Standard Operating Procedure
For
Tetrodotoxin

PURPOSE:
Tetrodotoxin is an extremely potent poison (toxin) found mainly in the liver and sex organs (gonads) of some fish, such as puffer fish, globefish, and toadfish (order Tetraodontiformes) and in some amphibian, octopus, and shellfish species. Human poisonings commonly occur when the flesh and/or organs of the fish are improperly prepared and eaten. A natural or synthetic form may be used in research laboratories; exposure in the laboratory setting has similar characteristics as natural exposure. It is known to interfere with the transmission of signals from nerves to muscles by blocking sodium channels. This results in rapid weakening and paralysis of muscles, including those of the respiratory tract, which can lead to respiratory arrest and death. This document establishes procedures for the safe handling and use of Tetrodotoxin.

COMMON NAMES:
Fugu poison, Maculotoxin, Spheroidine, Tarichatoxin, Tetrodontoxin, TTX

APPEARANCE:
Tetrodotoxin is a colorless or white crystalline solid or powder that darkens when heated above 428°F (220°C).

MODES OF TRANSMISSION: While inhalation is the most common route of exposure in the laboratory, tetrodotoxin can also cause poisoning through accidental ingestion, inoculation, or mucous membrane exposure.

SIGNS/SYMPTOMS

Time to onset of symptoms: Tetrodotoxin poisoning may either have rapid onset (10 to 45 minutes) or delayed onset (generally within 3 to 6 hours but rarely longer). Death may occur as early as 20 minutes, or as late as 24 hours, after exposure; but it usually occurs within the first 4 to 8 hours. Patient/Victims who live through the acute intoxication in the first 24 hours usually recover without residual deficits. Symptoms may last for several days and recovery takes days to occur.

Symptoms:

First Stage: numbness and sensation of prickling and tingling (paresthesia) of the lips and tongue, followed by facial and extremity paresthesias and numbness, headache, sensations of lightness or floating, profuse sweating (diaphoresis), dizziness, salivation (ptyalism), nausea, vomiting (emesis), diarrhea, abdominal (epigastric) pain, difficulty moving (motor dysfunction), weakness (malaise), and speech difficulties.
Second Stage: Increasing paralysis, first in the extremities, then in the rest of the body, and finally in the respiratory muscles; difficulty breathing or shortness of breath (dyspnea); abnormal heart rhythms (cardiac dysrhythmias or arrhythmia); abnormally low blood pressure (hypotension); fixed and dilated pupils (mydriasis); coma; seizures; respiratory arrest; and death.

Toxic Dose: A dose of approximately 10 μg/kg is thought to be a serious toxic dose for humans based on extrapolated animal data.

CONTAINMENT RECOMMENDATIONS:

BSL-2 practices, containment equipment, and facilities are required when working with clinical specimens and cultures known or suspect to contain Tetrodotoxin. Lab coats, gloves and eye protection should be worn while handling materials containing Tetrodotoxin. When conducting liquid transfers and other operations that pose a potential splash or droplet hazard in an open-fronted hood or BSC, safety glasses and disposable facemask, or a face shield, should be worn.

Tetrodotoxin should be removed from the hood or BSC only after the exterior of the closed primary container has been decontaminated and placed in a clean secondary container. Tetrodotoxin solutions, especially concentrated stock solutions, should be transported in leak/spill-proof secondary containers.

ABSL-2 practices, containment equipment and facilities are recommended for activities involving experimentally or naturally poisoned animals or tissues.

ACCIDENTS OR INJURIES:

Skin Exposure: Immediately go to the sink and thoroughly wash the skin with soap and water for five minutes and contact the University Employee Occupational Health Clinic (919-966-9119).

Splash to Eye(s), Nose, or Mouth: Immediately flush the area with copious quantities of water and contact the University Employee Occupational Health Clinic (919-966-9119).

Spill Procedures:

Do not attempt to clean-up if you feel unsure of your ability to do so or if you perceive the risk to be greater than normal laboratory operations.

In the event of a spill, avoid splashes or generating aerosols during cleanup by covering the spill with paper towels or other disposable, absorbent material. Apply an appropriate decontamination solution to the spill, beginning at the perimeter and working towards the center, and allow sufficient contact time to completely inactivate the toxin (see table 2 http://ehs.unc.edu/manuals/biological/chapter-17/).

ADDITIONAL INFORMATION:

Please refer to Chapter 17 of the Biological Safety Manual (Guidelines for work with Toxins of Biological Origin) http://ehs.unc.edu/manuals/biological/chapter-17/