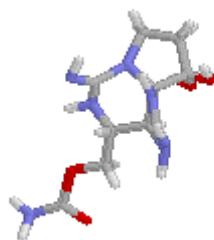


Saxitoxin

*...and the waters that were in the river were turned to blood.
And the fish that were in the river died; and the river stank and
the Egyptians could not drink of the water of the river...*

Exodus 7: 20-21

Saxitoxin (STX) is one of the most toxic non-protein natural toxins derived by algae (really dinoflagellates) such as *Alexandrium tamarense*, *Pyrodinium bahamense* and *Gymnodinium catenatum*. Mollusks, clams, scallops and oysters consume the algae and concentrate the toxin. These algae are responsible for the famous red tides that have been known since antiquity and have been theorized as having been the basis for one of the biblical miracles against Egypt. Such tides or blooms, called harmful algal blooms or HAB by scientists, still plague both the east and west coast of North America. They have been responsible for humpback whale, fish, mammal and birds deaths in moderate to large numbers. STX also causes human death and morbidity. Blooms form when algae have the right environmental conditions to grow rapidly and coalesce into large patches near the surface of the water. Red tides are not associated with tides and all are not harmful. In addition other color tides can be seen in nature such as brown tides. These are caused by different species of algae.

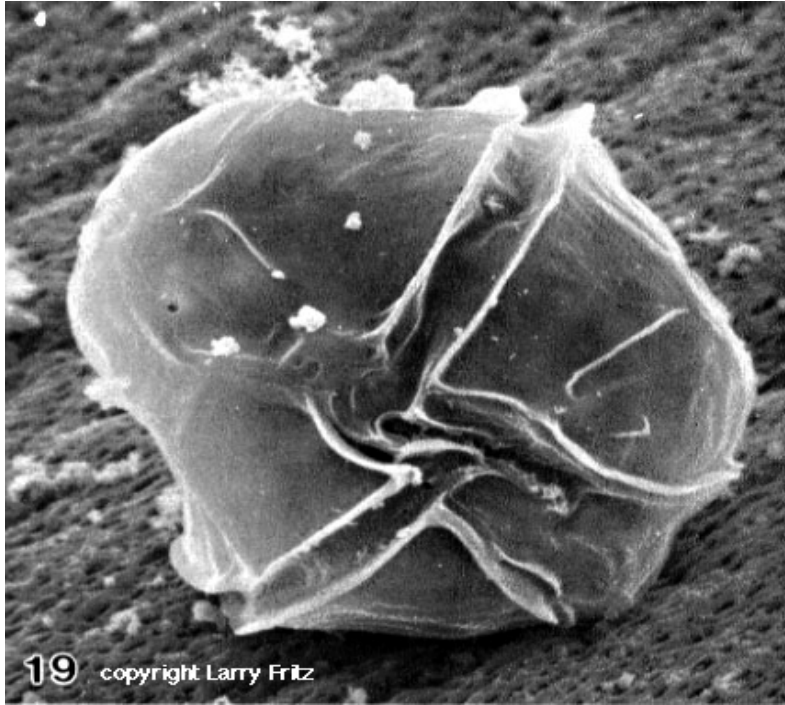


Saxitoxin

A few species are responsible for these potent neurotoxins. Consumption of such contaminated mollusks makes human susceptible to saxitoxin poisoning, which is called paralytic shellfish poisoning or PSP. As little as 0.2 mg/kg of STX is fatal to the average human. In fact ricin and saxitoxin are the only Schedule I Chemical Warfare agents. This should not be confused with satratoxin which is a tricothecene mycotoxin produced by *Stachybotrus atra*. It also should not be confused with red mold disease, which is due to toxic tricothecenes from *Fusarium nivale*.

Gathered by the CIA over many years, it was felt to be a potential agent for covert use. Ordered by President Nixon to be destroyed in 1970, the William Colby of the CIA admitted that it still had 10 grams of it in 1975

at which time it was distributed to scientists. Saxitoxin is 1000 times more toxic than sarin nerve gas and was used by the CIA in suicide capsules carried by agents such as Francis Gary Powers of U2 fame.



Alexandrium tamarense – Larry Fritz

Science has discovered that SXT expresses its unique effect by being a select sodium – channel blocker and is now used in research to identify subsets of sodium channel blockers and opened up new pathways to the study of nervous disorders. It has been first synthesized by Kishi et al at Harvard in 1977 and subsequently by others.



Texas Brown tide caused by *Aureoumbra*³

Besides saxitoxin other algae produce a different clinical pattern: Domoic acid produced by Psuedo-Nitzischia species caused amnesic shellfish poisoning and 4 deaths on Prince William Island in Canada in 1987. Canadian authorities now monitor the levels of toxin; Ciguatera Poisoning is caused toxins produced by a number of algae species affecting human ingestion of tropical reef fish; and Diarrhea shellfish poisoning is caused by another algae toxin.

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<http://www.redtide.whoi.edu/hab/whathabs/whathabs.html>**
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