# Globally Harmonized System pictogram Indicating a chemical is an Acute Toxic, capable of causing serious adverse health effects (i.e. lethality) after a single or short-term oral, dermal, or inhalation exposure to a substance or mixture. **Picric Acid** Globally Harmonized System pictogram Indicating a chemical is classified as an explosive.Globally Harmonized System pictogram Indicating a chemical is a Flammable Chemical

Introduction

Picric acid (CAS No. 88‐89‐1; 2,4,6‐trinitrophenol, picronitric acid) is a pale yellow, odorless, crystalline organic solid that is slightly soluble in water. In research labs, it is primarily used as a fixative agent, a staining reagent, in metallography applications (copper etching), and in chemical reactions. In industry, picric acid is mainly used for production of explosives, matches, electric batteries, dyes and in medicinal formulations. It can be purchased in various forms: for example, as a solid moistened with water (≥ 35% water), as a saturated solution in water (≈ 1.3%), as a more dilute solution in water, as a solution in ethanol, or as Bouin’s solution (which contains picric acid, formaldehyde, and acetic acid in an aqueous solution).

*This fact sheet is not intended to replace the Safety Data Sheet (SDS) provided by the manufacturer.*

Hazards

Potential Explosion Hazards

Dry picric acid (with less than 30% water) is a powerful explosive and highly sensitive to heat, shock, friction, and shearing forces. When hydrated (moistened), picric acid is typically safe to handle, and is classified as a flammable solid. Picric acid is highly reactive with a wide variety of chemicals and readily forms picrate salts on contact with heavy metals (including copper, lead, mercury, zinc, nickel, and iron), bases, ammonia, concreate and plaster. The picrate salts formed (e.g., metal picrates, calcium picrate formed in contact with concrete, etc.) are more sensitive explosives than dry picric acid itself when subjected to heat, friction, or impact.

Potential Health Hazards

Picric acid is toxic if swallowed, inhaled, or absorbed through the skin. Inhalation of dust may cause lung damage. Chronic exposure may cause liver or kidney damage. It is irritating to the skin and eyes and may cause an allergic skin reaction. See SDS for additional health effects and symptoms of exposure.

Best Practices

* Before using Picric Acid:
  + Review the product specific Safety Date Sheet (SDS).
  + Review this fact sheet.
  + Review or create a [Standard Operating Procedure (SOP)](https://research.wayne.edu/oehs/chemical/19-002st_lab_specific_chemical_sop_template.docx) for the specific process in which picric acid is used.
* Never work alone while using picric acid.
* Purchase only what is immediately needed in the smallest practical quantity. Do not open a new bottle until needed. Properly dispose of any excess picric acid via OEHS waste management group immediately after intended use.
* If possible, eliminate solid picric acid from your inventory by purchasing premixed stains or a 1% solution for use in stain preparation.
* Due to inhalation toxicity of picric acid, it needs to be handled in a chemical fume hood. Benchtop work with picric acid should be avoided.
* Do not use metal containers, spatulas, or other tools. Do not use bottles with ground glass stoppers. Use non-sparking tools.
* Label all containers that contain picric acid (including date received).
* Containers should always be examined after each use and any residue on the bottle, cap, or threads should be cleaned with a damp cloth (wetted with DI water) to remove any residue. Collect used clothes/paper towels as hazardous chemical waste. Note: Picric acid contaminated absorbent materials must be placed in a plastic bag, moistened with excess DI water, and sealed prior to disposing into the solid hazardous chemical waste bin.
* Dispose of picric acid that is more than 2 years old through OEHS.
* A bottle of potentially old picric acid is an item of high concern and requires special attention. These bottles may either containing shock sensitive dry picric acid crystals (due to drying overtime of the wetted paste) and/or contain highly shock sensitive picrates (inside the bottle or within the threads of the bottle lid), formed by the introduction of impurities during use.
* If old or previously unaccounted for bottles of picric acid that lack date received (or expiration date) are discovered, the following steps should be taken.
  + DO NOT TOUCH THE CONTAINER! Depending on how long the bottle has been left and the state of the chemical inside, even a minor disturbance could be dangerous. Crystals may have formed between the lid and the container. Any attempt to open the container could result in an explosion large enough to do serious damage to personnel and equipment.
  + Visually inspect the container for product identification and check for an expiration date. If the product is relatively new, there may not be a problem. Nevertheless, treat the situation carefully.
  + Visually inspect the contents of the bottle to determine water content and check for signs of crystallization inside the bottle and around the lid. If there is no evidence of crystal formation and the water content is high (30-40%), there is probably little cause for concern. If there is even the slightest indication of crystallization or low levels of water in the bottle, the situation is more serious. CONTACT OEHS (7-1200) IMMEDIATELY FOR GUIDANCE! Secure the area and restrict access.
  + **Dry picric acid or picrate salts should not be touched or moved under any circumstances.** This is a serious potential hazard. Restrict access to the area and contact OEHS (7-1200) IMMEDIATELY FOR GUIDANCE!
  + If you feel that your laboratory may have old picric acid in your chemical inventory, contact OEHS Hazardous Waste Team (7-1200) for a special pick-up to have it removed. Do not handle it yourself.

Personal Protective Equipment

In addition to proper street clothing (long pants or equivalent that cover legs and ankles, close-toed non-perforated shoes that completely cover the feet), wear the following minimum Personal Protective Equipment (PPE) when performing lab operations/tasks:

* Safety glasses (If splash potential exists, use goggles + face shield instead)
* Lab coat.
  + Hazard assessment of procedures may indicate the need for a flame-resistant lab coat, such as Nomex.
* Gloves – nitrile, neoprene, or other compatible gloves.
  + Refer to Section 8 “Exposure controls/personal protection” of SDS or a glove selection guide (e.g. [Ansell Chemical Protection Guide](https://www.ansellguardianpartner.com/chemical/home#hp)) to identify appropriate glove type.

Storage

* Label containers of picric acid or picric acid solutions with date received and date opened. Dispose of withing 2 years of purchase.
* Picric acid must be placed in a secondary container and stored in a dry, dark environment away from potential sources of ignition and incompatible materials, preferably in a flammable cabinet. Note - if lab does not have a flammable cabinet, store in a specific, labeled, dry, dark cabinet away from potential sources of ignition and incompatible materials. See section 10 of SDS for incompatible materials.
* Do not store in metal containers as it can form highly explosive metal picrate salts. If any old picric acid bottle with a metal cap is found in the lab, evacuate the area immediately, and contact OEHS (7-1200).
* Store containers in a polyethylene secondary container, large enough to contain the entire contents if the original container should rupture.
* Keep solids wet – ensure the solid is under a layer of water.

**Self‐Inspection of Picric Acid Containers**

Due to the hazards associated with dry picric acid, laboratories using and storing picric acid must conduct regular inspections of the containers as outlined below and document it.

* Post an inspection log near the picric acid storage location (see last page of this document).
* Inspect picric acid containers at a minimum quarterly. Assign this responsibility to a lab member trained on the hazards of picric acid. Document inspections on the log.
* First, without opening the bottle, check that no dried crystals have formed on the outside of the bottle near the cap and that there is a layer of water over the crystals within the bottle (at least 10% of total).
* If there is any evidence of picric acid crystals on the outside of the bottle or if the picric acid inside the bottle is not adequately wetted (water level less than 10%), dried crystals may also be present within the threads of the container. This presents a potential detonation hazard when opening the container. Contact OEHS immediately (7-1200).
* For containers of moistened or saturated picric acid, if the container appears safe to open, rehydrate contents with water, as needed, to ensure a sufficient layer of water above the solid (between 10%-40% of total; check product specific SDS for recommended amount). Note: This step MUST be done by lab personnel experienced with hydrating picric acid, and lab manger/principal investigator must be informed prior to such procedure.

Spill Procedures

* Small spills (< 30 ml) within a chemical fume hood can be cleaned by laboratory staff who is aware of the hazards of picric acid and is equipped with required spill response material.
  + Eliminate ignition sources.
  + Do not allow spilled material to dry.
  + DO NOT dry sweep the material; always keep picric acid wet to reduce any explosion hazards.
  + Damp spilled material with DI water or a 2% v/v aqueous solution of acetone without stirring to keep picric acid wet.
  + Use a spill response pad/paper towels moistened with DI water to absorb spilled material.
  + Place the spill cleanup material into sealable plastic bag, with DI water added.
  + Spray DI water onto the spilled area again and thoroughly wash the spill site. Dispose of the used paper towels into a sealable plastic bag.
  + Place the sealed plastic bags containing cleanup materials into a designated solid hazardous chemical waste container for picric acid waste.
  + Request chemical waste pickup immediately.
* For any amount of spill outside the chemical fume hood, larger spills or if clean‐up assistance is needed, cease all activities, eliminate sources of ignition, and immediately evacuate all personnel from the affected area. Call OEHS (7-1200) immediately for spill response.

Disposal

* DO NOT dispose picric acid waste via a sink or other drain. Picric acid will form unstable explosive picrates in contact with metal plumbing. All picric acid waste MUST be collected as hazardous chemical waste.
* Collect waste in a dedicated small glass or plastic bottle (instead of 5-gallon carboy) with excess water to ensure it is sufficiently moist until disposal. Request disposal within 6 months of accumulating the waste.
* Collect picric acid contaminated solid waste in sealable plastic bag, moistened with DI water, which is then placed in a plastic waste pail for disposal by OEHS. This is to ensure the material remains wetted until it can be disposed. Empty containers of picric acid should also be disposed of as hazardous waste.

Emergency Response & Contacts

* **WSU Public Safety: (**313) 577-2222, emergency transportation
* **Henry Ford Occupational Health – Harbortown**

3300 East Jefferson, Suite 100

Detroit MI 48207

(313) 656-1618

Monday – Friday 8:00 AM to 6:30 PM

* **For help outside of health clinic hours**

**Detroit Receiving Hospital – Emergency Room:** (313) 745-3000

**OR**

**Henry Ford Hospital – Emergency Room**: (313) 916-8742

* **Office of Environmental Health and Safety:** (313) 577-1200, spills or clean-up
* **WSU Fire Marshall:** (313) 577-3110.

References

[PubChem – Picric Acid](https://pubchem.ncbi.nlm.nih.gov/compound/6954)

[Transport Canada – Dangerous Goods: Picric Acid and Picrate Salts](https://tc.canada.ca/en/dangerous-goods/canutec/picric-acid-picrate-salts)

[Picric Acid Hazards](https://oag.ca.gov/sites/all/files/agweb/pdfs/cci/safety/picric.pdf)

**Picric Acid Monitoring**

* Check containers of picric acid at a minimum quarterly.
* Check for crust or crystal formation around the lid, on the container, and/or inside the container. If present, restrict access to the container and contact OEHS (7-1200) for safe disposal.
* For moistened/saturated picric acid, ensure bottle contains between 30-40% water above the solid to maintain safe saturation.
* Date and initial below each time container is inspected.

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