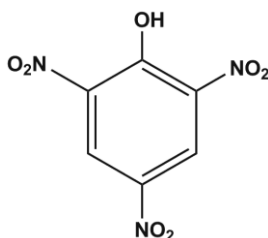


## Safe Handling of Picric Acid

Picric acid (CAS No. 88-89-1, 2,4,6-Trinitrophenol, picronic acid) is a pale yellow, odorless crystal that is slightly soluble in water (saturation occurs at about 1.3% by weight). 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. Numerous reports of bomb squads removing old bottles of picric acid can be found on the internet. It is also a **toxic** substance. The hazards posed by picric acid require special precautions and practices, described below, for storage and handling.



## Health Hazards & Physical Hazards of Picric Acid



### Hazard Statements

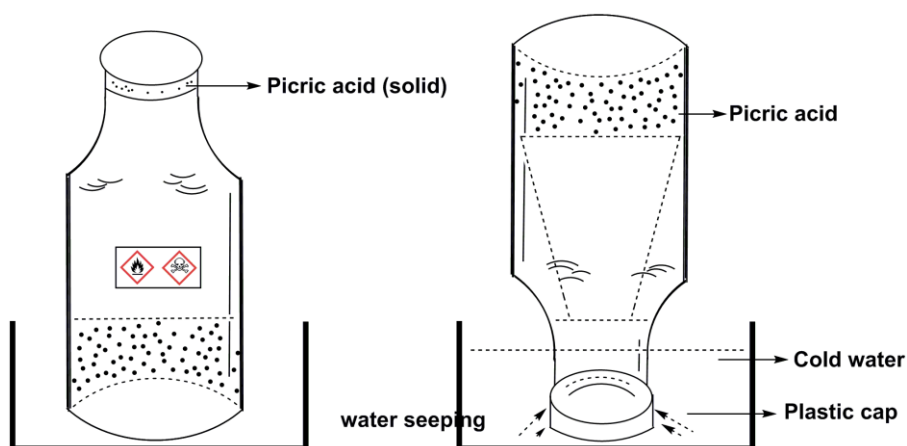
Flammable solid. Toxic if swallowed or in contact with skin. May cause an allergic skin reaction. Harmful if inhaled

**Physical Hazards:** Picric acid is typically sold moisten with at least 30% water for safety purposes. As the water evaporates over time, the substance becomes dry picric acid crystals. Dry picric acid is highly sensitive to heat, shock and friction. Picrate salts of heavy metals such as copper, zinc, iron and lead are even more sensitive than picric acid itself. It will also react with alkaline materials including plaster and concrete to form explosive materials. The rapid decomposition generates nitrogen, carbon dioxide, water, and other toxic substances.

**Health Hazards:** Picric acid is a toxic substance. The GHS classification system for acute toxicity puts it in category 3 (out of 5 categories, with 1 being the most toxic) for dermal and oral exposure and category 4 for inhalation as an airborne dust. Symptoms of exposure include Eye irritation (redness, pain, yellow vision), cough, and sore throat. Swallowing picric acid may cause a bitter taste, headache, dizziness, nausea, vomiting, and diarrhea. High doses may cause destruction of the red blood cells and damage to the kidneys. It is important to note that any skin absorptions will likely cause staining of the skin and that picric acid is also a skin sensitizer and can induce an allergic response following skin contact.

## Best Practices for Safe Handling

- When possible, purchase picric acid in solution. If you must purchase it as a solid make sure that it is sold moistened (not as a dry solid).
- Do not use a new bottle until the old picric acid is used completely.
- Make sure any stored picric acid **IS KEPT WET**.
- Clean bottleneck, cap and threads with a wet cloth before re-sealing.
- Don't allow picric acid come in long-term contact with metal surfaces. Remember, many metal picrates are much more sensitive to potential explosion than picric acid, itself.
- Never put picric acid in a metal container or use metal (unlined) lids.
- Do not use metal spatulas when manipulating picric acid. Wooden and plastic spatulas are safe to use.
- If there is any formation of solid deposits of picric acid around the plastic cap, immerse the container and lid in cold water and allow water to seep into the seal. Cold water can create negative pressure inside the reagent bottle.



### Removal of solid picric acid from plastic cap of a reagent bottle

- Check the hydration of picric acid as part of regular laboratory inspection and add distilled water if needed to maintain a wet paste (minimum 10% water by volume).
- Label the containers to show the date when they are opened first.
- Maintain a log for regular inspection of containers, usage, and the dates of receipt and opening.
- Keep inventories of picric acid low and contact the Chemical Safety Office for pick-up of unwanted chemicals

**IMPORTANT: Contact Chemical Safety Office immediately if you come across any bottles containing dehydrated picric acid. Do not handle.**

## Personal Protective Equipment and Engineering Controls

To prevent contact with the eyes and skin, a **lab coat**, **safety glasses**, and **gloves** with adequate chemical resistance (nitrile preferred) must be worn during any picric acid manipulations. All work with picric acid should be performed in a properly functional **chemical fume hood** to minimize inhalation exposure.

## Exposures to Picric Acid

**Skin Exposure (spill on hands):** Wash hands thoroughly with soap and copious amounts of water. Notify supervisor immediately.

**Skin Exposure (spill on body or clothes):** Remove affected clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Remove jewelry or clothing as necessary to facilitate cleaning of any residual material. Seek medical attention. Notify supervisor and EH&S immediately.

**Eye Exposure:** Immediately rinse eyes and inner surface of eyelid with water for 15 minutes while holding the eye open. Seek medical attention. Notify supervisor and EH&S at **265-5000** immediately.

**Inhalation:** Move person into fresh air if picric acid is breathed in. Consult a physician.

**Ingestion (Swallowing):** Rinse mouth with water. Never give anything by mouth to an unconscious person. Seek medical aid.

## Spill Clean-up and Decontamination

Most spills of picric acid can be handled safely following routine precautions. Wear appropriate PPE (see above). For spills it is recommended that you double-glove. Isolate the spill to prevent spread and avoid walking through the material and spreading the contamination. Be careful not to cut yourself on any broken glass.

**For picric acid solutions:** cover the spill area with a suitable absorbent material. Small spills (<30 ml) can be handled with paper towels. Designated spill pads or other spill materials from the laboratory spill kit should be used for larger spills.

**For picric acid powders:** First ensure that the material is moist. If necessary apply water to the powder (misting it if possible). This will reduce dust formation and make it safe to handle. Keep misting during the clean-up process. Do not sweep up. Use a dampened absorbent pad to remove the material off the floor.

All surfaces can be cleaned with a soap solution followed by alcohol. Collect all picric acid and the spill materials into a **glass jar** for disposal purposes (avoid containers with metallic caps). If necessary a plastic pail with a lid can be used. Contact EH&S for pick-up.

**Important:** If you feel you are unable to handle the spill please contact EH&S (**265-5000**) during working hours and **911** after hours.

## Training

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Develop a Standard Operating Procedure (SOP) for picric acid manipulations and review it with your PI, lab manager or senior student. Using an SOP is an opportunity to fully evaluate the hazards associated with the experiment and the materials you will be working with. First time users of picric acid must use the minimum quantity of picric acid for manipulations. Based on the SOP evaluation, it may be determined that some of the safety precautions in this section are not applicable.

## Storing Picric Acid

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Do not store large amount of picric acid. Dispose of picric acid stocks that are more than two years old. Also, dispose of all old picric acid bottles with metal caps. Use extreme caution with such containers that still contains picric acid. Keep quantities to a minimum. Keep container tightly closed and in a cool dry well-ventilated area. Minimum amount of picric acid should be acquired in laboratories for manipulations. When possible, purchase picric acid in solution (not as a dry solid). Label all picric acid with date received.

Picric acid forms sensitive salts with, and is therefore incompatible with: alkalis, transition metal oxides and alkaline salts, and heavy metal oxides. Iron, nickel, copper, zinc, lead, and mercury compounds are specifically mentioned in various reports, but manganese, cobalt, palladium, silver and cadmium compounds should be suspected as well.

## Disposal

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Picric acid must be properly disposed of through safety department, as long as the chemical is hydrated and no crystal formation is evident. If the picric acid is dry and/or crystal formation is evident, CALL EH&S IMMEDIATELY at 608-265-5000 for stabilization and disposal.

## References and Important Links

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