Shellfish Poisoning: Paralytic or Domoic Acid

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To identify whether the source of transmission is a major public health concern (e.g., a commercial shellfish product or recreational harvest area) and to prevent further transmission from such sources.
2. To identify others who shared the exposure and educate them regarding symptoms of shellfish poisoning to facilitate rapid diagnosis.
3. When the source is a risk to only a few individuals (e.g., shellfish harvested from an area closed to harvesting), to inform those individuals how they can reduce their risk of future exposure.

B. Legal Reporting Requirements

1. Health care providers: **immediately notifiable to local health jurisdiction.**
2. Health care facilities: **immediately notifiable to local health jurisdiction**.
3. Laboratories: no requirements for reporting.
4. Local health jurisdictions: **immediately notifiable to the Washington State Department of Health (DOH) Communicable Disease Epidemiology Section (CDES) (1-877-539-4344 or 206-418-5500)**.

C. Local Health Jurisdiction Investigation Responsibilities

1. **Immediately** begin an investigation to determine the likelihood of the diagnosis and potential sources of exposure.
2. Notify CDES (206-418-5500 or 1-877-539-4344) or the DOH Shellfish Program (360-236-3330) of potential sources of exposure and prevent consumption of remaining potentially contaminated shellfish.
3. Facilitate the collection and transport of potentially contaminated shellfish for testing at DOH Public Health Laboratories.
4. Report all *confirmed* and *probable* cases to CDES (see definitions below) using the standard case report form (available at: http://www.doh.wa.gov/notify/forms/sfpoison.pdf).

2A. PARALYTIC SHELLFISH POISONING AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Paralytic shellfish poisoning (PSP) is caused by ingesting shellfish containing saxitoxins, heat-stable toxins produced by dinoflagellates including species of *Alexandrium*. Molluscan shellfish (those that have a hinged shell such as clams, mussels, oysters,

geoduck, etc.) are filter feeders that ingest the phytoplankton and concentrate the toxins in their systems. The concentration of saxitoxins in shellfish often increases when warm temperatures, sunlight and nutrient–rich water cause plankton to rapidly reproduce or "bloom." The presence of "red tides" or reddish discoloration of the water during an algae bloom are not necessarily associated with increased levels of saxitoxins and toxic algae blooms can occur without discoloration of the water. Blooms of the causative *Alexandrium* species occur several times each year, primarily from April through October. After concentrating toxin, most shellfish remain toxic for several weeks after the bloom subsides. However, some shellfish species including butter clams can remain toxic for more than a year.

B. Description of Illness

Paralytic shellfish poisoning presents with neurologic symptoms frequently accompanied by gastrointestinal symptoms. Paresthesias of the mouth and extremities are the initial and most common neurologic complaint. In severe cases, ataxia (loss of coordination), dysphonia (difficulty speaking), dysphagia (difficulty swallowing) and total muscle paralysis with respiratory arrest and death may occur (if supportive care is not received). Symptoms usually resolve within a few days and recovery is complete.

C. Paralytic Shellfish Poisoning in Washington State

In recent years, DOH has received 0–7 reports of paralytic shellfish poisoning (PSP) annually. Throughout the year, the DOH Shellfish Program routinely tests Washington shellfish beds for the presence of marine biotoxins. Areas are closed to harvesting when toxin levels in shellfish exceed 80 µg/100 g. The DOH 24-hour PSP hotline (1-800-562-5632) provides information on shellfish harvest areas closed due to marine biotoxins. Most paralytic shellfish poisoning cases occur in individuals or small groups gathering shellfish from areas closed to recreational (non-commercial) shell fishing.

D. Reservoirs

Paralytic shellfish poisoning is particularly common in bivalve mollusks (i.e., clams, oysters) harvested from colder waters above 30N and below 30S latitude, but may occur in tropical waters as well. In the United States, paralytic shellfish poisoning is primarily a problem in Alaska, California, Washington, and the New England states.

E. Modes of Transmission

Paralytic shellfish poisoning is acquired by eating shellfish containing the toxin. *Cooking or freezing does not inactivate the toxin.*

F. Incubation Period

Symptoms occur minutes to hours after eating contaminated shellfish.

G. Period of Communicability

Paralytic shellfish poisoning is not transmitted from person to person.

H. Treatment

Treatment is supportive and may require intensive care and ventilatory support.

2B. DOMOIC ACID POISONING AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Domoic acid shellfish poisoning, also called amnesic shellfish poisoning, results from ingesting molluscan shellfish or crabs with high levels of domoic acid, a heat-stable toxin produced by marine diatom species in the genus *Pseudo-nitzschia.* Anchovies and sardines can also accumulate the toxin. The first description was an outbreak in 1987 in Prince Edward Island, Canada, involving over 100 cases and three deaths. Subsequent avian outbreaks have been identified in pelicans and cormorants in California.

B. Description of Illness

Gastrointestinal symptoms of vomiting, diarrhea and abdominal cramps begin within 24 hours of shellfish ingestion. There may be neurological symptoms beginning within 48 hours that include headache, dizziness, confusion, permanent short-term memory loss, motor weakness or paralysis, seizures, profuse respiratory secretions, cardiac arrhythmias, coma and possibly death.

C. Domoic Acid Shellfish Poisoning in Washington State

In 1991 high domoic acid levels were identified in shellfish and there were 29 cases of illness retrospectively associated with razor clams. In recent years, monitoring has identified domoic acid at unsafe levels in razor clams and Dungeness crab from Washington's coast, as well as its presence in clams, mussels, and oysters. No cases have been reported recently, which may reflect the testing and closures of risk areas.

D. Reservoirs

Domoic acid poisoning is associated with bivalve mollusks, crabs, and anchovies harvested from both coasts but particularly the Pacific Coast during last summer and fall. In the United States, domoic poisoning has been associated primarily with marine birds.

E. Modes of Transmission

Domoic acid shellfish poisoning is acquired by eating molluscan shellfish or crabs containing the toxin. *Cooking or freezing does not inactivate the toxin.*

F. Incubation Period

Symptoms occur 15 minutes to 38 hours after eating contaminated shellfish.

G. Period of Communicability

Domoic acid shellfish poisoning is not transmitted from person to person.

H. Treatment

Treatment is supportive and may require extended rehabilitation.

3. CASE DEFINITIONS

Paralytic Shellfish Poisoning

A. Clinical Criteria for Diagnosis

Onset of neurological symptoms (paresthesias, ataxia, cranial nerve abnormalities, paralysis, etc.) with or without gastrointestinal symptoms within minutes to hours following consumption of shellfish.

B. Laboratory Criteria for Diagnosis

1. Identification of saxitoxin in epidemiologically implicated food.

C. Case Definition

Probable: A clinically compatible case that is not laboratory confirmed and not epidemiologically linked to a confirmed case.

Confirmed: A case that is laboratory confirmed, or that meets the clinical case definition, is not laboratory confirmed, and is epidemiologically linked to a confirmed case.

Domoic Acid Shellfish Poisoning

A. Clinical Criteria for Diagnosis

Onset of gastrointestinal symptoms (vomiting, diarrhea and abdominal cramps) within 24 hours of shellfish ingestion with or without neurological symptoms (headache, dizziness, confusion, memory loss, motor weakness, paralysis, seizures) within 48 hours of shellfish ingestion

B. Laboratory Criteria for Diagnosis

1. Identification of domoic acid in epidemiologically implicated food.

C. Case Definition

Probable: A clinically compatible case that is not laboratory confirmed and not epidemiologically linked to a confirmed case.

Confirmed: A case that is laboratory confirmed, or that meets the clinical case definition, is not laboratory confirmed, and is epidemiologically linked to a confirmed case.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

Tests are not readily available to detect saxitoxin or domoic acid in clinical specimens and are not required for case classification. Therefore, the best way to confirm the diagnosis of shellfish poisoning in a patient with compatible clinical symptoms is to test epidemiologically implicated shellfish for toxins.

B. Services Available at the Washington State Public Health Laboratories (PHL)

PHL test for saxitoxins and domoic acid in shellfish. If implicated shellfish are available, consult Communicable Disease Epidemiology Section or the DOH Shellfish Program to arrange for testing at PHL.

Note that PHL require all clinical specimens have two patient identifiers, a name **and** a second identifier (e.g., date of birth) both on the specimen label and on the submission form. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. Also include specimen source and collection date.

C. Specimen Collection

For instruction regarding collecting and shipping shellfish specimens to PHL, contact the Shellfish Program at (360) 236-3330. Instructions for handling food specimens can be found in the PHL Directory of Services:
http://www.doh.wa.gov/EHSPHL/PHL/Forms/DirServ30.pdf

When submitting commercial food specimens, keep the food item in the original package and include all available documentation regarding the purchase of the item including receipts.

5. ROUTINE CASE INVESTIGATION

Interview the case and others who may be able to provide pertinent information.

A. Evaluate the Diagnosis

Review the clinical presentation and determine the likelihood of the diagnosis. The likelihood of the diagnosis will help to determine how aggressively to recall shellfish while confirmatory tests are pending.

B. Identify Potential Sources of Infection

Ask the patient about shellfish consumed in the minutes to two days prior to onset. Identify sources of shellfish particularly from coastal provinces of Canada, Washington, Oregon, and coastal Texas. Collect details about the type of shellfish consumed, site of harvest/purchase, and date of harvest/purchase. Report the information to the DOH Shellfish Program immediately (360-236-3330) if shellfish from Washington State are implicated.

C. Identify Potentially Exposed Persons

Immediately identify persons who shared the same exposure as the patient and educate them about symptoms and where to obtain treatment if symptoms develop.

D. Environmental Evaluation

Perform a trace-back investigation to determine where the implicated shellfish were harvested. Collect information about the supplier and harvest site of the shellfish. Obtain legally required shellfish tags from retail sites. If possible, obtain shellfish samples for testing at DOH Public Health Laboratories.

6. CONTROLLING FURTHER SPREAD:

A. Infection Control Recommendations

None, the disease is not spread from person to person.

B. Case Management: Case follow up is not needed.

C. Contact Management: None, the disease is not spread from person to person.

D. Management of Other Exposed Persons

It is urgent to educate persons who shared an exposure with the case about symptoms and where to obtain treatment if symptoms develop.

E. Environmental Measures

Prevent further consumption of shellfish from the same harvest area until further information is gathered. This is done by putting a hold on shellfish from the same lot in a restaurant or grocery store. The DOH Shellfish Program is responsible for recalling shellfish harvested from the same site if needed and for initiating a closure for harvesting shellfish from a beach.

7. MANAGING SPECIAL SITUATIONS

Determine if the case is associated with or potentially associated with an outbreak.

If an outbreak of shellfish poisoning is suspected, notify Communicable Disease Epidemiology Section immediately: 1-877-539-4344 or 206-418-5500.

8. ROUTINE PREVENTION

A. Immunization Recommendations: none

B. Prevention Recommendations

1. Before harvesting shellfish, consult the 24 hour PSP Hotline 1-800-562-5632 or the DOH website
    a. Emergency closures at http://ww4.doh.wa.gov/gis/mogifs/biotoxin.htm
    b. Map of shellfish harvest areas closed due to marine biotoxins at http://ww4.doh.wa.gov/scripts/esrimap.dll?Name=bioview&Step=1
2. Biotoxins are not destroyed by cooking or freezing. Only eat shellfish from safe areas.

ACKNOWLEDGEMENTS

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UPDATES

October 2010

Domoic acid poisoning was added to the guideline including description in Section 2B and case definition in Section 3.

January 2011:

The Legal Reporting Requirements section has been revised to reflect the 2011 Notifiable Conditions Rule revision.