

## Saxitoxin

*Saxitoxin is a neurotoxin primarily produced by some species of marine dinoflagellates. It is a small molecular weight toxin (MW = 299). Saxitoxin is an extremely potent biological toxin with the potential for development of life-threatening symptoms within minutes to hours of exposure. Potential exposure routes in a laboratory environment include cuts or punctures through the skin as well as oral and aerosol exposures.*

### General Safety considerations:

- As with tetrodotoxin, exposure to saxitoxin can be rapidly fatal! Upon any exposure to any amount of saxitoxin that could cause symptoms, call 911 immediately! If UW-Madison Office of Biological Safety (OBS) requires that you handle the saxitoxin in containment, then it is a large enough amount to require calling 911 upon exposure.
- After exposure to saxitoxin, the PI and supervisor MUST notify the UW-Madison Office of Biological Safety (OBS), UW-Madison Select Agent staff, and UW-Madison Occupational Medicine staff. A First Report of Exposure/Release MUST be submitted within 24 hours of an exposure to saxitoxin.
- Exposure routes: Inhalation, oral, and parenteral (through the skin).
- Saxitoxin blocks sodium channels in nerve cell membranes. This leads to paralysis of nerve and muscle function, including muscles involved in breathing.
- Saxitoxin is generally acquired in powdered form. Dry forms of saxitoxin are **always** handled in a chemical fume hood or ducted certified biological safety cabinet. **Be extremely careful** when handling any amount of saxitoxin in dry form. Only order as much as you need to use in the immediate future and resuspend the entire vial at once rather than weighing out aliquots.
- Saxitoxin is unusually resistant to steam autoclaving. However, it is slightly less resistant to bleach than tetrodotoxin, so treatment of saxitoxin with 10% aqueous bleach solution for at least 30 minutes is an effective method of inactivation.

### Biosafety Protocol

*At UW-Madison, research laboratories that utilize purified Saxitoxin in their research programs must list information about use of the toxin in their Bio-ARROW protocol. The UW-Madison Institutional Biosafety Committee will review all protocols that include use of Saxitoxin, and review will be in the closed session portion of the meeting because of its status as a Select Agent Toxin. Following is information about adding Saxitoxin to specific sections of the Bio-ARROW protocol:*

#### Select Agents

- The Federal Select Agent Program does not regulate certain Select Agent (SA) toxins if the amount under the control of a PI does not exceed, at any time, the amounts indicated on

their website (<https://www.selectagents.gov/permissibletoxinamounts.html>). UW-Madison requires that PIs maintain an accurate inventory of SA toxins and secure the toxins in their laboratory. Inventory reports are submitted semi-annually (every 6 months) to the Office of Biological Safety ([biosafety@fpm.wisc.edu](mailto:biosafety@fpm.wisc.edu)).

- The permissible amount of saxitoxin, that an investigator can possess in their laboratories without registering as a Select Agent laboratory, is 500 mg.
- Select Agent Principal Investigator (PI):
  - If the PI of the protocol is a Select Agent registered person, please contact the UW-Madison Select Agent Program for guidance about listing saxitoxin on the protocol.
  - If the PI of the protocol is not a Select Agent registered person, select “No”.

### Microbes

- Microbes treated with saxitoxin are handled at BSL2 or (if applicable) BSL3.

### Biological Toxins: Biological Toxins Details

- Select Agent: Yes
- Botulinum Toxin: No
- Biological Toxin Select Agent Inventory: Please indicate that toxin is kept in a secured fridge or freezer, a current inventory is maintained, and semi-annual (every 6 months) inventory reports are submitted to the Office of Biological Safety at [biosafety@fpm.wisc.edu](mailto:biosafety@fpm.wisc.edu).
- Amount: Estimated maximum total amount of saxitoxin you will have in your laboratory. Note that the total amount of saxitoxin under the control of the PI at any time must not exceed 500 mg.
- Form: Enter all forms handled (dry/lyophilized, aqueous, etc.) and note if the dry/lyophilized form is only handled for reconstituting.
- LD<sub>50</sub>: 0.6 ug/kg (parenteral, human); 5.7 ug/kg (oral, human).
- Biosafety Level: BSL2
- Storage only: Select “yes” only if all of the saxitoxin in the laboratory is now remaining in storage and is not in active use in your research program.

### Cells, Organs, Tissues, or Biological Specimens

- Cells and tissues are administered saxitoxin in a biological safety cabinet at BSL2. Requests to handle saxitoxin outside of containment must be reviewed by the Office of Biological Safety and approved by the IBC.
- Treated cells or tissues are subsequently handled at BSL2.

### Vertebrate Animals

- ABSL2 housing is adequate for most animal studies involving saxitoxin. OBS staff will work with labs to determine the required biosafety level for these animals, and whether administration of saxitoxin to animals must occur in a BSC.

### Containment

- Aerosol Generating Activities: Cage changes of rodents treated with saxitoxin must be performed in a biological safety cabinet.

### PPE

- Lab coat, eye protection, and disposable gloves must be worn when handling saxitoxin.
- Depending on the research activities being performed with saxitoxin, a fit-tested respirator (N95, etc.) may also be required.

### Disinfection and Inactivation - Animal

- Because saxitoxin could potentially be present in bedding of saxitoxin-treated animals bedding must be treated to inactivate saxitoxin prior to disposal. A minimum of 10% bleach for at least 30 minutes is needed to inactivate saxitoxin.
- Carcasses of animals injected with saxitoxin should not need to be autoclaved prior to pick-up for incineration unless they need to be autoclaved for a different reason (also infected with a Risk Group 3 pathogen, for instance).

### Disinfection and Inactivation - General: Biotoxins

- Saxitoxin is heat resistant and is resistant to inactivation by steam autoclaving. However, saxitoxin should be inactivated by treatment with at least 10% aqueous bleach solution for at least 30 minutes.
- Because of the potential aerosol risk, spills of saxitoxin outside of containment must include evacuation of the lab for at least 30 minutes to allow dissipation of aerosols.
- Because the microwave inactivation process utilized at MERI may be insufficient to inactivate saxitoxin, materials being sent to MERI that may contain saxitoxin must first be treated to inactivate any saxitoxin present.

### Spill and Release Procedures:

- Please note that the Biosafety in Microbiological and Biomedical Laboratories (BMBL), current edition, recommends the following PPE are worn during a cleanup for a liquid toxin spill: mask, gloves, safety glasses or goggles and laboratory coat.

### Signage

- A "Toxins in Use" sign is posted on the laboratory door when saxitoxin is being handled. The sign can be removed when no toxin is in use.
- Cage cards must specify that animals have been treated with saxitoxin.

### Emergency Response

- UW-Medicine Occupational Medicine provides Medical Response plans for biological toxins and infectious agents through a link at <https://ehs.wisc.edu/workplace-safety/occupational-medicine-2/>.
- Emergency Response - General: Depending on the amount involved, exposures to saxitoxin could potentially lead to development of symptoms within minutes. Symptoms

after exposure could include respiratory arrest or death. Thus, the first response to a saxitoxin exposure is typically to call 911. Also, immediately wash or flush the affected area with soap and water for 15 minutes. Use an eyewash for 15 minutes after a splash to the eye. After a needlestick, immediately remove gloves and “bleed out” the wound under running water for 15 minutes. PI or supervisor must submit a First Report of Exposure/Release form as soon as possible, and within 24 hours.

- Upon adding saxitoxin to your biosafety protocol, OBS personnel will conduct a risk assessment of the details of the proposed saxitoxin usage (amount utilized, etc.) and will provide specific handling recommendations, including emergency response.
- OBS may require a separate spill protocol specifically for saxitoxin.

### Laboratory Training

- Individuals handling saxitoxin or working in a laboratory where saxitoxin is being handled must receive training about potential risks from exposure to the toxin as well as safe handling of the toxin as outlined in the biosafety protocol.
- Individuals handling saxitoxin must receive training about security and inventory requirements for saxitoxin.
- A separate spill protocol for saxitoxin may be required.

### Research Description

- Briefly describe what you will be doing with saxitoxin, including the amount that may be utilized at any one time. Specify the form of saxitoxin handled (typically aqueous).
- Specify the location and biosafety level for research involving saxitoxin.

### **Contacts and Additional Information**

*The sources listed may provide additional information about safe use of saxitoxin in research laboratories at UW-Madison:*

- Office of Biological Safety (OBS); [biosafety@fpm.wisc.edu](mailto:biosafety@fpm.wisc.edu), 608-263-2037
- Chemical Safety Department; [chemsafety@fpm.wisc.edu](mailto:chemsafety@fpm.wisc.edu), 608-265-5700
- Occupational Medicine; [occmmed@uhs.wisc.edu](mailto:occmmed@uhs.wisc.edu), 608-265-5610
- First Report of Exposure or Release Form; <https://ehs.wisc.edu/first-report-of-biological-exposure-or-release-event/>
- Bio-ARROW KnowledgeBase; <https://kb.wisc.edu/arrow/ibc/page.php?id=43188>
- UW-Madison Select Agent Program; <https://www.selectagents.gov/sat/permmissible.htm>; 608-890-4951
- Wannamaker, RW. Procedures for the Inactivation and Safe Containment of Toxins.