

## HARMFUL ALGAL BLOOM BACKGROUND INFORMATION

The term plankton is derived from the Greek word planktos, meaning “wanderer” or “drifter” and is used to describe any organism that drifts with the ocean’s currents. There are many varieties of plankton which are uniquely important to the environment.

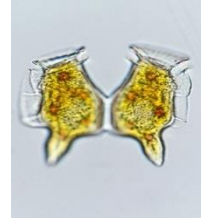
Plant plankton, known as phytoplankton, form the base of the food chain through their cellular respiration. They are responsible for a supreme amount of the atmospheric oxygen with estimates as high as 80%. This is due to the presence of chloroplasts in their cells that allow them to photosynthesize. Unlike other types of plankton all phytoplankton are holoplankton – they remain planktonic through their whole life cycle.

Animal plankton, known as zooplankton, are the next level in the food chain. They are the primary consumers of phytoplankton and bacteria and they vary greatly in morphology and characteristics. It is in this group that you start to see species of meroplankton – the type of animals that are only plankton at various stages in their life cycle.

As a whole, phytoplankton are ecologically important but potentially dangerous. They produce most of the oxygen we breathe and serve as an important carbon sink trapping dangerous carbon emissions. They are also the base of the food chain, which means that disruptions at that trophic level have far reaching implications further up the chain. Some species of phytoplankton can be hazardous if conditions allow for algal blooms. During these times of population explosions, they not only can cause the oxygen in the water to drop, creating anoxic conditions, but some species

release toxins into the water that are bio-magnified up the food chain.

Harmful algal blooms, or HABs, occur when colonies of toxic phytoplankton grow out of control and produce harmful effects for people, fish, shellfish, marine mammals and birds. The human illnesses caused by HABs, though rare, can be debilitating or even fatal.



**Bioaccumulation** occurs when an organism absorbs a substance at a rate faster than that at which the substance is lost by catabolism and excretion.

**Biomagnification** is the process in which toxins are concentrated in an organism as larger animals continue to eat smaller animals. This process moves toxins exponentially up the food chain to larger organisms and is of particular concern with regards to concentrating dangerous toxins in larger species.

**Bioaccumulation and Biomagnification** can have major impacts on food chains and ecosystems, as well as on human health. Shellfish are well known to bioaccumulate toxins making them an especially dangerous part of the food web for predators, including human consumers.

There are four recognized forms of shellfish poisoning; **Diarrhetic, Amnesic, Paralytic, and Neurotoxic**.

Dinoflagellate species of plankton produces toxins called okadaic acid and dinoflagellate toxins. These toxins cause **Diarrhetic Shellfish Poisoning** (DSP), which is a gastrointestinal illness. DSP symptoms usually occur within 30 minutes to a few hours after consumption of contaminated shellfish. Symptoms include diarrhea, nausea, vomiting and abdominal pain. Shellfish containing toxic levels of Diarrhetic Shellfish Poison don't look or

taste any different from shellfish that are safe to eat. Laboratory testing of shellfish meat is the only known method of detecting Diarrhetic Shellfish Poison.

**Amnesic shellfish poisoning** is an illness caused by consumption of a marine biotoxin called domoic acid, produced by a marine diatom called Pseudo-nitzschia. Symptoms 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, short-term memory loss, motor weakness, seizures, profuse respiratory secretions, cardiac arrhythmias, coma, and possible death. Short term memory loss can be permanent. Razor clams are most commonly affected by Amnesic Shellfish Poison.

**Paralytic shellfish poisoning** is caused by an accumulation of neurotoxins, such as Saxitoxin. Saxitoxin is a neurotoxin produced by some dinoflagellate, diatoms, and cyanobacteria. Alexandrium are the most numerous and widespread dinoflagellates to produce saxitoxins. PSP can be fatal in extreme cases, particularly in **immunocompromised** individuals. Children are more susceptible. Early symptoms include tingling of the lips and tongue, which may begin within minutes of eating toxic shellfish or may take an hour or two to develop. Symptoms may progress to tingling of fingers and toes and then loss of control of arms and legs, followed by difficulty in breathing. Some people feel nauseous or experience a sense of floating. If a person consumes enough toxin, muscles of the chest and abdomen become paralyzed, including muscles used for breathing, and the victim can suffocate.

Death from Paralytic Shellfish Poison has occurred in less than 30 minutes.

**Neurotoxic shellfish poisoning** is caused by the consumption of shellfish contaminated with brevetoxins, primarily by the dinoflagellate, *Karenia brevis*. Symptoms can occur 15 minutes to 18 hours after consumption. In humans they include vertigo, convulsions, vomiting, diarrhea and nausea and a variety of neurological symptoms such as slurred speech and the reversal of hot and cold sensations. No fatalities have been reported but there are a number of cases which led to hospitalization.

*\*\*\*The Back Bay Science Center participates in collecting plankton for the California Department of Public Health's monthly Marine Biotoxin Monitoring Reports. This report provides a monthly summary of toxin concentrations and threats to public health, related to harmful algal blooms.*

