



Paralytic Shellfish Poisons (Saxitoxins) Fact Sheet

What are Saxitoxins/Paralytic Shellfish Poisons?

Saxitoxins (STXs) are a group of chemically-related neurotoxins produced by a group of marine microalgae known as dinoflagellates. The term “paralytic shellfish poisoning (PSP)” was coined to describe the illness and deaths caused by eating contaminated shellfish. Saxitoxins have also been found in fish, crustaceans, cephalopod molluscs and ascidians, as well as a wide range of filter-feeding, herbivorous and carnivorous gastropods.

What are the causative organisms?

In Australia the known causative dinoflagellates are from the *Alexandrium* genus (most commonly *A. catenella*, *A. minutum*, *A. ostenfeldii* and *A. tamarense*) and *Gymnodinium catenatum*.

These species grow naturally in marine environments. When they are present in significant levels they may enter the tissues of marine animals, mainly through feeding behaviours. Being water soluble, STXs tend to be found more in filter-feeders and planktivores, but lower-level carnivores may bioaccumulate STXs at levels that can be hazardous to humans. Bivalve shellfish present the greatest risk.

STXs have been recorded from Tasmania, Victoria, South Australia and New South Wales.

What outbreaks have occurred?

Toxic blooms and associated seafood product contamination has resulted in considerable economic disruption to affected industries.

Fortunately, Australia’s regulatory oversight seems to have been largely effective to date, as there are only a few anecdotal and case reports of relatively mild human illness, all from non-commercial harvests.

- In Tasmania in 2011 one male was hospitalised following consumption of mussels.
- Several anecdotal cases exist from the consumption of Tasmanian mussels during extensive blooms in 1986 and 1993.

How much saxitoxin is a harmful dose?

A dose of about 1.5 micrograms of STX equivalents per kilogram body weight is thought capable of initiating symptoms of saxitoxin poisoning, i.e. around 100 micrograms for a 65 kg adult. This equates to 500 micrograms STX equivalents per kg seafood in a 200g portion.

Note that this dose is a topic of some controversy amongst expert groups. It is calculated from published reports of mild symptoms of STX poisoning in individuals who may be particularly sensitive to the toxin/s, and is lower than the concentration of saxitoxins currently mandated as the safety level in Australia and most other countries. The current regulatory level has been in operation for many decades, with a long history of protecting public health from STXs in commercial shellfish.

What are the symptoms?

- STXs block nerve conduction, manifesting as respiratory distress due to partial paralysis of the muscles necessary for breathing.
- Mild neurological symptoms encompass tingling or numbness around the lips or in

fingers and toes (paraesthesias), sensations of floating or weightlessness (dysaesthesias), or gastrointestinal upset (nausea, vomiting, diarrhoea, gut pains).

- More severe poisoning may present with functional weakness (impaired grip strength, staggering gait), difficulty breathing and signs of acute respiratory insufficiency, e.g. cyanosis of the lips or fingernails.
- Severe STX intoxication can cause catastrophic acute respiratory failure and death by asphyxiation.

What can be done to manage saxitoxins in seafood?

- Shellfish production in Australia requires adherence to algal biotoxin management plans to control this hazard. Each State monitors commercial shellfish areas for toxic algae in the water and/or toxins in the shellfish. Detection of either factor above compliance levels results in mandatory closure of fisheries until toxin concentrations return to safe levels.
- Relaying shellfish to uncontaminated areas may facilitate the elimination of STXs, but should be confirmed with chemical and/or biological testing.
- Avoid consumption of crustacean tomalley (“mustard”) during bloom events as

crustaceans are known to concentrate STXs in the hepatopancreas.

- Public health authorities may caution or restrict some commercial and recreational fishing activities when waters are affected by toxic microalgal blooms.

How can we test for saxitoxins?

- Monitoring source water samples by microscopy to detect the presence of potentially toxic dinoflagellates.
- Monitoring seafood tissues for STX either via antibody-based screening test kits or confirmatory chemical testing conducted by specialist analytical laboratories.

Regulatory standards

The Australian regulatory limit for STX in bivalve molluscs is 800 micrograms STX equivalents per kg, available at <http://www.foodstandards.gov.au>. State food safety regulators usually apply this limit in the case of other seafood products found to be contaminated with STXs.

International regulatory limits can be found in the Trade & Market Access Database available at www.frdc.com.au/trade.

Where can I access more information?

FAO 2004. Marine Biotoxin. Rome, Italy: Food and Agriculture Organization of the United Nations.

HALLEGRAEFF, G. M. 2003. Algal toxins in Australian shellfish. In: HOCKING, A. D. (ed.) *Foodborne Microorganisms of Public Health Significance*. Sixth ed. New South Wales: Australian Institute of Food Science and Technology Inc.

TURNBULL, A., HARRISON, R. & MCKEOWN, S. 2013. Paralytic Shellfish Poisoning in South Eastern Tasmania. *Communicable Diseases Intelligence* 37, 3.

US Food and Drug Administration: Fish and fishery products hazards and controls guidance – 4th edition 2011 <http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Seafood/ucm2018426.htm>

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