINATION PROCEDURES FOR AZIDE CONTAMINATED PLUMBING

The following procedure[1] has been suggested by the Center for Disease Control, U.S. Public Health Service, for use in its laboratories:

1. Prepare 1 to 2 liters of 10% sodium hydroxide solution (100 g NaOH per liter of water).

2. Syphon all liquid from the trap and drain using a soft rubber or plastic hose. Use proper precautions against any hazardous chemicals which may be present.

3. Slowly pour the sodium hydroxide solution into the trap.

4. Tape to the sink a warning sign reading "Do Not Use Sink...Contains Caustic Material."

5. Allow the solution to remain in the trap for a minimum of 16 hours.

6. Flush the drain with water for a minimum of 15 minutes.

   If the drain will not flow, the sodium hydroxide should be removed by syphoning, if possible, then diluted with water. Maintenance personnel should be advised that the drain is potentially contaminated with explosive agents and caustic material.

The above procedure is designed to decontaminate a drain trap. Longer lengths of drain lines can be decontaminated with a similar procedure after plugging the drain below the point at which any azide contamination is likely to have occurred and then filling the entire length of pipe with 10% sodium hydroxide solution.

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[1]Manual Guide--Safety Management No. CDC-22, Decontamination of Laboratory Sink Drains to Remove Azide Salts, Center for Disease Control, Atlanta, Georgia, April 30, 1976.

Where it is not possible for a drain line to remain filled with sodium hydroxide solution for at least 16 hours, Coulter Electronics, Inc. has suggested the following:[2]

1. Pour five gallons of sodium hydroxide solution into the piping rapidly enough to simulate the flushing action of a water closet. CAUTION: The solution is caustic!
2. Allow the pipe to remain undisturbed by water or other effluents for at least 16 hours.
3. Flush with copious amounts of water.
4. Repeat steps 1, 2, and 3 two more times at intervals of a week or so.

Descriptions of several other procedures which have been suggested for the decontamination of azides are listed in the Journal of Chemical Education.[3]

PRECAUTIONS

Because the possibility of residual sodium hydroxide will always exist, personnel should wear gloves and face shields when breaking the drain line or trap for maintenance. (This equipment should be worn when breaking any laboratory drain, as the presence of hazardous chemicals should always be suspected.)

Extreme caution should be exercised when plugging a drain line potentially contaminated with heavy metal azides.

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[2]Personal Communication from Coulter Diagnostics, Inc., June 3, 1976.

[3]James O. Wear, "Azide Hazards with Automatic Blood Cell Counters," Journal of Chemical Education, 52, A23-A25, January 1975.

The decontamination of plumbing systems containing copper or its alloys (e.g., brass) should include a supplemental treatment with nitrous acid, since the sodium hydroxide procedure may not adequately remove accumulations of copper azides. The following nitrous acid decontamination procedure[4] has been employed with success:

1. Close the exit of the drain beyond the point of potential azide accumulation.

2. Fill the drain line with nitrous acid, prepared immediately before use by mixing equal volumes of a 20% solution of acetic acid with a 20% solution of sodium nitrite.

   CAUTION! The area should be well ventilated, as toxic vapors (oxides of nitrogen) may be released when azide reacts with nitrous acid.

3. Allow the nitrous acid solution to remain in the drain for twenty-four hours.

4. Open the exit of the drain.

5. Immediately repeat procedure once.

NOTE

The decontamination of plumbing systems is complicated by a number of factors, including the possible coating of heavy metal azides by impervious materials as well as the possible accumulation of heavy metal azides in cracks and threads of plumbing. Although the decontamination procedures do reduce the risk of explosion, even a "decontaminated" system should be treated with respect in recognition of the possibility of its being explosive. Maintenance people should be alerted so that proper precautions can be taken before working on plumbing potentially contaminated with heavy metal azides. Good work practices include shielding the person working on the plumbing, maximizing the distance between the person and the plumbing, and keeping all unnecessary personnel out of the area.

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[4]This procedure has been recommended and used by the Department of Health and Social Security, Government of the United Kingdom.

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