# GUIDELINES FOR SAFE USE AND MANAGEMENT OF
# PICRIC ACID
**CAS 88-89-1**

**Picric acid** is used as a staining agent and reagent in many laboratory procedures. Although commonly treated as an acidic material, the real hazards of picric acid are its unstable nature and ability to react with other materials and create explosive compounds.

## Description
Picric acid { $C_6H_6(NO_2)_3OH$ } is a pale, yellow, odorless, intensely bitter crystal which is explosive upon rapid heating or mechanical shock. It melts at $122^0$C.

## Synonyms
Piconitric acid; trinitropenol; nitroxanthic acid; carbazotic acid, phenol trinitrate

## Chemical Properties[1]
Picric acid is an odorless yellow crystal with an intense bitter taste. In dry form it is explosive compound. It easily forms picrate salts that are often more unstable and explosive than pure picric acid. These unstable picrate salts are formed when in contact with concrete, amines, bases, and metals (copper, lead, mercury, and zinc). Mixtures with aluminum and water may also ignite.

## Toxicological Properties [1,2]
Picric acid is a strong irritant and allergen that causes local, as well as systemic allergic reactions. It can cause skin damage and staining at the contact site as well as systemic poisoning when ingested or absorbed. Symptoms of exposure may include headache nausea, vomiting, diarrhea, abdominal pain, itching, urinary dysfunction, stupor, convulsions, and death. Hepatic and renal damage may also occur.

## Exposure Limits
The OSHA Permissible Exposure limit and the ACGIH Threshold Limit Value (TLV) for picric acid is 0.1 mg/m$^3$. The oral rat $LD_{50}$ is 200 mg/kg. The STEL value is 0.3 mg/m$^3$. The notation "skin" is added to indicate the possibility of cutaneous absorption. The IDLH level is 100 mg/m$^3$.

## Potential Exposures
Picric acid is used in the manufacture of explosives, rocket fuels, fireworks, colored glass, matches, electric batteries, and disinfectants. It is also used in the pharmaceutical and leather industries, and in dyes, copper and steel etching, forensic chemistry, histology, textile printing, and photographic emulsions.

## Incompatibilities
Copper; lead; zinc; other metals; salts; plaster; concrete.

## Determination in Air

Collection on a mixed cellulose ester membrane filter; extraction with aqueous methanol; and measurement by high performance chromatography with UV detector.

## Determination in Water

Methylene chloride extraction followed by gas chromatography with flame ionization or electron capture detection (EPA Method No. 604) or gas chromatography plus mass spectrometry (EPA Method No. 625).

## Routes of entry

Inhalation and ingestion of dust; percutaneous absorption; eye and sin contact.

## Harmful Effects and Symptoms

LOCAL – Picric acid dust or solutions are potent skin sensitizers. In solid form, picric acid is a skin irritant, but in aqueous solution it irritates only hypersensitive skin. The cutaneous lesions that appear usually on exposed areas of the upper extremities consist of dermatitis with erythema, popular, and vesicule eruptions. Desquamation may occur following repeated or prolonged contact. Skin usually turns yellow upon contact, and areas around nose and mouth as well as the hair are most often affected. Dust or fume may cause eye irritation that may be aggravated by sensitization. Corneal injury may occur from exposure to picric acid dust and solutions.

SYSTEMIC - Inhalation of high concentrations of dust by one worker caused temporary coma followed by weakness, myalgia, anuria, and later polyuria. Following ingestion of picric acid, there may be headache, vertigo, nausea, vomiting, diarrhea, yellow coloration of the skin, hematruia, and albuminuria. High doses may cause destruction of erythrocytes, hemorrhagic nephritis, and hepatitis. High doses that cause systemic intoxication will color all tissues yellow, including the conjunctiva and aqueous humor, and cause yellow vision.

## Target Organs

Kidneys; live; blood; skin; eyes.

## Medical Surveillance

Pre-placement and periodic medical examinations should focus on skin disorders such as hypersensitivity, atopic dermatitis, and liver and kidney function.

## First Aid

If this chemical gets into the eyes, irrigate immediately. If it contacts the skin, promptly wash with soap and copious amounts of water. If an individual breathes large amounts of picric acid, move the exposed person to fresh air at once and perform artificial respiration. When it has been swallowed, get immediate medical attention.

## Personal Protective Methods

Skin protection by dry clothing and barrier creams can avoid the irritant and sensitizing action of picric acid. Wear appropriate clothing to prevent any reasonable probability of skin contact. Wear eye protection and/or face shield to prevent any reasonable probability of eye contact. Employees should wash promptly when skin is wet or contaminated, and daily at the end of each work shift. Work clothing should be changed at least daily; change at once if it is possible that clothing is contaminated. Remove non-impervious clothing promptly if wet or contaminated. Wear appropriate protective gloves of compatible material(s). Wear an appropriate full-face respirator or SCBA for exposures exceeding the PEL/TLV.

## Proper Storage

Picric acid and its derivatives should be stored in small quantities in the original container in a cool, dry, well-ventilated area, away from sources of heat. Picric acid is considered a flammable solid and is incompatible with oxidizers, reducing agents, inorganic salts, metals, alkaloids and albumin. Improperly managed or stored picric acid may become sensitive to shock, friction, and heat. Picric acid allowed to dry out to less than 10% water by volume becomes unstable and may pose an explosion hazard in your laboratory.

**If the material appears dry, do not open or handle the container.** Contact the TAMU Hazardous Materials Emergency Response Team at 845-2132 or dial 9-911 for assistance. The following steps can be taken to reduce the chances of this occurring in your laboratory:

1. Attach a copy of the "Picric Acid Inspection Log" (included below) to your picric acid container and write the date of initial receipt.

2. After initially opening the container, inspect the material monthly to ensure that it contains enough water. The material should look like a wet paste. Document this inspection on the "Picric Acid Inspection Log" in the inspection column.

3. Re-hydrate the contents of the container every 6 months with deionized water to maintain a wet paste. Document this re-hydration on the "Picric Acid Inspection Log" in the re-hydration column. Dispose of picric acid as a hazardous waste within two years of initial receipt.

| Picric Acid Inspection Log | | | |
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| Initial Receipt Date: _____ | | | |
| Date | Inspection | Re-hydration | Name |
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## Regulatory/Code References

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| CAS | 88-89-1 |
| RETECS | TJ7875000 |
| UN | 0154 |
| EPA | Toxic Priority Pollutant |
| DOT | Class A, Explosive |

## Disposal Method Suggested

Controlled incineration in a rotary kiln incinerator equipped with particulate abatement and wet scrubber devices, at an approved/licensed TSD facility.

## For more information on chemical waste management see:

- "Guidelines for Disposal of Chemical Waste"
- "Identification and Segregation of Chemical Waste."

## If you have questions, please contact:

- Office of Engineering Safety (EH&S) at 845-4986
- TAMU Environmental Health & Safety Department at 845-2132

## References


1. Sax, N.I., and Lewis, R.J., Dangerous Properties of Industrial Materials, Van Nostrand and Reinhold, 1996.

2. Windholz, M., ed., The Merck Index. Merck & Co., Inc., 1989.