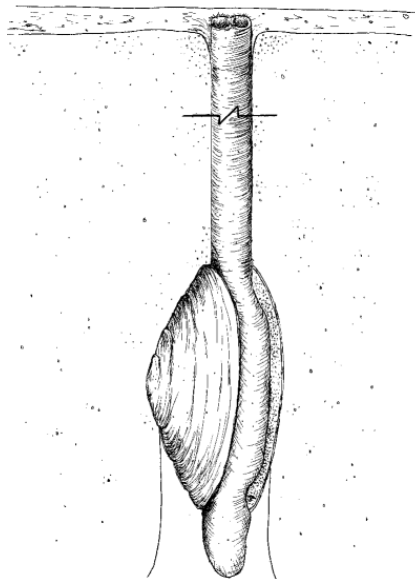


QUESTIONS AND ANSWERS

Oregon Coast Softshell Clam (*Mya arenaria*) Health Advisory related to Inorganic Arsenic

Why is this health advisory being issued?

The Oregon Department of Environmental Quality (DEQ), as part of its routine Water Quality Toxics Monitoring Program, tested a variety of shellfish species collected along the Oregon coast for several contaminants. This study was designed to assess the presence of contaminants in shellfish coast-wide and assess possible ecological endpoints. This testing found that softshell clams (*Mya arenaria*) contained unexpectedly high levels of inorganic arsenic. Most of the inorganic arsenic, however, was concentrated in the skin covering the siphon. The inorganic arsenic found in softshell clams can be greatly reduced by removing the siphon skin before eating, and therefore it is recommended that the siphon skin be removed before consuming. This health advisory helps inform people about the number of meals of softshell clams that are safe to eat with and without this siphon skin in place.



What is the source of the arsenic?

Arsenic is a trace metal and chemical element that occurs naturally in sediments, bedrock, groundwater, plants, and animals. Inorganic arsenic is the toxic form of arsenic. This form is often associated with natural geology and rock formations but can also be introduced into the environment from pressure-treated wood,

outdoor building materials, and by agriculture and industrial activities. Oregon's coastal geology is naturally high in arsenic, and it is difficult to definitively identify the specific source of arsenic in the environment and in shellfish.

Why do we care about inorganic arsenic and not total arsenic?

Most arsenic found in fish and shellfish is in the form of organic arsenic. Organic arsenic is considered non-toxic to humans. Another form known as inorganic arsenic has the potential to cause toxicity in people who consume contaminated shellfish. DEQ's testing in softshell clams (*Mya arenaria*) revealed that inorganic arsenic was much higher than expected based on studies of other species of shellfish. Additional testing determined that most of the inorganic arsenic found in these softshell clams was confined within the siphon skin.

What are the health effects of inorganic arsenic?

Chronic (long-term) exposure to inorganic arsenic can increase the risk of cancers of the skin, bladder, liver and lung. Chronic exposure can also cause wart-like skin problems, increase the risk of diabetes and cardiovascular problems (such as high blood pressure), and cause neurological problems including painful numbness or "pins and needles" sensations in toes and fingers.

Does this advisory affect clams or other shellfish that I would buy at the grocery store, seafood market, or local restaurant?

Softshell clams (*Mya arenaria*) are not currently commercially harvested and are not found in restaurants and markets. Shellfish that you can buy in seafood markets, grocery stores and restaurants are not part of this advisory.

What other species were tested?

The DEQ study also tested Olympia oysters (a native species of oyster), California mussels, and purple varnish clams. Testing determined that these species do not have levels of inorganic arsenic that necessitate limiting their consumption.

Will more species be tested?

Yes. DEQ is in the process of testing three additional species of popular bay clams for total and inorganic arsenic along the coast. The three species are gaper clams, butter clams, and cockle clams. Because gaper clams also have a tough skin covering their siphon, they will be tested with and without the siphon skins in place. DEQ expects to have results from those tests by the end of August.

What other contaminants were tested?

DEQ tested for a wide range of contaminants. These included other metals, such as cadmium, mercury, and selenium; chlorinated pesticides like DDT and chlordane; polychlorinated biphenyls (PCBs); dioxins and furans; tributyl tin and other butyl tins; and brominated flame retardants (polybrominated diphenyl ethers

[PBDEs]). None of these other contaminants were present in any of the species collected at high enough concentrations to pose a public health risk.

What is the health advisory?

The most important part of the health advisory is to remove the skin from the siphon before eating softshell clams (*Mya arenaria*). This drastically reduces the amount of inorganic arsenic in the clams.

Analysis revealed that most of the inorganic arsenic in softshell clams was concentrated in the thick skin on the siphon. Removal of this skin (also called a siphon sheath) removed most of the inorganic arsenic. Exposure to inorganic arsenic is reduced to a low level when the siphon skin is removed from the softshell clams during cleaning and preparation. To protect the health of all people who eat softshell clams, the Public Health Division of the Oregon Health Authority (OHA) recommends that the siphon skin should always be removed but has established separate meal recommendations for softshell clams prepared and eaten with and without the siphon skins. Meal recommendations differ by geography because the levels of inorganic arsenic detected in softshell clams varied. Concentrations of inorganic arsenic were higher on the North Coast, and lower toward the south.

Table 1 presents the recommended number of meals of softshell clams per month that can be eaten without posing a health risk from inorganic arsenic contamination.

Table 2 shows the recommended meal sizes for softshell clams for several different age groups of humans. The meal sizes differ by the age group of humans primarily due to variability in body weight. Because the weight of individual softshell clams are highly variable (ranging from small to large clams), the recommended meal sizes are shown with units of clam weight (ounces) and volume (cups).

Table 1. Meal recommendations for softshell clams (*Mya arenaria*) along the north, central, and south segments of the Oregon coast

| Coast Segment | Shellfish Types (Softshell clams; <i>Mya arenaria</i>) | Recommended meals/month |
|--|---|--------------------------------|
| North Coast (mouth of Columbia to Neskowin) | Softshell Clams (siphon sheath intact) | 1 |
| | Softshell Clams (siphon sheath removed) | 11 |
| Central Coast (Cascade Head to mouth of Umpqua River) | Softshell Clams (siphon sheath intact) | 2 |
| | Softshell Clams (siphon sheath removed) | 26 |
| South Coast (mouth of Umpqua River to California border) | Softshell Clams (siphon sheath intact) | 4 |
| | Softshell Clams (siphon sheath removed) | 33 |

Table 2. Recommended meal sizes for softshell clams (*Mya arenaria*) for different age groups

| Age Group | Meal size by clam weight (excluding shells) | Meal size by clam volume (excluding shells) |
|----------------------------|--|--|
| Adult (17 years and older) | 8 ounces | 1 cup |
| 12-16 years old | 6 ounces | 3/4 cup |
| 7-11 years old | 4 ounces | 1/2 cup |
| 4-6 years old | 3 ounces | 1/3 cup |
| 2-3 years old | 2 ounces | 1/4 cup |

How can the skin be removed from the siphons of softshell clams?

The skin that surrounds the siphon of softshell clams can be removed immediately after collection by making shallow incision along the length of the siphon and pulling the skin away. Alternatively, the skin can be removed during cleaning and preparation by scalding the intact softshell clam in hot water followed by pulling the skin away from the siphon. In both techniques, the skin should be discarded.



Who is involved in developing this health advisory?

Although OHA typically issues fish consumption advisories for inland waters and recreational fisheries, the agency will also issue health advisories for shellfish if contamination is found at levels that could be harmful to the public health. In order for OHA to issue advisories, we must rely on our partner agencies for tissue collection and analysis. In this case OHA collaborated with those agencies directly connected with the shellfish fishery. To assist DEQ's monitoring efforts, ODFW and the Oregon Department of Agriculture (ODA) collected the shellfish, DEQ analyzed the samples, and the ODA provided its expertise. With the help of ODFW, OHA will distribute information about the advisory to the public, including instructions on how to remove the siphon skin from softshell clams before consumption.

Is the human health advisory for softshell clams related to the high levels of Domoic acid and PSP reported for razor clams and mussels?

No. These are distinctly different types of toxicity events. The human health advisory for softshell clams is due to arsenic that occurs in sediments located primarily in the upper region of bays and estuaries. In contrast, the closure of razor clams and mussels is due to elevated levels of biotoxins (*i.e.*, domoic acid and Paralytic Shellfish Poison) that are produced by microscopic algal cells that periodically bloom in the near shore waters of the Pacific Ocean.