

**BIOHAZARDOUS AGENT REFERENCE DOCUMENT**

## Diphtheria toxin (DT)

The Biohazardous Agent Reference Document (BARD) is a general guidance resource that reviews and summarizes the nature of a pathogen or biotoxin, and offers safety requirements for work with the agent in the laboratory. The BARD may replace the formal SOPs used in conjunction with some IBC registrations.

The BARD is provided as an additional guidance tool, and is not a substitute for a risk assessment, biosafety training, lab-specific training, or a formal [IBC master protocol registration](#). This document should be readily available in the laboratory, and it is the responsibility of the Laboratory Supervisor or Principal Investigator to ensure that all personnel have read, understood, and signed the document. The BARD is for informational purposes only, and is not intended to be a substitute for professional medical advice, diagnosis, or treatment. Please consult a health care provider for any medical questions or concerns.

**INSTRUCTIONS**

- 1. Review the information contained in this document.**
- 2. Add any necessary information that is specific to your work in the laboratory (such as strain-specific information). Please be sure that the track changes function is turned on to indicate any changes that you make.**
- 3. Instruct all personnel to review the BARD and sign the last page, indicating that they have read and understood the information.**
- 4. Submit the BARD along with your IBC master protocol registration, amendment, or continuing review.**

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### Diphtheria toxin (DT)

CHARACTERISTICS	
<b>Morphology</b>	Bacterial exotoxin that inhibits protein synthesis in eukaryotic cells
<b>Characteristics</b>	Natural source is <i>Corynebacterium diphtheria</i>

HEALTH HAZARDS	
<b>Host Range</b>	Humans. Rarely: cows, cats, horses
<b>Modes of Transmission</b>	Inhalation, ingestion, mucous membrane contact, percutaneous
<b>Signs and Symptoms</b>	Cranial, motor, and sensory nerve palsies, fever, localized irritation, seizures, myocarditis, endocarditis, organ necrosis, death.
<b>Lethal Dose (LD50)</b>	In mice: 0.01 micrograms/kg (intravenous) or 1.0 micrograms/kg (subcutaneous, intraperitoneal)
<b>Incubation Period</b>	2 – 4 days for clinical disease

MEDICAL PRECAUTIONS / TREATMENT	
<b>Prophylaxis</b>	Booster dose of diphtheria toxoid
<b>Vaccines</b>	Vaccination with booster recommended every 10 years (typically combined with tetanus & pertussis vaccines as Tdap and administered to young children)
<b>Treatment</b>	Administer antitoxin, treat symptomatically
<b>Surveillance</b>	Monitor for clinical disease symptoms
<b>UVM IBC Requirements</b>	Report any exposures or signs and symptoms to your supervisor
<b>Additional Medical Precautions</b>	

LABORATORY HAZARDS	
<b>Laboratory Exposures</b>	33 cases of lab-acquired diphtheria infections reported as of 1976
<b>Sources</b>	Lyophilized toxin, exudates or secretions of the respiratory system, wounds, blood, or skin of infected animals

CONTAINMENT REQUIREMENTS	
<b>BSL - 2</b>	Preparation/dilution of the agent, work with clinical specimens and cultures known or suspected to contain the agent
<b>BSL - 3</b>	
<b>ABSL - 2</b>	Administration of the agent to an animal model. Use mechanical or anesthetic restraint for injections.
<b>ABSL - 3</b>	
<b>Aerosol generating activities</b>	Centrifugation, homogenizing, vortexing or stirring, pipetting, pouring liquids, filling or expelling syringes
<b>Primary containment device (BSC)</b>	Use a biosafety cabinet for preparing stocks, and for all manipulations of DT

EXPOSURE PROCEDURES	
<b>Mucous membranes</b>	Immediately flush eyes, mouth or nose for 15 minutes at eyewash station, seek medical attention.
<b>Other exposures</b>	Wash area with soap and water, seek medical attention.
<b>Medical Follow-Up</b>	Contact UVMHC Infectious Disease Dept. directly at <b>(802) 847-2700</b> for immediate assistance
<b>Reporting</b>	Report all exposures or near misses to: <ol style="list-style-type: none"> <li>1. Your immediate Supervisor</li> <li>2. The UVM Biosafety Officer at <b>(802) 777-9471</b> and Risk Management at <b>6-3242</b></li> <li>3. Risk Management and Safety; <a href="https://www.uvm.edu/riskmanagement/incident-claim-reporting-procedures">https://www.uvm.edu/riskmanagement/incident-claim-reporting-procedures</a></li> </ol>

PERSONAL PROTECTIVE EQUIPMENT (PPE)	
<b>Minimum PPE Requirements</b>	Nitrile gloves, lab coat, appropriate eye/face protection
<b>Additional Precautions (Risk assessment dependent)</b>	Sharps use strictly limited. Store DT locked up. Due to risk of inhalation, respirators may be required when working with DT. Medical clearance, fit testing and training is required annually per UVM's Respiratory Protection Program; <a href="https://www.uvm.edu/riskmanagement/personal-protective-equipment">https://www.uvm.edu/riskmanagement/personal-protective-equipment</a>

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VIABILITY	
<b>Disinfection</b>	Freshly prepared 10% bleach with a 30 minutes contact time
<b>Inactivation</b>	Autoclaving at 121°C for 1 hour liquid cycle
<b>Stability in Environment</b>	Stable at room temperature and normal pressures

SPILL CLEAN UP PROCEDURES	
<b>Small Spill</b>	Notify others working in the lab. Allow aerosols to settle. Don appropriate PPE. Cover area of the spill with paper towels and apply approved disinfectant, working from the perimeter towards the center. Allow 30 minutes of contact time before clean up and disposal. Dispose in double biowaste bags and biobox.
<b>Large Spill</b>	<p><b>Inside of a lab:</b> Call UVM Service Operations at 656-2560 and press option 1 to speak to a dispatcher. Ask them to page Risk Management and Safety.</p> <p><b>Outside of a lab:</b> Pull the nearest fire alarm and evacuate the building. Wait out front of the building for emergency responders to arrive.</p>

REFERENCES	
Canadian PSDS	<a href="https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/corynebacterium-diphtheriae.html">https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/corynebacterium-diphtheriae.html</a>
BMBL	<a href="https://www.cdc.gov/biosafety/publications/bmb15/">https://www.cdc.gov/biosafety/publications/bmb15/</a>
CDC Guidelines	<a href="https://www.cdc.gov/diphtheria/">https://www.cdc.gov/diphtheria/</a>
Applied Biosafety	Johnson B, Mastnjak R, Resnick IG. 2001. Safety and Health Considerations for Working with Biological Toxins. Applied Biosafety. 6 (3): 117-135

STUDENT / EMPLOYEE NAME	SIGNATURE	DATE

**Biosafety Review:**

\_\_\_\_\_  
Jeff LaBossiere, Biological Safety Officer

\_\_\_\_\_  
Date

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

IBC Registration #: \_\_\_\_\_