

# Domoic Acid and Amnesiac Shellfish Poisoning

**R**ed tide, harmful algal blooms, shellfish poisoning, beach closures—you may have encountered these issues when planning a clamming trip to the Oregon coast. What are these events that close shellfish harvesting?

## Red Tide

Red tide occurs when appropriate ocean conditions allow for massive overgrowth of phytoplankton. These microscopic organisms undergo such rapid growth that the phenomenon, called *algal bloom*, sometimes will discolor the waters. Several of these microorganisms produce toxins and store them in their cells, hence the term *harmful algal blooms*. Shellfish such as clams, mussels, scallops, oysters, and cockles feed upon the phytoplankton, concentrating the poisons within their bodies. The poisons can sicken people who consume the shellfish.

## Paralytic Shellfish Poisoning

Paralytic shellfish poisoning, caused by a substance called *saxitoxin*, has been around for many years and is routinely monitored along the west coast. The culprit that produces this toxin is a microscopic organism called a *dinoflagellate*, in the genus *Alexandrium*. This toxin can produce paralysis in humans, sometimes resulting in death.

## Domoic Acid

Domoic acid is a relatively new toxin and has recently appeared along the west coast of the United States and Canada. Domoic acid is produced by the diatom *Pseudo-nitzschia*. The first reported outbreak of domoic acid poisoning



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occurred in 1987, when shellfish from Prince Edward Island, Canada, were consumed. In that outbreak, 3 people died and more than 100 developed a variety of toxin-induced symptoms. The most unusual—and most serious—symptom was a loss of short-term memory; hence the initial designation of *amnesiac shellfish poisoning*. Unfortunately, for

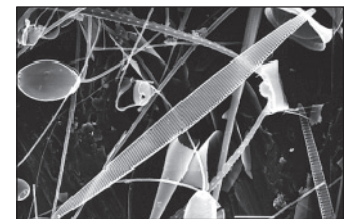
many with short-term memory loss, the brain damage is permanent. The poison is not destroyed by cooking or freezing.

## Recent History of Amnesiac Shellfish Poisoning

Unsafe levels of domoic acid first appeared off the Washington and Oregon coasts in the fall of 1991, when domoic acid was detected in razor clams. Razor clams accumulate domoic acid in the edible tissue (foot, siphon, and mantle), and the poison lingers in the tissue after the infestation in the water is gone. In Dungeness crabs, domoic acid primarily accumulates in the gut (also known as the “butter”).

In 2001, along the beaches of Monterey Bay, California, dead and dying seabirds were observed. Many of the sick birds displayed unusual symptoms suggesting a neurological toxin. Examination of the contents of the dead birds’ stomachs revealed high levels of domoic acid.

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Magnified view of *Pseudo-nitzschia* (elongated object running diagonally), which produces domoic acid.

Rita Horner, University of Washington

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Furthermore, the birds had been eating anchovies from the bay. Examination of the anchovy gut contents showed that these fish had been consuming a phytoplanktonic diatom called *Pseudo-nitzschia australis*.

Beginning in February 2002, more than 500 sick California sea lions came ashore in southern California. This unusually high number of strandings caught the attention of marine mammal scientists, who traced the condition to domoic acid.

Sea lions don't eat the microscopic algae but fish do, and sea lions eat the fish that eat the algae. How can this be deadly? The toxin becomes concentrated as it travels through the food chain. This process is called *bioaccumulation*. In 2002, the domoic acid problem occurred almost exclusively in common dolphins and sea lions. A large part of these animals' daily diets is composed of filter-feeding anchovies and sardines. Other animals were spared because they eat different food items.

When sea lions eat fish that contain domoic acid, the toxin gets into their bloodstream and damages a part of their brain (the *hippocampus*). Sick sea lions show a variety of symptoms: they may vomit, have seizures, and become depressed and comatose. Some of the animals died on the beaches. Most of the affected sea lions were pregnant females. Because these moms were sick, they could not care for their babies.

### **Symptoms of Amnesiac Shellfish Poisoning**

Symptoms of amnesiac shellfish poisoning include vomiting, nausea, diarrhea, and abdominal cramps within 24 hours of ingestion. In more severe cases, neurological symptoms develop within 48 hours and include headache, dizziness, confusion, disorientation, and loss of short-term memory.

### **What Should I Do if I Think Someone May Have Amnesiac Shellfish Poisoning?**

If symptoms are mild, call your health care provider and your local public health agency. If symptoms are severe, call 911 or transport the affected person to the emergency room. There is no known antidote for ASP.

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*Photo of clam diggers used with permission from beachdog.com. Magnified view of Pseudo-nitzschia used with permission from the National Office for Marine Biotoxins and Harmful Algal Blooms, Woods Hole Oceanographic Institution, Woods Hole, MA 02543.*

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