

Working Safely with Picric Acid

1. OVERVIEW

Picric Acid (trinitrophenol) is a trinitro-aromatic compound frequently found in forensic and histology laboratories as a staining and fixative agent. This compound is related to trinitrotoluene (TNT).

Outside the laboratory picric acid has primarily been used for explosives and fireworks. In the lab it is used in many common fixatives for histology applications. Bouin's, Holland's, and Gendre's solutions all have picric acid as a major component. In metallography applications, picric acid is used as an etchant for magnesium and its alloys. When hydrated, picric acid can be handled safely, but it poses a potential explosion hazard when it dries.

2. RESPONSIBILITY

Supervisors and members of research groups who are using picric acid must:

- Keep an inventory of all picric acid
- Create and document a risk assessment prior to picric acid use
- Purchase, store and use the minimum quantity of picric acid possible; disposal costs of picric acid far outreach the original cost
- Periodically inspect the picric acid containers to make sure it contains at least 10% or more water
- Document training and follow the appropriate safe work procedure.

3. TRAINING REQUIRED

In addition to the courses required by the department/faculty to work with hazardous substances, all employees working with picric acid must receive appropriate onsite training covering:

- Health effects resulting from exposure to picric acid
- Safe work procedures that need to be followed
- Personal protection
- How to clean a picric acid spill
- First aid and emergency procedure

4. HAZARD

There are both health and physical hazards associated with picric acid.

Health Hazards



Acute/chronic toxicity: toxic if in contact with skin or if inhaled, harmful if inhaled.

Picric acid is toxic by ingestion, inhalation and dermal absorption! According to ACGIH TLV documentation (2001) systemic poisoning after absorption of picric acid in man, ingestion of 1-2 grams would cause severe poisoning. Systemic poisoning causes headache, vertigo, nausea, vomiting, diarrhea, inflammation of kidneys and acute hepatitis. Red colored urine may be produced. Inhalation of dust may cause lung damage.



The Symptoms of exposure include Eye irritation (redness, pain, yellow vision), cough, and sore throat.

It is important to note that any skin absorptions will likely cause staining of the skin and that picric acid is a skin sensitizer and can induce an allergic response following skin contact.

Physical Hazards**Flammable solid**

Dry picric acid is highly sensitive to heat, shock, and friction. The hydrated solid is classified as a flammable solid.

Picric acid readily forms salts on contact with many metals (including copper, lead, mercury, zinc, nickel, and iron) that are more sensitive explosives than picric acid itself when subjected to heat, friction, or impact. Salts formed with ammonia and amines are also sensitive explosives. Contact with concrete floors or plaster may form the friction-sensitive calcium picrate. Forms very sensitive explosive metallic compounds.

Corrosive

Picric Acid is corrosive to the eyes and skin and may cause permanent eye injury and may cause scarring.

WorkSafe BC regulation states the time weighted average (TWA - concentration of a substance in air which may not be exceeded over a normal 8-hour work period) limit for picric acid is 0.1 mg/m³.

5. ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT (PPE)Engineering Controls

All picric acid solutions must be prepared and handled in a certified chemical fume hood. The use of a Biological Safety Cabinet is not appropriate for working with picric acid.

Any fume hood where picric acid is used shall be posted with a warning sign that identifies the hazards and necessary controls.

Personal Protective Equipment

Hand protection: Nitrile, neoprene or butyl gloves are recommended (NOT latex). Double-gloving is recommended when working with pure picric acid or concentrated solutions. Change gloves frequently and when contaminated, punctured or torn.

Eye protection: ANSI-approved properly fitting safety glasses or chemical splash goggles are required.

Skin and body protection: Laboratory coats must be worn, appropriately sized for the individual, and buttoned to their full length. A chemical-resistant/rubber apron can be utilized in conjunction with the lab coat to maximize protection. Personnel must also wear full length pants or equivalent, and close-toed shoes. The area of skin between the shoe and ankle must not be exposed.

Respiratory protection: Picric acid should never be used outside of a chemical fume hood. Usage outside of a fume hood must be approved by SRS and will require respiratory protection. Contact Safety & Risk Services for approval.

6. GUIDELINES FOR SAFE WORK PRACTICES**6.1. Handling**

- All operations involving picric acid must be performed in a fully functioning chemical fume hood.
- The fume hood must be in the immediate vicinity of a safety shower and emergency eyewash station.

- The working surfaces of any fume hood for which picric acid is used should be protected with plastic backed absorbent pads to insure containment of any spills.
- Work at least 6" inside of the fume hood and set the sash at the lowest possible position.
- Do not use metal spatulas to remove picric acid. Do not allow contact with metal: metal picrates are extremely shock sensitive.
- Carefully inspect the picric acid bottle before opening it. If there is any evidence of crystal formation, do not open the bottle and contact SRS for assistance (604 822 2029).
- Always clean the neck of the bottle, cap and thread with a wet cloth before recapping and seal the cap with Parafilm. Thoroughly wet the cloth used, collect it in a plastic or glass container labeled as hazardous waste and contact ESF at 604-822-6306 for disposal.

6.2. Storage

- Label containers of picric acid or picric acid solutions with the date received and date opened. Dispose of the picric acid containers within 2 years from the date received.
- Solid picric acid must be stored with at least 10% moisture content and regular inspections must be made to ensure that the minimum moisture content is maintained. **Never let picric acid dry out.**
- Store picric acid in a cool, dry, well-ventilated area, out of direct sunlight and away from sources of heat.
- Picric acid is incompatible with oxidizers, reducing agents, inorganic salts, alkaloids and metals and must not be stored with these.
- Use and store picric acid in containers made of polyethylene, polypropylene, Teflon or glass. Do not use containers with metal caps. Place storage containers in unbreakable secondary containment.
- Protect from freezing temperatures.

6.3. Waste

- Waste Picric Acid should be placed in a chemically compatible container and disposed of as [hazardous waste](#)
- Never dispose of Picric Acid contaminated material in the trash.

7. EMERGENCY PROCEDURES

7.1. Spills

In the case of a small spill restricted inside a chemical fume hood, the spill can be cleaned by laboratory staff assuming that the correct equipment is present and that the staffs understands the hazards associated with picric acid.

- NEVER allow spilled material to dry - dampen spilled solids with water or a 2% v/v aqueous solution of acetone without stirring to keep picric acid wet.
- NEVER attempt to sweep up dry material; always keep picric acid wet to reduce any explosion hazards.
- Use a spill response pad or pillow dampened with water to absorb spilled material.
- Place the pads / pillows in a compatible, impervious container with water added.

- Thoroughly wash the spill site after material pickup is complete.
- Collect all picric acid-containing waste in plastic or glass bottles and contact ESF at 604-822-6306 for disposal.
- Complete UBC Incident/Accident forms on CAIRS (Centralized Accident Incident Reporting System) within 48 hours of the spill.
- In the event of a large spill located outside a chemical fume hood, request assistance for spill clean-up: SRS at 604 822 2029 or 911.
- Advise and warn co-workers.
- Evacuate the area immediately
- Restrict access to the area.

7.2. Personal contact

Skin contact

- Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

Eye contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Inhalation

- Remove the person from exposure
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped
- Transfer promptly to a medical facility.

8. DOCUMENT INFORMATION

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