

Appendix A: Disease-Specific Chapters

Chapter: Paralytic Shellfish Poisoning (PSP)

Effective: February 2019

Paralytic Shellfish Poisoning (PSP)

Communicable

Virulent

**Health Protection and Promotion Act:
O. Reg. 135/18 (Designation of Diseases)**

1.0 Aetiologic Agent

Paralytic Shellfish Poisoning (PSP) is an illness caused by toxins that are produced by oceanic phytoplankton or dinoflagellates. There is an extensive number of PSP-type marine biotoxins worldwide. The toxin most commonly associated with paralytic shellfish poisoning is saxitoxin produced mainly by *Alexandrium* species and other dinoflagellates. PSP neurotoxins are water-soluble and heat-stable.^{1,2}

2.0 Case Definition

2.1 Surveillance Case Definition

Refer to [Appendix B](#) for Case Definitions.

2.2 Outbreak Case Definition

The outbreak case definition varies with the outbreak under investigation. Please refer to the *Infectious Diseases Protocol, 2018* (or as current) for guidance in developing an outbreak case definition as needed.

The outbreak case definitions are established to reflect the disease and circumstances of the outbreak under investigation. The outbreak case definitions should be developed for each individual outbreak based on its characteristics, reviewed during the course of the outbreak, and modified if necessary, to ensure that the majority of cases are captured by the definition. The case definitions should be created in consideration of the outbreak definitions.

Outbreak cases may be classified by levels of probability (*i.e.* confirmed and/or probable).

3.0 Identification

3.1 Clinical Presentation

PSP is a serious illness that may have potentially fatal effects.

Onset of symptoms typically begins within a few minutes and up to 10 hours after consumption.^{1,3} The intensity and progression of the symptoms are dependent on the type, dose, and concentration of the toxin ingested in the shellfish.³

Symptoms of PSP typically begin with a prickly, tingling or numbness sensation (paresthesia) around the lips or mouth, which gradually spreads to the face and neck. Other early symptoms may include prickly, 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 occur.¹⁻³

In severe cases, paresthesia occurs in the arms and legs, ataxia (i.e., lack of coordination/balance), incoherent speech, dysphagia (e.g., difficulty swallowing), and a rapid pulse may occur.¹⁻³

In extreme 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.^{2,3} Typically, symptoms resolve completely within a few hours to a few days. In severe and extreme cases, individuals who survive for 24 to 48 hours usually recover without long-term complications.¹⁻³

3.2 Diagnosis

A diagnosis of PSP should be based on clinical symptoms with recent shellfish/seafood consumption. Confirmation of the diagnosis can be made by detection of the toxin in samples of food, water, or stomach contents.²

See [Appendix B](#) for diagnostic criteria relevant to the Case Definitions.

For further information about human diagnostic testing, contact the Public Health Ontario Laboratories or refer to the Public Health Ontario Laboratory Services webpage: <http://www.publichealthontario.ca/en/ServicesAndTools/LaboratoryServices/Pages/default.aspx>

4.0 Epidemiology

4.1 Occurrence

In Ontario, there have been zero cases of PSP reported between 2013 and 2017.

PSP is uncommon in North America, with small clusters occurring sporadically, mainly in coastal locations.² 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

Please refer to Public Health Ontario’s (PHO) Reportable Disease Trends in Ontario reporting tool and other reports for the most up-to-date information on infectious disease trends in Ontario.

<http://www.publichealthontario.ca/en/DataAndAnalytics/Pages/DataReports.aspx>

For additional national and international epidemiological information, please refer to the Public Health Agency of Canada and the World Health Organization.

4.2 Reservoir

The main reservoir is bivalve shellfish (i.e., 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 (e.g., 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.²

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.^{2,4} Other shellfish, such as shrimp and prawns, are not affected.²

Saxitoxins are the dominant toxin found in shellfish species located in British Columbia and the Gaspé region of Quebec. 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.²

4.3 Modes of Transmission

Consumption of contaminated shellfish, raw or cooked.²

4.4 Incubation Period

Symptoms may occur from within a few minutes to up to 12 hours after consumption of shellfish contaminated with toxin.¹⁻³

4.5 Period of Communicability

Not communicable by person-to person transmission.²

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.²

5.0 Reporting Requirements

As per Requirement #3 of the “Reporting of Infectious Diseases” section of the *Infectious Diseases Protocol, 2018* (or as current), the minimum data elements to be reported for each case are specified in the following:

- *Ontario Regulation 569* (Reports) under the *Health Protection and Promotion Act* (HPPA);⁵
- The 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 day.^{3,4}

- Educate consumers to purchase shellfish from reputable suppliers - all shellfish should have a tag verifying federal inspection.^{3,6}
- Advise travelers to exercise caution when consuming shellfish abroad.²
- 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).⁷ The CSSP classifies harvesting areas and controls the commercial and recreational harvesting and processing of shellfish for the consumer market, and is run by 3 federal government agencies with the following mandate responsibilities:⁷

- 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; and
- Fisheries and Oceans Canada - responsible for opening and closing harvest areas, and prohibiting shellfish harvesting when bacteriological or toxin levels are unsafe.

The CFIA establishes sampling sites and frequencies for each region to monitor changes in Paralytic Shellfish Poison, Amnesic Shellfish Poison and Diarrhetic Shellfish Poison levels. Acceptable levels of Paralytic Shellfish Poison should be below 80 micrograms of the toxin per 100 grams of the shellfish.⁸ When this level is exceeded, beaches are closed to harvesting, and shellfish are not permitted for retail sale.⁶

All shellfish must be federally inspected in registered plants before being offered for sale.^{6,8}

6.3 Management of Cases

In addition to the requirements set out in the Requirement #2 of the “Management of Infectious Diseases – Sporadic Cases” and “Investigation and Management of Infectious Diseases Outbreaks” sections of the *Infectious Diseases Protocol, 2018* (or as current), the board of health shall investigate cases to determine the source of infection. Refer to Section 5: Reporting Requirements above for relevant data to be collected during case investigation.

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

- There is no known anti-toxin for PSP.² 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/biochemguide/en/>
- Individuals with serious illness should be hospitalized and placed under respiratory care.^{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).

6.4 Management of Contacts

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.²

6.5 Management of Outbreaks

Please see the *Infectious Diseases Protocol, 2018* (or as current) for the public health management of outbreaks or clusters in order to identify the source of illness, manage the outbreak and limit secondary spread.

Refer to Ontario's Foodborne Illness Outbreak Response Protocol (ON-FIORP) 2013 (or as current) for multi-jurisdictional foodborne outbreaks which require the response of more than two Parties (as defined in ON-FIORP) to carry out an investigation.

7.0 References

1. Heymann DL, editor. Control of Communicable Diseases Manual. 20 ed. Washington, D.C: American Public Health Association; 2015.
2. Alberta Health. Public Health Disease Management Guidelines: Shellfish Poisoning. Edmonton, AB: Government of Alberta; 2018. Available from: <https://open.alberta.ca/publications/shellfish-poisoning>
3. Canadian Food Inspection Agency. Marine Toxins in Bivalve Shellfish: Paralytic Shellfish Poisoning, Amnesic Shellfish Poisoning and Diarrhetic Shellfish Poisoning [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2017 [updated September 21, 2017; cited February 15, 2018]. Available from: <http://www.inspection.gc.ca/food/information-for-consumers/fact-sheets-and-infographics/products-and-risks/fish-and-seafood/toxins-in-shellfish/eng/1332275144981/1332275222849>
4. Government of Canada. Health Canada reminds Canadians about the consumption of lobster tomalley [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2013 [updated May 27, 2013; cited February 15, 2018]. Available from: <http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2013/33625a-eng.php>
5. Health Protection and Promotion Act, R.S.O. 1990, Reg. 569, Reports, (2018). Available from: <https://www.ontario.ca/laws/regulation/900569>
6. BC Centre for Disease Control. Paralytic Shellfish Poisoning [Internet]. Vancouver, BC: Provincial Health Services Authority; 2018 [cited February 15, 2018]. Available from: <http://www.bccdc.ca/health-info/diseases-conditions/paralytic-shellfish-poisoning>
7. Canadian Food Inspection Agency. Canadian Shellfish Sanitation Program [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2016 [updated July 6, 2016; cited February 15, 2018]. Available from: <http://www.inspection.gc.ca/food/fish-and-seafood/shellfish-sanitation/eng/1299826806807/1299826912745>
8. Canadian Food Inspection Agency. Canadian Shellfish Sanitation program, Manual of Operations: Chapter 11 - Control of Marine Biotoxins [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2018 [updated January 23, 2018; cited February 15, 2018]. Available from: <http://www.inspection.gc.ca/food/fish-and-seafood/manuals/canadian-shellfish-sanitation-program/eng/1351609988326/1351610579883?chap=13>

8.0 Document History

Table 1: History of Revisions

Revision Date	Document Section	Description of Revisions
September 2013		New document.
February 2019	General	Minor revisions were made to support the regulation change to Diseases of Public Health Significance, Paralytic Shellfish Poisoning is designated a disease of public health significance and is now classified as communicable. Common text included in all Disease Specific chapters: Surveillance Case Definition, Outbreak Case Definition, Diagnosis, Reporting Requirements, Management of Cases, and Management of Outbreaks. The epidemiology section and references were updated and Section 8.0 Additional Resources was deleted.
February 2019	1.0 Aetiologic Agent	Minor revisions to entire section.
February 2019	3.1 Clinical Presentation	Entire section revised.
February 2019	4.2 Reservoir	Last sentence removed: "Shellfish are not grown in Ontario, since these organisms are marine-water inhabitants."
February 2019	4.6 Host Susceptibility and Resistance	Last sentence removed: "Case-fatality rate can be as high as 10%."
February 2019	6.3 Management of Cases	Third bullet removed: "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."

