The University of Vermont
Risk Management & Safety
Biosafety Office

BIOHAZARDOUS AGENT REFERENCE DOCUMENT

Tetrodotoxin (TTX)

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.**

Principal Investigator: _____ IBC Registration #: _____

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CHARACTERISTICS	
Morphology	Potent neurotoxin with a chemical formula of $C_{11}H_{17}N_3O_8$, and molecular weight 319.27 g/mol. May be isolated from biological source or laboratory synthesized.
Characteristics	Interferes with conduction of nerve impulses by blocking sodium channels. Synonyms: Maculotoxin, TTX, Fugu poison, Tarichatoxin

HEALTH HAZARDS	
Host Range	Humans, other mammalian species
Modes of Transmission	Inhalation, ingestion, injection, dermal exposure, mucous membrane contact
Signs and Symptoms	Numbness or tingling of the mouth, hands, and feet, dizziness, headache, nausea, excessive salivation or sweating, muscle paralysis or ataxia, dilated pupils, abdominal pain, vomiting, diarrhea, weakness, shortness of breath, irregular heartbeat, slow pulse rate, low blood pressure, pulmonary edema, respiratory failure, coma, seizures, death.
Toxic Dose	Median LD_{50} for mice is 334 micrograms/kg (oral) or 8 micrograms/kg (injected)
Incubation Period	10 minutes to 6 hours, death may occur as early as 20 minutes after ingestion of naturally occurring toxin.

MEDICAL PRECAUTIONS / TREATMENT	
Prophylaxis	None available
Vaccines	None available
Treatment	None available, supportive treatment only
Surveillance	Monitor for symptoms
UVM IBC Requirements	Report any exposures or signs and symptoms to your supervisor. Select Agent, maximum permissible quantity is 500 mg.
Additional Medical Precautions	

LABORATORY HAZARDS	
Laboratory Exposures	No data.
Sources	Occurs naturally in the skin, intestine, sex organs, and liver of some species of fish (order Tetraodontidae), and some species of amphibians, octopus, and shellfish. May also be produced by some species of bacteria associated with these animals.

CONTAINMENT REQUIREMENTS	
BSL - 2	Preparation/dilution of the agent, work with clinical specimens and cultures known or suspected to contain the agent
BSL - 3	
ABSL - 2	Administration of the agent to an animal model, may be housed at ABSL-1 post-exposure
ABSL - 3	
Aerosol generating activities	Centrifugation, homogenizing, vortexing or stirring, pipetting, pouring liquids, filling or expelling syringes
Primary containment device	Use a chemical fume hood, ducted BSC, or glove box for preparing stocks and dilutions

EXPOSURE PROCEDURES	
Mucous membranes	Flush eyes, mouth or nose for 15 minutes at eyewash station, seek medical attention.
Other exposures	Wash area with soap and water for 15 minutes, seek medical attention
Medical Follow-Up	Contact UVMMC Infectious Disease Dept. directly at **(802) 847-2700** for immediate assistance. Bring this document with you if seeking medical care.
Reporting	Report all exposures or near misses to: 1. Your immediate Supervisor 2. The UVM Biosafety Officer at **(802) 777-9471** and Risk Management at **6-3242** 3. Risk Management and Safety; https://www.uvm.edu/riskmanagement/incident-claim-reporting-procedures

PERSONAL PROTECTIVE EQUIPMENT (PPE)	
Minimum PPE Requirements	Nitrile gloves, lab coat, appropriate eye/face protection. Wash hands after removing gloves.
Additional Precautions (Risk assessment dependent)	Sharps use strictly limited. Store in a secure location. Due to risk of inhalation, respirators may be required when working with TTX. Medical clearance, fit testing and training is required annually per UVM's Respiratory Protection Program: https://www.uvm.edu/riskmanagement/personal-protective-equipment

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VIABILITY	
Disinfection	Susceptible to 1 – 2.5% sodium hypochlorite with a 30-minute contact time
Inactivation	Autoclaving NOT effective
Stability in Environment	Stable at room temperature and normal pressures

SPILL CLEAN UP PROCEDURES	
Small Spill	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.
Large Spill	**Inside of a lab:** Call UVM Service Operations at 656-2560 and press option 1 to speak to a dispatcher. Ask them to page Risk Management and Safety. **Outside of a lab:** Pull the nearest fire alarm and evacuate the building. Wait out front of the building for emergency responders to arrive.

REFERENCES	
NIH/NLM PubChem	https://pubchem.ncbi.nlm.nih.gov/compound/tetrodotoxin#section=Top
BMBL	https://www.cdc.gov/biosafety/publications/bmbl5/
CDC Guidelines	https://www.cdc.gov/niosh/ershdb/emergencyresponsecard_29750019.html
FDA	https://www.fda.gov/food/foodborneillnesscontaminants/causesofillnessbadbugbook/default.htm

STUDENT / EMPLOYEE NAME	SIGNATURE	DATE

Biosafety Review:

_____ _____

Jeff LaBossiere, Biological Safety Officer — Date

Principal Investigator: _____ IBC Registration #: _____