



## Nitric Acid

***Principal Investigator (PI) Approval is Required Prior to Performing this Procedure***

### Description

*This standard operating procedure outlines the handling and use of nitric acid. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when handling nitric acid.*

Nitric acid is a very strong oxidizer that can ignite on contact or react explosively with many organic and inorganic substances. The MIOSHA permissible exposure limit (PEL) for nitric acid is 2 ppm (5 mg/m<sup>3</sup>) as an 8-hour time-weighted average.

### Potential Hazards

- Contact with easily oxidizable substances (including many organic substances such as acetone, acetonitrile, various alcohols, dichloromethane, DMSO, and many others) may result in fires or explosions.
- Nitric acid also reacts violently with many inorganic substances including various bases, reducing agents, ammonia, and alkali metals, among others. Many reactions will yield toxic gases, including nitrogen dioxide (NO<sub>2</sub>).
- Concentrated nitric acid can release vapors and toxic gases (including NO<sub>2</sub>), which can cause moderate to severe health effects, especially irritation to the eyes, skin, respiratory tract, and other mucosal membranes.
- If concentrated nitric acid contacts the skin, it can cause severe burns. Dilute concentrations that contact skin can cause mild irritation.
- Contact with eyes can cause severe burns and permanent eye damage.
- If high concentrations of nitric acid are inhaled, severe respiratory irritation can develop, along with possible delayed effects such as pulmonary edema, which can be fatal.
- Though not likely, ingestion of nitric acid can cause severe corrosion and burning of the mouth, esophagus, and stomach. As little as 10 ml of ingested nitric acid can be fatal.

### Engineering Controls

An eyewash and safety shower must be available in the immediate work area for any work with nitric acid.

When working with nitric acid, always work in a clean fume hood that contains NO organic materials with the sash closed while reactions are in progress.

Always use containers/glassware free from organic materials (and other incompatibles) for work with nitric acid.

If mists are generated either mechanically or from vapor, work must be performed in a chemical fume hood to avoid inhalation.

## Work Practice Controls

- Designate an area for working with nitric acid (e.g. fume hood).

Work should be done in a way that avoids hand/glove contact with nitric acid; it should be noted that nitric acid penetrates standard nitrile gloves in 5 minutes or less. If gloves come in contact with nitric acid through a splash (or otherwise) they should be removed and changed immediately. Once work with nitric acid is complete, decontaminate the area by wiping it down with a soap and water solution.

## Personal Protective Equipment

Goggles, lab coat, closed-toe shoes, double gloves (nitrile) or chemical resistant gloves (approved for contact with nitric acid) if there is an increased risk of glove contact. If neoprene gloves are available, they offer better protection than nitrile.

Face shield and acid-resistant apron are recommended if working with a larger volume (>200ml).

Latex gloves are NOT recommended for work with nitric acid (they offer little to no protection due to easy chemical penetration).

If contact with gloves is unavoidable, gloves rated for work with nitric acid must be used. Thicker neoprene gloves typically have the best glove ratings for prolonged nitric acid exposure. Refer to the [glove compatibility charts on the Occupational Safety and Environmental Health \(OSEH\) website](#) or the individual glove manufacturer's website.

## Transportation and Storage

- Nitric acid should be stored in a well-ventilated area that is separated from organics and other combustible materials and incompatibles. Containers should be below eye level and in secondary containment.
- Store away from metal (unless the metal has a corrosion-proof coating), and do not store under the sink.
- Avoid storing on the floor.
- Ensure primary and secondary containment is free from organic chemicals/solvents.
- Transport corrosives in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.

## Waste Disposal

Handle and store nitric acid wastes following the guidelines above while accumulating wastes and awaiting chemical waste pickup. Because most spent, unused and expired chemicals/materials are considered hazardous wastes, they must be properly disposed of. **Do not dispose of chemical wastes by dumping them down a sink, flushing in a toilet or discarding in regular trash containers, unless authorized by UM Flint EHS.** Contact Environment, Health and Safety (EHS) at (810) 766-6763 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also refer to UM-Flint Hazardous Waste Management Program and EHS webpage <http://www.umflint.edu/ehs/environment-health-and-safety> for more information.

## Exposures/Unintended Contact



**If the employee is in need of emergency medical attention, call 911 immediately.**



For an actual chemical exposure/injury:

- **Chemical Spill on Body or Clothes** – Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention (see below).
- **Chemical Splash Into Eyes** – Immediately rinse eyeball and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention (see below).
- Note: In case of inhalation, symptoms may be delayed up to 24 hours
- If swallowed, DO NOT INDUCE VOMITING. Never give anything by mouth to an unconscious person. Wash mouth with water, and then give plenty of water slowly to drink and **obtain urgent medical attention**.

Contact EHS for advice on symptoms of chemical exposure, or assistance in performing an exposure assessment.

Report all work related accidents, injuries, illnesses or exposures to UM-Flint DPS. Additionally, employees and supervisors must be sure to report the injury to EHS and complete and submit the [Illness and Injury Report Form](#) to WorkConnections within 24 hours. Follow the directions on the WorkConnections website [Forms Instructions](#) to obtain proper medical treatment and follow-up.

If you were involved in or observed an incident or near miss, please complete the [EHS Laboratory Incident and Near-Miss Report Form](#). This will be valuable in improving laboratory safety on UM-Flint campus.

**TREATMENT FACILITIES:**

<b><u>MAJOR INJURIES</u></b>	<b><u>MINOR INJURIES –During Business Hours</u></b>	<b><u>MINOR INJURIES –After Business Hours</u></b>
<p><b>Genesys Hospital</b> One Genesys Parkway Grand Blanc, MI 48439 (810) 606-5710</p> <p><b>Hurley Medical Center</b> One Hurley Plaza Flint, MI 48503 (810) 262-9000</p> <p><b>McLaren Hospital Flint</b> 401 South Ballenger Hwy Flint, MI 48532 (810) 342-2000</p>	<p><b>Genesys Occupational Health Network</b> 1460 Center Rd. Burton, MI 48509 (810) 715-4620 Mon. to Fri. 7:30 am to 10 pm Sat. &amp; Sun. Noon to 8 pm</p> <p><b>McLaren Flint-Burton OCC Center</b> 1459 S. Center Rd. Burton, MI 48509 (810) 496-0900 Mon. - Fri. 8 am to 8 pm Sat &amp; Sun 10 am to 2 pm</p>	<p><b>Downtown Flint</b> 420 S. Saginaw St. Flint, MI 48502 (810) 762-1550</p> <p><b>Genesys East</b> 1096 S. Belsay Rd, Suite F Burton, MI 48509 (810) 743-3351</p> <p><b>Genesys North</b> 4154 W. Vienna Rd Clio, MI 48420 (810) 686-7397</p> <p><b>Genesys South</b> 8447 N. Holly Rd Grand Blanc, MI 48439 (810) 603-0856 Mon. - Fri. 6 to 10pm / Sat. &amp; Sun. 1-10pm</p>

Click [here](#) for more information on the UM – Flint Emergency Preparedness and Response Plan.

## Spill Procedure

- When a spill occurs, ***personal safety should always come first.***
- Alert and clear everyone in the immediate area where the spill occurred.
- Use proper personal protective equipment as indicated above.
- Use appropriate spill kits/sorbents to neutralize corrosives and/or absorb spill. Collect residue, place in container and contact EHS at (810) 766-6763 for proper disposal.

If any nitric acid solution is spilled OUTSIDE of the fume hood, open the hood sash fully, leave the lab and call UM-Flint Department of Public Safety (DPS) at 911 to request assistance from EHS. Do not take any action to cover the spill. Post a warning on the lab and do not allow others to enter. Have a person available that has knowledge of the incident and laboratory to assist emergency personnel.

## Additional Spill Response Steps:

### MAJOR CHEMICAL SPILL

- Attend to injured or contaminated persons and remove them from exposure.
- Alert people in the laboratory to evacuate.
- **Call UM-Flint DPS at 911 immediately for assistance.**
- Close doors to affected area.
- Post warnings to keep people from entering the area.
- Have person available that has knowledge of incident and laboratory to assist emergency personnel.

## Additional Spill Links:

- [www.oseh.umich.edu/pdf/chemspil.pdf](http://www.oseh.umich.edu/pdf/chemspil.pdf)
- <http://www.oseh.umich.edu/emer-chemical.shtml>.

Report all emergencies, suspicious activity, injuries, spills, and fires to the UM-Flint Department of Public Safety (DPS) at 911 from any university telephone or (810) 762-3333 from cell phone or non-university telephone. Register with the [University of Michigan-Flint Emergency Alert System](#) via Wolverine Access. Also, preprogram the UM-Flint DPS telephone number (810) 762-3333 into your cell phone for quick, easy use.

## Training of Personnel

All personnel are required to complete Laboratory Safety Training. Documentation of the training is required. This training can be accomplished by completing the ***Comprehensive Laboratory Safety*** session (**BLS009** or equivalent) via [MyLINC](#), or UM-Flint EHS on-line training or other equivalent approved by EHS. Furthermore, all personnel shall read and fully adhere to this SOP when handling nitric acid.

**Certification**

I have read and understand the above SOP. I agree to contact my Supervisor or Lab Manager if I plan to modify this procedure.

Name	Signature	UM ID #	Date

Principal Investigator \_\_\_\_\_

Revision Date \_\_\_\_\_