

Ontario Public Health Standards:  
Requirements for Programs, Services and Accountability

Infectious Disease Protocol

# **Appendix 1:**

## **Case Definitions and Disease-Specific Information**

### **Disease: Paralytic Shellfish Poisoning (PSP)**

Effective: May 2022

# Paralytic Shellfish Poisoning (PSP)

Communicable

Virulent

[Health Protection and Promotion Act \(HPPA\)](#)

[Ontario Regulation \(O. Reg.\) 135/18 \(Designation of Diseases\)](#)

## Provincial Reporting Requirements

Confirmed case

Probable case

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:

- [O. Reg. 569](#) (Reports) under the HPPA;<sup>5</sup>
- The iPHIS User Guides published by Public Health Ontario (PHO); and
- Bulletins and directives issued by PHO.

## Type of Surveillance

Case-by-case

## Case Definition

### Confirmed Case

Clinically compatible signs and symptoms **AND**

- Detection of saxitoxin in samples of consumed shellfish or other seafood (e.g., whole scallops, crabs and lobsters).

**OR**

- Detection of high levels of dinoflagellates associated with shellfish poisoning in water from which epidemiologically related shellfish were gathered.\*

**OR**

- Detection of PSP toxins in a urine or fecal sample.†.

## **Probable Case**

Clinically compatible signs and symptoms with onset within 12 hours following consumption of a potential source of Paralytic Shellfish Toxins (e.g., shellfish or other seafood, such as whole scallops, crabs and lobster; see section 7.0).

## **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).

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\* Saxitoxins are produced by dinoflagellates of the *Alexandrium* genus.

† Testing not currently available in Canada but can be carried out in partner labs if clinically and epidemiologically warranted.

# Clinical Information

## Clinical Evidence

Clinical illness is characterized by neurological symptoms (e.g., paresthesia and/or paralysis of the mouth, neck, face, or extremities) with onset within 12 hours following ingestion of potentially contaminated food, which may or may not be accompanied by gastrointestinal symptoms (e.g., nausea, vomiting, diarrhea, and abdominal pain).

## 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.<sup>1,3</sup> The intensity and progression of the symptoms are dependent on the type, dose, and concentration of the toxin ingested in the shellfish.<sup>3</sup>

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.<sup>1-3</sup>

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.<sup>1-3</sup>

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.<sup>2,3</sup> 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.<sup>1-3</sup>

# Laboratory Evidence

## Laboratory Confirmation

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 biotoxin (i.e., saxitoxin, or its analogues) at concentrations sufficient to cause symptoms in the shellfish remaining from the same lot or harvest area as the shellfish consumed/implicated in the illness.

## Approved/Validated Tests

- Screening analysis of the implicated shellfish using the mouse bioassay.
- Analytical/confirmatory analysis of the implicated shellfish using an analytical confirmatory technique equivalent to AOAC 2011.02, Post-Column Oxidation Method for PSP.

## Indications and Limitations

- Various other seafood biotoxins may cause positive results with the mouse bioassay (or equivalent) screening method. Confirmation of the Paralytic Shellfish Toxins (saxitoxin or related toxins) is necessary.

For further information about human diagnostic testing, contact the [Public Health Ontario Laboratories](#).

## Case Management

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 Provincial 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.<sup>2,3</sup>

- There is no known anti-toxin for PSP.<sup>2</sup> Treatment is supportive.
- Individuals with serious illness should be hospitalized and placed under respiratory care.<sup>2,3</sup>

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).

## Contact Management

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.<sup>2</sup>

Symptomatic contacts should be instructed to seek immediate medical attention.<sup>2</sup>

## Outbreak Management

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 \(ON-FIORP\) 2020](#) (or as current) for multi-jurisdictional foodborne outbreaks which require the response of more than two Partners (as defined in ON-FIORP) to carry out an investigation.

## Prevention and Control Measures

### 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.<sup>3,4</sup>

- Educate consumers to purchase shellfish from reputable suppliers - all shellfish should have a tag verifying federal inspection.<sup>3,6</sup>
- Advise travelers to exercise caution when consuming shellfish abroad.<sup>2</sup>
- Educate consumers regarding raw and uncooked shellfish consumption.

### 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).<sup>7</sup> 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:<sup>7</sup>

- 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.<sup>8</sup> When this level is exceeded, beaches are closed to harvesting, and shellfish are not permitted for retail sale.<sup>6</sup>

All shellfish must be federally inspected in registered plants before being offered for sale.<sup>6,8</sup>

## Disease Characteristics

**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.<sup>1,2</sup>

**Modes of Transmission** - Consumption of contaminated shellfish, raw or cooked.<sup>2</sup>

**Incubation Period** – Symptoms may occur from within a few minutes to up to 12 hours after consumption of shellfish contaminated with toxin.<sup>1-3</sup>

**Period of Communicability** - Not communicable by person-to-person transmission.<sup>2</sup>

**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.<sup>2</sup>

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.<sup>2,4</sup> Other shellfish, such as shrimp and prawns, are not affected.<sup>2</sup>

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.<sup>2</sup>

**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.<sup>2</sup>

Please refer to [PHO's Reportable Disease Trends in Ontario reporting tool](#) for the most up-to-date information on infectious disease trends in Ontario.

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

## Comments

Consumption of bivalve mollusk shellfish (e.g., oysters, clams, mussels) has been most frequently linked to PSP cases. However, occasionally, PSP cases have also been linked to non-traditional sources of saxitoxin, which may be present in harmful concentrations in non-bivalve shellfish (e.g., whelks, moon snails and dogwinkles), or the tomalley of crustaceans (e.g., crabs, scallops, lobster).

Laboratory testing and confirmation of PSP toxins in food specimens is conducted by the CFIA laboratory.

## References

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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>
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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>

## Case Definition Sources

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# Document History

<b>Revision Date</b>	<b>Document Section</b>	<b>Description of Revisions</b>
April 2022	Entire Document	New template. Appendix A and B merged. No material content changes.
April 2022	Epidemiology: Occurrence section	Removed.
April 2022	ICD Codes	Removed.