Paralytic Shellfish Poisoning (PSP)

☐ Communicable
☐ Virulent

Health Protection and Promotion Act:
Ontario Regulation 559/91 – Specification of Reportable Diseases

1.0 Aetiologic Agent

Paralytic Shellfish Poisoning (PSP) is caused by toxins that are produced by oceanic phytoplankton or dinoflagellates. The toxin most commonly associated with paralytic shellfish poisoning is saxitoxin. Saxitoxin is water-soluble and heat-stable. There are over 20 known toxins formed from either saxitoxin or its derivatives. Species of dinoflagellates belonging to the *Alexandrium* genus are the primary saxitoxin producers.¹,²,³

2.0 Case Definition

2.1 Surveillance Case Definition

See Appendix B

2.2 Outbreak Case Definition

The outbreak case definition varies with the outbreak under investigation. The outbreak case definition should be created in consideration of the provincial surveillance case definition; for example, confirmed outbreak cases should, at a minimum, meet the criteria specified for the provincial surveillance confirmed case classification. Consideration should be given to the following in establishing an outbreak case definition:

1. Clinical, laboratory and/or epidemiological criteria;
2. A time frame for occurrence;
3. A geographic location(s) or place(s) where cases live or became ill/exposed; and
4. Special attributes of cases (e.g. age, underlying conditions).

Cases may be classified into an outbreak case definition by levels of probability (*i.e.* confirmed, probable and/or suspect).

3.0 Identification

3.1 Clinical Presentation

PSP is caused by potent neurotoxins that can pose a severe and urgent health threat. A typical progression of clinical signs and symptoms is outlined below.⁴

Onset of clinical signs typically begins between 30 minutes and 3 hours after ingestion of the contaminated food, but symptoms have been reported less than one minute after food consumption.⁷ The progression of paralysis may be rapid in severe cases. The intensity and
progression of the symptoms are dependent on the type, dose, and concentration of the toxin ingested in the shellfish.

The first symptom is often paresthesia (*i.e.*, sensation of tingling or numbness) around the lips or mouth, which spreads to the face and neck. Other early symptoms may include tingling or numbness in the fingertips/toes; dizziness or a “floating” sensation; headache; diaphoresis (*i.e.*, sweating) or excess saliva production. Gastrointestinal symptoms such as nausea, vomiting and abdominal pain may or may not occur.

Typically, the next symptoms to develop are generalized paresthesia (*i.e.*, numbness), descending paralysis/weakness of the extremities (*i.e.*, arms and legs), and ataxia (*i.e.*, lack of coordination/balance). Incoherent speech and dysphagia (*e.g.*, difficulty swallowing) have also been reported. Individuals remain conscious and alert throughout.

In severe cases, rapid progression to respiratory muscle paralysis and respiratory failure may occur. This can lead to respiratory arrest and death. Most deaths occur within 12 hours of ingestion. In mild cases, symptoms usually resolve completely within a few hours to a few days. Symptoms in individuals with moderate to severe illness resolve over two to three days. Individuals with severe PSP illness who survive beyond 24 to 48 hours usually recover without long-term complications.1, 2, 3, 5

### 3.2 Diagnosis

A diagnosis of PSP should be based on clinically compatible signs and symptoms, in the context of a history of recent shellfish/seafood consumption. Confirmation of the diagnosis can be made by detection of the toxin (*i.e.*, saxitoxin, or its analogues) at concentrations sufficient to cause symptoms in the remaining shellfish from the same lot or harvest area as the shellfish consumed/implicated in the illness.

See Appendix B for diagnostic criteria relevant to Case Definitions.

### 4.0 Epidemiology

#### 4.1 Occurrence

In Ontario, PSP is a newly reportable disease as of September 2013. As a result, no cases of PSP have been reported in the province between 2006 and 2012.

Cases of reported PSP are rare in Canada; however, the disease may be under-reported as it only became nationally notifiable in 2008.2

PSP is uncommon in North America, with small clusters occurring sporadically, mainly in coastal locations.

In 2011, an outbreak of PSP occurred in Southeast Alaska. A total of eight confirmed and 13 probable cases were reported.7

PSP has occurred worldwide and is common in shellfish harvested from waters above 30°N and below 30°S, but may also be found in shellfish from tropical waters.1
4.2 Reservoir

The main reservoir is bivalve shellfish (shellfish with two shells, hinged together along one side) such as clams, oysters, mussels, scallops and cockles. However, it may also occur in non-bivalve shellfish, such as crustaceans (crabs and lobsters), whelks, moon snails and dogwinkles. These shellfish are filter feeders that accumulate high levels of marine biotoxins produced by microscopic algae during massive algal blooms or “red tides”. The toxin may also be present in the absence of recognizable algal blooms. The shellfish can remain toxic for a few weeks after the last exposure to the toxin, with some species being persistently toxic. For example, butter clams and scallops can retain PSP toxins for a long period of time, sometimes more than a year. In addition, certain types of shellfish accumulate more toxin than others. Mussels have nerve structures that are insensitive to PSP toxins, in contrast to oysters, and therefore retain higher levels of toxin.

The tomalley or hepatopancreas (the soft green substance inside the body cavity) of crustaceans such as crabs and lobsters which have fed on contaminated bivalve shellfish may also contain PSP toxins. The majority of the toxin within the shellfish is normally found within the digestive gland. Other shellfish, such as shrimp and prawns, are not affected.

Saxitoxins are the dominant toxin found in shellfish species located in British Columbia, the Gaspé region of Quebec, and the Atlantic region of Canada. Shellfish can have high levels of marine toxins during any given month, depending on environmental conditions. However, algal blooms of dinoflagellates usually occur during the warmer months of June to October. Shellfish are not grown in Ontario, since these organisms are marine-water inhabitants.

4.3 Modes of Transmission

Consumption of contaminated shellfish, raw or cooked.

4.4 Incubation Period

Less than 12 hours. Symptoms may occur from within a few minutes to up to 12 hours after consumption of shellfish contaminated with toxin.

4.5 Period of Communicability

Not communicable by person-to-person transmission.

4.6 Host Susceptibility and Resistance

Susceptibility varies. Some individuals can tolerate large doses of the toxins. Children are more susceptible. Alcohol consumption may have a protective effect against the toxin by acting as a diuretic. Case-fatality rate can be as high as 10%.

5.0 Reporting Requirements

5.1 To local Board of Health

Individuals who have or may have PSP shall be reported to the medical officer of health by persons required to do so under the Health Protection and Promotion Act, R.S.O. 1990 (HPPA).
5.2 To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry

Report only cases of PSP which meet the case classifications specified in the surveillance case definition (see Appendix B).

Cases shall be reported using the integrated Public Health Information System (iPHIS), or any other method specified by the ministry within one business day of receipt of initial notification, as per iPHIS Bulletin Number 17: Timely Entry of Cases.8

The minimum data elements to be reported for each case are specified in the following:

- Ontario Regulation 569 (Reports) under the HPPA;
- The disease-specific iPHIS User Guides published by PHO; and,
- Bulletins and directives issued by PHO.

6.0 Prevention and Control Measures

6.1 Personal Prevention Measures

Health Canada recommends that children not eat lobster tomalley, and that adults restrict their consumption of lobster tomalley to no more than the amount from one cooked lobster per day5

- Educate consumers to purchase shellfish from reputable suppliers - all shellfish should have a tag verifying federal inspection.3, 5
- Advise travelers to exercise caution when consuming shellfish abroad.
- Educate consumers regarding raw and uncooked shellfish consumption.

6.2 Infection Prevention and Control Strategies

Canadian federal authorities conduct a monitoring and prevention program for toxins found in shellfish, including those causing paralytic shellfish poisoning, as part of the Canadian Shellfish Sanitation Program (CSSP).9 The CSSP classifies harvesting areas and controls the commercial and recreational harvesting and processing of shellfish for the consumer market, and is run by three federal government agencies with the following mandate responsibilities:

- Environment Canada - responsible for monitoring water quality in shellfish areas
- The Canadian Food Inspection Agency - responsible for monitoring marine toxins in shellfish areas and for registering and inspecting shellfish processing plants
- Fisheries and Oceans Canada - responsible for opening and closing harvest areas, and prohibiting shellfish harvesting when bacteriological or toxin levels are unsafe9

The CFIA establishes sampling sites and frequencies for each region to monitor changes in Paralytic Shellfish Poison (PSP), Amnesic Shellfish Poison (ASP) and Diarrhetic Shellfish Poison (DSP) levels.9 Acceptable levels of Paralytic Shellfish Poison should be below 80 micrograms of the toxin per 100 grams of the shellfish.9 When this level is exceeded, beaches are closed to harvesting, and shellfish are not permitted for retail sale.9
All shellfish must be federally inspected in registered plants before being offered for sale.9

6.3 Management of Cases

Individuals who feel ill (as per the above clinical presentation) after eating bivalve shellfish should seek immediate medical attention.2, 3, 4

- There is no known anti-toxin for PSP. Treatment is supportive. The World Health Organization (WHO) suggests that diuretics may be of benefit as the toxin is cleared from the body via urine, http://www.who.int/csr/delibepidemics/en/annex2.pdf.
- Individuals with serious illness should be hospitalized and placed under respiratory care.2, 3, 4
- In general, supportive measures are the basis of treatment for PSP, especially ventilatory support in severe cases. Without supportive treatment, up to 75% of severely affected persons die within 12 hours.2, 3

Investigate to determine the possible source of the illness. Submit food specimens where available for laboratory analysis. Note that testing for Paralytic Shellfish Poison is conducted by the Canadian Food Inspection Agency.

Obtain food history with a focus on shellfish exposure. Include place of purchase, type of vendor, and location where food item was prepared and consumed.

Investigate history of travel. If travel occurred within Canada, determine if the case engaged in any shellfish harvesting activities, and the location where such activity occurred.

Identify epidemiologically linked contacts who may have consumed the suspect food items (note: index cases are reported to be the tip of the iceberg for marine toxin induced diseases).6

6.4 Management of Contact

Although not transmissible from person to person, contact follow-up is recommended for others who may also have consumed potentially contaminated food. These individuals should be instructed on disease symptoms, when to seek medical attention, transmission, incubation period and preventive measures.2

Symptomatic contacts should be instructed to seek immediate medical attention.5, 6

6.5 Management of Outbreaks

If more than two cases are identified in separate households, notify PHO and the ministry.

Issue Public Health/CIOSC Alert.

Refer to ON-FIORP for outbreak investigation measures.

7.0 References


8.0 Additional Resources


9.0 Document History

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