Poliomyelitis

Revision Dates

Case Definition	August 2011
Reporting Requirements	April 2018
Remainder of the Guideline (i.e., Etiology to References sections inclusive)	June 2005

Case Definition

Confirmed Case

Clinical illness[(A)] with laboratory confirmation of infection:

- Isolation of polio virus (vaccine or wild type) from an appropriate clinical specimen (e.g., stool)[(B)];

OR

- Detection of polio virus RNA (e.g., PCR) in an appropriate clinical specimen (e.g., stool, throat swab, blood, vesicle fluid, CSF)[(B)];

OR

- Clinical illness[(A)] in a person who is epidemiologically linked to a laboratory-confirmed polio case.

Probable Case

Clinical illness[(A)] without detection of polio virus from an appropriate clinical specimen and without evidence of infection with other neurotropic viruses but with one of the following laboratory confirmations of infection:

- Significant rise in polio virus antibody titre in paired sera;

OR

- The presence of polio-specific IgM antibody in the absence of recent immunization with polio virus-containing vaccine.

Suspect Case

Clinical illness[(A)] and no laboratory confirmation of infection (no polio virus detection or serologic evidence), including negative test results, and inadequate or no investigation.

[(A)] Clinical illness is characterized by all of the following:

- acute flaccid paralysis of one or more limbs,
- decreased or absent deep tendon reflexes in the affected limbs,
- no sensory or cognitive loss,
- no other apparent cause (including laboratory investigation to rule out other causes of a similar syndrome) and
- neurological deficit present 60 days after onset of initial symptoms unless the patient has died.

[(B)] Refer to the Provincial Laboratory for Public Health (ProvLab) Guide to Services for current specimen collection and submission information.

Paralytic polio can be subdivided into the following categories:

Wild-virus: Laboratory investigation implicates wild type virus. This group is further subdivided as follows:

- Imported: travel or residence in a polio-endemic area 30 days or less before onset of symptoms.
- Import-related: epidemiologically linked to someone who has traveled or resided in a polio-endemic area within 30 days of onset of symptoms.
- Indigenous: no travel or contact as described above.

Vaccine-associated: Laboratory investigation implicates vaccine-type virus. This group is further subdivided as follows:

- Recipient: the illness began 7-30 days after the patient received oral polio vaccine (OPV).
- Contact: the patient was shown to have been in contact with an OPV-recipient and became ill 7-60 days after the contact was vaccinated.
- Possible contact: the patient had no known direct contact with an OPV-recipient and no history of receiving OPV, but the paralysis occurred in an area in which a mass vaccination campaign had been in progress 7-60 days before the onset of paralysis.
- No known contact: the patient had no known contact with an OPV-recipient and no history of receiving OPV, and the paralysis occurred in an area where no routine or intensive OPV vaccination had been in progress. In Canada, this would include all provinces and territories.

NOTE: All cases will be reviewed by the Working Group on Polio Eradication to determine their classification.

Reporting Requirements

1. **Physicians, Health Practitioners and others**
   Physicians, health practitioners and others shall notify the Medical Officer of Health (MOH) (or designate) of the zone, of all confirmed, probable and suspect cases in the prescribed form by the Fastest Means Possible (FMP).

2. **Laboratories**
   All laboratories shall report all positive laboratory results by FMP to the MOH (or designate) of the zone and the Chief Medical Officer of Health (CMOH) (or designate).

3. **Alberta Health Services and First Nations Inuit Health Branch**
   - The MOH (or designate) of the zone where the case currently resides shall notify the CMOH (or designate) by FMP of all confirmed, probable and suspect cases.
   - The MOH (or designate) of the zone where the case currently resides shall forward the initial Notifiable Disease Report (NDR) of all confirmed, probable, and suspect cases to the CMOH (or designate) within one week of notification and the final NDR (amendment) within two weeks of notification.
   - For out-of-province and out-of-country reports, the following information should be forwarded to the CMOH (or designate) by FMP:
     - name,
     - date of birth,
     - out-of-province health care number,
     - out-of-province address and phone number,
     - positive laboratory report, and
     - other relevant clinical / epidemiological information.

Etiology

Poliovirus is a member of genus *Enterovirus,* family Picornaviridae. There are three types: Type 1, 2, and 3. The virus is extremely stable and can remain viable in the environment for a long period of time (1). It is rapidly inactivated by heat, formaldehyde, chlorine and ultraviolet light.

Clinical Presentation (2)

Poliomyelitis is a highly infectious disease. The clinical presentation of poliovirus infection is variable and is typically categorized based on the severity of symptoms. Manifestations range from inapparent or asymptomatic infections to severe paralysis and death. Asymptomatic infections occur in up to 95% of cases. The virus enters through the mouth and begins to multiply at the site of implantation (pharynx and gastrointestinal tract). The virus is commonly present in the throat and stool before symptoms are apparent. One week after onset the virus is rarely found in the throat but continues to be excreted in the stool for 3-6 weeks. The virus infects lymph tissue and enters the blood stream. It may then invade cells of the central nervous system. The replication of the virus occurs in motor neurons of the anterior horn and brain stem resulting in cell destruction. This is the cause of the typical manifestations of poliomyelitis.

A minor or nonspecific illness occurs in 4-8% of cases. Symptoms may include fever, malaise, headache, nausea, and vomiting. There is little or no evidence of CNS invasion. Three syndromes are associated with this type of infection: upper respiratory infection, gastrointestinal upset, and influenza-like illness. Aseptic meningitis (occasionally with paresthesias) occurs in a small number of individuals after the minor illness has resolved. A more severe form of infection is characterized by the onset of acute flaccid paralysis (AFP). This occurs in about 1% of infections. Severe muscle pain and stiffness of the neck and back with paralysis may occur.

Paralytic polio is classified into three types depending on the level of involvement. Spinal polio is the most common (79% of paralytic polio cases) and is characterized by asymmetric paralysis usually of the legs. Bulbar polio occurs in about 2% of paralytic polio cases and is manifested by weakness of muscles innervated by cranial nerves. Bulbospinal polio accounts for about 19% of cases and is a combination of spinal and bulbar polio. The duration of the paralysis is usually short, lasting 3-4 days. Rarely will the paralysis remain but if it extends beyond 60 days it is usually permanent. Cranial nerve involvement and paralysis of respiratory muscles can occur.

Post polio syndrome (PPS) affects polio survivors 10-40 years after recovery from an initial paralytic polio attack. PPS is not thought to be caused by persistence of the virus but rather by the death of nerve terminals in the motor units that remain after the initial attack of polio. It is characterized by further weakening of muscles that were previously affected by the polio infection. Individuals may experience fatigue, slowly progressive muscle weakness, joint pain and increasing skeletal deformities. Some individuals experience only minor symptoms and others have more severe symptoms. The extent to which individuals will suffer PPS depends on how seriously they were affected by the original polio attack. It is usually not life threatening (3).

Diagnosis (4)

The following are considerations to confirm polio:

- All suspected cases of polio should have a throat swab and CSF submitted to the PLPH for viral isolation.
- Collection of one stool sample within two weeks (up to six weeks) after the onset of paralysis for viral studies. A rectal swab is acceptable in the absence of a stool sample.
- Serum specimen should be collected immediately for polio serology.

- In the absence of a positive culture, acute and convalescent neutralizing antibody titres can be examined to detect a fourfold rise indicative of infection. In some cases these antibodies may already be present at the time of paralysis and no rise is demonstrated.
- A second serum specimen should be collected two weeks later if the patient presents in the acute phase of the illness or one month later if the patient presents in the convalescent phase. Samples should be tested in parallel for poliovirus antibody titres and polio-specific IgG and IgM evaluations.
- All samples should be sent to PLPH and may be forwarded to the National Centre for Enteroviruses for further investigation when needed i.e., to determine whether the virus is wild-type or vaccine strain.
- Neurologic investigations should take place (electromyography, nerve conduction studies, MRI, CT).

Epidemiology

Reservoir

The reservoir is humans.

Transmission

Wild-type polio is predominately transmitted through the fecal-oral route. In many developing countries transmission is through direct contact with oral secretions.

In cases of vaccine-associated paralytic poliomyelitis (VAPP) the transmission via OPV is most often associated with the first dose. Transmission to recipients or their contacts is rare.

Incubation Period

The incubation period is 9-12 days with a range of 5-35 days to the onset of the prodromal period and 11-17 days with a range of 8-36 days to the onset of paralysis.

In cases of vaccine-associated disease, paralysis may occur 7-21 days following the administration of OPV while contact cases (those in contact with another person who has received OPV) appear within 20-29 days.

Period of Communicability

Poliomyelitis is communicable for as long as the virus is shed in the throat (36 hours to 12 days after exposure) or in the stool (72 hours to six weeks after exposure or until feces are culture negative). The disease is most communicable in the few days before and after the onset of symptoms.

Host Susceptibility

Immunodeficiency increases the risk for acquiring polio. Viral type specific immunity follows an infection.

Occurrence

General (4, 5)

The WHO has set a target of the year 2005 for the eradication of polio worldwide. Wild type polio does not normally circulate in the Western hemisphere, however, it persists in many African countries. In 1999, 6,970 cases of polio were reported globally, up 10% from 1998 (6,349 cases) due to a large wild poliovirus type 3 outbreak in Angola. Type 2 polio was identified in Madagascar in 2002 when four cases were identified through AFP surveillance. The children affected were not fully immunized.

Canada (2, 4)
Paralytic poliomyelitis has been nationally notifiable since 1924. The last major epidemic in Canada occurred in 1959 when there were 1,887 cases of paralytic polio reported. The last case of indigenous wild paralytic poliomyelitis in Canada occurred in 1977. The most recent significant outbreak occurred in Canada between 1978 and 1979 when 11 cases of imported paralytic polio were reported in Ontario, Alberta, and British Columbia. These cases were linked to an outbreak occurring in Holland and involved members of a group opposed to immunization. No cases were seen in immunized groups.

From 1980 to 1999, 12 cases of paralytic polio were reported in Canada. Eleven cases were determined to be associated with vaccine: three were confirmed vaccine-associated contact cases, five as possible vaccine-associated contact cases and one as confirmed vaccine-associated recipient case; two were not reviewed but occurred in known contacts of children vaccinated with OPV. The last case of VAPP was reported in 1995.

In 1993 wild-type virus circulated in an unimmunized group that had contact with infected individuals from Europe. Twenty-two asymptomatic cases were identified at that time (Alberta). In 1996, a similar case occurred in an asymptomatic child who lived in Ontario but had recently traveled to India. In general, wild-type infections in Canada are associated with importation or foreign travel.

Canada was certified polio free in 1994. One of the conditions of the certification was to establish a surveillance system for the identification of AFP. Active surveillance for AFP continues. This data is collected by the Canadian Paediatric Surveillance Program and IMPACT.

Alberta (6, 7)
Polio vaccination was introduced in Alberta in 1956 (IPV). In 1962, the administration of OPV became part of the routine immunization program. With the elimination of wild-type polio disease in Canada and the Western hemisphere, the relative importance of rare cases of OPV vaccine-associated paralysis became more pronounced. In 1994 and 1997, Alberta began administering vaccines containing IPV for primary childhood immunization, hence, the risk of vaccine-associated polio disease was eliminated.

Since 1967, three cases of symptomatic polio have been reported. Two were attributed to vaccine. One vaccine-associated case was reported in 1979 in a four month old partially immunized infant. No details were available on the second vaccine-associated case. The third case of symptomatic polio was reported in 1978. This was the last symptomatic case reported in Alberta. The disease was diagnosed in an eight year old child who was a member of a group opposed to immunization and was related to the Canadian outbreak of 1978-79 (cases imported from Holland).

In 1993, 22 asymptomatic cases of imported wild polio were identified in members of a southern Alberta religious group. Members were not immunized and had been in contact with infected individuals in Europe.

Key Investigation

Single Case/Household Cluster (4)

- Assess polio immunization status (total number of doses of oral and/or inactivated polio vaccine received).
- Obtain relevant medical history including immunocompromised status or abnormal neurological history.
- In cases of wild-virus disease assess for:
  - travel to or residing in another country within 30 days prior to the onset of this illness, and
  - household member or other close contacts who have traveled to or resided in another country within 30 days prior to the onset of the child's illness.
- In cases of vaccine-associated disease assess for:
  - receipt of oral polio vaccine (OPV) 7-30 days prior to the onset of current illness,
  - recent (7-60 days) presence in an area where a mass immunization campaign had been in progress, and
  - household members or other close contacts who have received OPV 7-60 days prior to the onset of this child's illness.
- Identify contacts. Contacts are defined as:
  - persons living in the same household or having close contact with the case (e.g., sharing sleeping arrangements or playing together for ≥ four hours) within 30 days before the case's onset of illness,
  - children attending the same daycare as the case, and
  - persons having contact with stool or fecal matter of the case within 30 days before the case's onset of illness, without using infection control precautions.

Control

Management of a Case

- Isolation with routine practices and contact precautions for hospitalized patients.
- Household measures are felt to be of little use since the infection has usually spread by the time the first case is suspected. It is still important, however, to implement routine practices and contact precautions.
- Throat discharges, feces, and contaminated articles should be handled using routine practices and contact precautions. In areas where there is modern sewage disposal, feces and urine can be discharged directly into the sewers.

Treatment of a Case

- **No specific treatment is available**.

Management of Contacts

- Identify symptomatic contacts and refer to physician for assessment.
- Contacts may be quarantined by order of the MOH. This is generally not valuable in most cases as often the virus has already been transmitted when the case is identified.
- Public health will interview contacts to assess polio immunization history and have immunization updated, if needed, according to the current Alberta Immunization Manual.

Preventive Measures (7)

- Immunization with inactivated polio vaccine (IPV) as per the current Alberta Immunization Manual. IPV produces immunity to all three types of poliovirus in over 90% of individuals following two doses of vaccine given at least six weeks apart and close to 100% following a booster dose given 6-12 months later. Vaccine is recommended for:

  - infants and children as part of the routine immunization schedule and completion of an immunization series started in a country where OPV is used,
  - primary immunization of laboratory workers handling specimens that may contain poliovirus,
  - primary immunization of healthcare workers who may be in contact with individuals excreting wild or vaccine stains of poliovirus, and
  - primary immunization of parents or childcare workers who will be caring for children in countries where OPV is used.
- Routine immunization against poliomyelitis for adults living in Canada is not considered necessary.

NOTE: IPV and OPV are licensed in Canada, however, in the past number of years all cases of polio or suspected polio have been associated with OPV. As well, imported wild-virus has not led to transmission to anyone in Canada outside of groups that remain unimmunized, thus, only IPV is recommended for routine use.

References

(1) Public Health Agency of Canada. *Canadian Immunization Guide.* Sixth Edition. 2002. http://www.phac-aspc.gc.ca/publicat/cig-gci

(2) Centers for Disease Control and Prevention, Department of Health and Human Services. *Epidemiology and prevention of vaccine-preventable diseases.* The Pink Book. Seventh Edition. January 2002.

(3) *Post-polio syndrome fact sheet*. National Institute of Neurological Disorders and Stroke. December 2004. http://www.ninds.nih.gov/disorders/post_polio/detail_post_polio.htm

(4) Public Health Agency of Canada. *Protocol for the investigation of acute flaccid paralysis and suspected paralytic poliomyelitis*. Ottawa: CCDR 1998;24-04. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/98vol24/dr2404e.html

(5) Public Health Agency of Canada. *Paralytic polio in Madagascar, 2002*. Ottawa: CCDR 2002; 28-16. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02vol28/dr2816.html

(6) Alberta Health and Wellness, Disease Control and Prevention. *Notifiable Diseases – Alberta*. Communicable Disease Reporting System Mid Year Population. March 2003.

(7) Alberta Health and Wellness, Disease Control and Prevention. *Alberta Immunization Manual - Poliomyelitis vaccine*. January 2001.