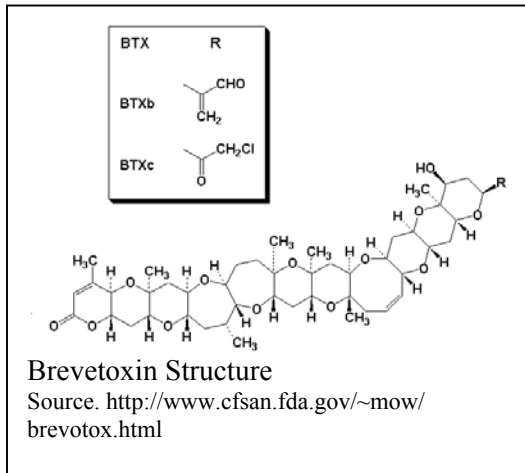


# Brevetoxin & Florida Red Tides

**Source of Brevetoxin (BTX):** Red tides in Florida are caused by annual blooms of the dinoflagellate *Karenia brevis* which have been recorded since at least the mid 1800s. *Karenia brevis* is principally distributed throughout the Gulf of Mexico, with occasional red tides occurring along the mid and south Atlantic coast. The State of Florida continuously monitors for *K. brevis*, which produces nerve toxins (neurotoxins) known as brevetoxins that can cause serious public health effects and significant animal mortalities.



*Karenia brevis* Source: FWC-Florida Marine Research Institute



**Toxin/Mode of Action:** Brevetoxins are polyether ladder neurotoxins that bind to voltage-sensitive sodium channels, an important protein structure of cell membranes. Binding results in persistent activation of neuronal cells, skeletal muscle cells and cardiac cells.

**Human Health Syndrome:** Neurotoxic Shellfish Poisoning (NSP) is caused by human consumption of molluscan (e.g. oysters, clams) shellfish contaminated by brevetoxins. NSP is characterized by paresthesia (tingling), reversal of hot-cold temperature sensation, myalgia (muscle pain), vertigo, ataxia (loss of coordination), abdominal pain, nausea, diarrhea, headache, bradycardia (slow heart rate), and dilated pupils.

**Syndrome Distribution:** Although shellfish poisonings were known in Florida since the 1880s, the cause was not identified as *K. brevis* until 1960. Shellfish monitoring to protect the public from NSP is successfully managed by the State of Florida and there have been no human fatalities attributed to NSP. New NSP cases may rarely occur when people consume unregulated shellfish species, when shellfish are illegally harvested, or when blooms expand to other unmonitored geographic areas. For example, in 1987, an entrained *K. brevis* red tide that originated off the Florida west coast was transported to North Carolina waters, causing 48 NSP cases.

**Other Human Health Effects:** People can suffer from respiratory effects when brevetoxins become aerosolized through the disruption of *K. brevis* cells by breaking waves, surf or onshore winds. The first written report of respiratory irritation caused by a Florida red tide was in 1917.

**Effects on Other Organisms:** *Karenia brevis* red tides are responsible for the annual mass mortalities of thousands of fish. In some years, notable mass mortalities of marine mammals, birds, and sea turtles have been reported. During 1946-1947, one of the largest *K. brevis* red tide events on record occurred in Florida waters and was associated with catastrophic mortalities of bottlenose dolphins, sea turtles, and numerous fish species from Tarpon Springs to Key West (150 miles). Other marine mammal and bird mortality events with red tide links include:

- Brevetoxin involvement suspected in the unprecedented die-off of more than 740 bottlenose dolphins, *Tursiops truncatus*, from June 1987-February 1988 along the eastern USA.
- During August 1999-February 2000, over 120 bottlenose dolphins stranded along the Florida panhandle during a co-occurring red tide.
- During an October 1973-May 1974 red tide, large numbers of birds were found moribund or dead, particularly double-crested cormorants, red-breasted mergansers, and lesser scaup.
- Substantial numbers of sick and dying cormorants co-occurred with red tide outbreaks along the west Florida coast during 1995-1999.
- *K. brevis* was implicated in mass mortalities of the endangered Florida manatee, *Trichechus manatus latirostris*, in 1963, 1982, 1996, 2002, and 2003 when hundreds of animals died during the winter-spring in southwest Florida.