Standard Operating Procedure

PHENOL

Potential Hazards/Toxicity

Phenol is a chemical commonly used in research for tissue preservation as well as DNA/RNA extraction. It has many significant health hazards, including systemic effects that may occur from any route of exposure.

Health Effects:

Acute Effects:

Eyes: Contact with eyes may cause severe damage and blindness.

Skin: Contact with skin may cause severe burns, although it may not cause immediate pain as phenol has a local anesthetic effect. A whitening of the area of contact generally occurs, with severe burns developing later. Skin contact may also cause systemic poisoning as phenol is readily absorbed through the skin. Toxic or fatal amounts can be absorbed through the skin.

Ingestion: Phenol is acutely toxic. Death can occur rapidly following ingestion. Symptoms include irritation, swelling, burns and damage to the mouth, throat and stomach, internal bleeding, vomiting, diarrhea, decreased blood pressure, shock, collapse, coma and death.

Inhalation: Irritation to the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema).

Chronic Effects:

Phenol affects the central nervous system, liver and kidneys. Repeated or prolonged skin exposure to phenol or vapors from heated phenol may cause headache, nausea, dizziness, muscle ache, difficulty swallowing, diarrhea, vomiting, shock, convulsions, and death.

Personal Protective Equipment (PPE)

The University's Personal Protective Equipment Policy can be found on the EHS website (ehs.yale.edu)

Eye Protection

Safety glasses must be worn whenever handling phenol. When there is the potential for splashes, goggles and/or a faceshield must be worn.

Hand Protection

Gloves must always be worn when handling research materials. For phenol, the type of glove will depend on the projected use and concentration.

For protection against incidental contact with dilute solutions (<10% phenol), double exam-style nitrile or thicker (8mil) nitrile gloves should be worn. Gloves should be changed frequently, as well as immediately after any contact with the phenol. When making solutions and working with the concentrated stock solution, utility grade neoprene or butyl gloves should be worn over exam-style nitrile gloves.

Skin and Body Protection

Long pants or clothing that covers the body to the ankles and closed-toe solid top shoes must always be worn in any laboratory where hazardous materials are used or stored. A fully buttoned lab coat must also be worn when handling hazardous chemicals, including phenol. If a splash to the body is likely, a butyl rubber or neoprene apron should be worn over the lab coat.

Engineering Controls

Fume Hood

Fume hoods, or other locally exhausted ventilation, must be used whenever handling phenol. This includes stock solutions and working solutions.

Storage/Handling

- Never heat or melt phenol in an incubator, microwave, drying oven or similar appliance.
- Use caution when centrifuging phenol. Centrifugation produces aerosols which can lead to inhalation exposures. Use sealed safety cups. After centrifuging, always open tubes in a fume hood to prevent inhalation exposures.
- Keep container tightly closed to prevent agent from subliming and entering the atmosphere.
- Store away from oxidizers such as chlorine, bromine, and calcium hypochlorite and other incompatible chemicals.
- Store saturated phenol at 4°C.
- Keep away from heat, sparks, flames, sources of ignition.
- Store protected from light and moisture.
- Store containers at/below eye level (~5 feet).

Waste Disposal

All phenol solutions/stock materials must be collected as chemical hazardous waste.

For items with trace phenol contamination, such as empty pipettes/pipet tips, empty tubes, etc, follow this procedure:

- Collect the items in a sealable container.
- Place closed collection container (plastic container, small box, etc.) into a lined Stericycle box whose bottom is taped shut. Each Stericycle biomedical waste box should come with a red bag to line the box.
- Tape the red bag shut.
- Place a completed black and white generator name and address label on the inner bag and on the top of the outer box.
- Tape the top of the box shut.

- Place an “Anatomical/Pathological Waste” or “Incinerate Only” label on the top of the outer box.
- Do not commingle this waste with other biological waste and do not autoclave it.

Emergency Procedures

Fire Extinguishers
Both ABC dry powder and carbon dioxide extinguishers are appropriate for fires involving phenol.

Eyewash/Safety Showers
An ANSI approved eyewash station that can provide quick drenching or flushing of the eyes must be immediately available within 10 seconds travel time for emergency use. An ANSI approved safety drench shower must also be available within 10 seconds travel time from where these compounds are used. Ensure the locations of the eyewashes and safety showers, and how to activate them, are known prior to an emergency.

First Aid Procedures

If inhaled
Remove to fresh air. Call 911 for immediate medical attention.

In case of skin contact
RAPID AND IMMEDIATE SKIN DECONTAMINATION IS CRITICAL to minimize absorption

Remove contaminated clothing immediately and begin swabbing the area repeatedly with Polyethylene Glycol (PEG) 300 or 400, frequently changing out the swab for a fresh one soaked with the PEG. Continue the PEG application medical assistance arrives or the odor is no longer detectable.

If PEG is not available, depending on the area involved with the skin contamination, go to the nearest emergency shower or use the closest drench hose to rinse the affected area. Yell for assistance and rinse for 15 minutes.

Always seek medical attention.

For significant exposures, call 911 for immediate medical attention. For all other exposures, follow up at YNHH emergency room.

Note: Anyone assisting in decontamination should wear protective clothing and gloves. Any clothing contaminated with phenol should be bagged and put aside.

In case of eye contact
Go to the nearest emergency eyewash. Yell for assistance and rinse for 15 minutes. Call 911 for immediate medical attention.

Spills

Small Spill (inside a fume hood)
If a small spill occurs inside the fume hood, lab personnel should be able to safely clean it up by following standard spill clean up procedures:

- Alert people in immediate area of spill
- Wear personal protective equipment, including utility grade butyl or neoprene gloves over exam style nitrile
- Confine spill to small area with adsorbent material (pads, vermiculite)
- Collect residue, place in container, label container, and dispose of as hazardous waste
- Clean spill area with soap and water

Larger Spill or Spill Outside a Fume Hood

- Call EHS for emergency assistance (203-785-3555)
- Evacuate the spill area
- Post someone or mark-off the hazardous area with tape and warning signs to keep other people from entering
- Stay nearby until emergency personnel arrive and provide them with information on the chemicals involved