



# Biological Toxins

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

**Description**

*This document serves as a guide for laboratories that use biological toxins. Review this document and supply the information required in order to make it specific to your facility. Facilities that possess and use these materials should follow procedures, use appropriate containment equipment, and wear personal protection appropriate for the hazard posed by these materials. The CDC/NIH manual, Biosafety in Microbiological and Biomedical Laboratories, provides additional guidance for laboratories handling toxins.*

All lab members working with wild-type diphtheria toxin (DT) must have received Td booster vaccinations within the last 5 years. In addition, available vaccinations for any toxins (ex. pertussis toxin, tetanus toxin) must be offered to all lab members working with those materials.

Under the CDC regulations, certain listed toxins are exempt from the Select Agent registration **provided that the PI does not at any time possess more than the following aggregate amount of toxin.** Laboratories using quantities of toxins below federally established thresholds are required to follow the procedures outlined in the OSEH CDC Select Agents Guideline. **PIs in possession of any of the toxins listed below must complete the [OSEH Toxin Declaration Form](#).**

**The select agent toxins and the exempt amount that can be used include:**

HHS Toxin	Amount
Abrin	100 mg
Botulinum neurotoxins	0.5 mg
Short, paralytic alpha conotoxins	100 mg
Diacetoxyscirpenol (DAS)	1000 mg
Ricin	100 mg
Saxitoxin	100 mg
Staphylococcal enterotoxins (Subtypes A, B,C, D and E)	5 mg
T-2 toxin	1000 mg
Tetrodotoxin	100 mg

**Non-select agent toxins and their LD50 values include:**

Toxin	LD50 (ug/kg)
Aerolysin	7.0
b-bungarotoxin	14.0
Caeruleotoxin	53
Cereolysin	40-80
Cholera toxin	250
Clostridium difficile enterotoxin A	0.5
Clostridium difficile cytotoxin B	220
Clostridium perfringens kappa toxin	1500
Toxin	LD50 (ug/kg)

Clostridium perfringens perfringolysin O	13-16
Clostridium perfringens enterotoxin	81
Clostridium perfringens beta toxin	0.4
Clostridium perfringens delta toxin	5
Clostridium perfringens epsilon toxin	0.1
Crotoxin	82
Diphtheria toxin	0.1
Listeriolysin	3-12
Leucocidin	50
Modeccin	1-10
Nematocyst toxins	33-70
Notexin	25
Pertussis toxin	15
Pneumolysin	1.5
Pseudomonas aeruginosa toxin A	3
Shiga toxin	20
Shigella dysenteriae neurotoxin	1.3
Streptolysin O	8
Streptolysin S	25
Taipoxin	2
Tetanus toxin	0.001
Viscumin	2.4-80
Volkensin	1.4
Yersinia pestis murine toxin	10

### Engineering Controls

All work with toxins should be conducted within the operationally effective zone of the Biosafety Cabinet (BSC) or fume hood. Each user should verify the inward airflow before initiating work. Engineering controls must be inspected in order to ensure efficient removal of hazard. Notification of laboratory personnel must be made prior to any maintenance that will impact the capture velocity of ventilation systems. Local exhaust ventilation systems including laboratory-type chemical fume hoods and BSCs must be certified upon installation, after maintenance and annually thereafter. Use of a chemical fume hood may require secondary containment with HEPA filtration to prevent contamination of ductwork.

### Work Practice Controls

- Resuspend the toxin by careful and slow titration, rinsing down the walls of the tube in the process.
- An emergency shower and eyewash station or eyewash/drench hose combination unit is recommended in locations where toxins are used.
- A hand-washing sink must be readily available to all locations where toxins are used.
- Laboratory work with toxins can be done only in designated rooms with controlled access and at pre-determined bench areas. When toxins are in use, the area/room should be clearly posted: "Toxins in Use – Authorized Personnel Only."
- Standard sharps should not be used with biological toxins. If it is absolutely necessary to use sharps with toxins, sharps with engineering controls (i.e. self-sheathing) must be used. Used needles must be disposed of in an approved sharps container immediately after use. Used needles should not be set on the bench, sheared, bent or re-capped prior to disposal.

- Restraint devices and practices should be used to reduce the risk of exposure during animal manipulation and administration should take place inside a certified BSC or fume hood.
- Toxin should be removed from the BSC or fume hood only after the exterior of the closed primary container has been decontaminated (with a solution appropriate for specific toxin) and placed in a clean secondary container.
- The interior of the BSC or hood should be decontaminated periodically, for example, at the end of a series of related experiments.
- Until thoroughly decontaminated, the fume hood or BSC should be posted to indicate that toxins remain in use, and access should remain restricted.
- Remove and dispose or decontaminate protective clothing and wash hands with soap and water before leaving the work area.

### **Protective Equipment (PPE)**

At a minimum, lab personnel must wear safety glasses, suitable laboratory PPE to protect hands and arms (such as lab coats, smocks, or coveralls), and disposable gloves when working at an open-fronted BSC or fume hood.

When handling toxins that are percutaneous hazards (irritants, necrotic to tissue, or extremely toxic by dermal exposure), select gloves that are known to be impervious to the toxin. Consider both the toxin and the diluent when selecting gloves or other protective clothing. If infectious agents and toxins are used in an experimental system, consider both when selecting protective clothing and equipment. Respiratory protection may be required if aerosols may be generated and it is not possible to use containment equipment or other engineering controls.

### **Transportation and Storage**

- Toxin containers must be labeled with the toxin name and hazard warnings.
- Toxins should be transported only in leak-proof secondary containers.
- When toxins are stored in the lab, containers should be sealed, legibly labeled and secured to ensure restricted access.
- Use spill trays in fume hoods, BSC or glove boxes for work with toxins, especially in solution.
- Refrigerators and other storage containers containing biological toxins should be labeled with contact information for trained, responsible laboratory staff.

### **Security**

- Toxins should be stored within a locked freezer, refrigerator or cabinet when not in use. Freezers, refrigerators, cabinets, and other containers where stocks of select agents are stored must be locked when they are not in direct view of the workers (e.g., when located in unattended storage areas).
- An inventory control system should be in place.
- Access to areas containing toxins should be restricted to those whose work assignments require access

### **Waste Disposal**

Before disposal, destroy select agent biological toxins by using appropriate chemical or physical agents (i.e. sodium hypochlorite and / or sodium hydroxide solution or by autoclave).

## Medical Surveillance

Medical surveillance may be required for laboratory personnel based on potential risks of exposure. The PI should determine the need for medical surveillance with the assistance of Environment, Health and Safety (EHS) at (810) 766-6763.

## Exposures/Unintended Contact



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



For an actual chemical exposure/injury:

- Flush exposed eyes or skin with water for at least 15 minutes, then seek medical attention (see below).
- Leave the area and into fresh air (for inhalation hazards).

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:

<u>MAJOR INJURIES</u>	<u>MINOR INJURIES –During Business Hours</u>	<u>MINOR INJURIES –After Business Hours</u>
<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

- For small spills of dilute solution (inside or outside BSC or fume hood): At a minimum, safety glasses, lab coat, smock, or coveralls should be worn, along with appropriate gloves to clean up a spill. If splashing may occur, safety goggles and a face shield must be worn in place of safety glasses. Cover spill with paper towel or other disposable, absorbent material. Apply a decontamination solution to the spill, beginning at the perimeter and working towards the center, and allow sufficient time to completely inactivate the toxin. Collect clean up materials in a biohazard bag. Notify your supervisor and EHS at (810) 766-6763 of the spill immediately.

### BSC/Fume Hood Failure

- Close or cover all toxin containers. Shut down operations, close hood sash, and evacuate room. Contact your maintenance provider to repair the BSC or fume hood.

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 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 these toxins. Personnel must have training as to the symptoms of toxin exposure, post-exposure management, spill cleanup and decontamination, proper use of engineering and work practice controls, personal protective equipment and security requirements. Additional training is required for Select Agent Toxin use.

### 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 \_\_\_\_\_