Prince Edward Island
Health and Wellness
CANADA

Prince Edward Island Guidelines for the Management and Control of Invasive Haemophilus influenza serotype b (Hib)

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Department of Health and Wellness
Chief Public Health Office

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Case Definition (1)

Confirmed Case

Clinical evidence of invasive disease[1] with laboratory **confirmation** of infection:

- Isolation of *Haemophilus influenzae* serotype b (Hib) from a normally sterile[2] site.

OR

- Isolation of Hib from the epiglottis in a person with epiglottitis

Only confirmed cases of Haemophilus influenza serotype B are reported nationally.

Probable Case

Clinical evidence of invasive disease[1] with laboratory **evidence** of infection:

- Demonstration of *H. influenzae* serotype b antigen[2] in cerebrospinal fluid

OR

- Demonstartion of *H. influenzae* DNA[2] by specific nucleic acid test (e.g. Polymerase Chain Reaction [PCR]) in a normally sterile[3] site

OR

- Buccal cellulitis or epiglottitis in a child < 5 years of age with no other causative organisms isolated.

Reporting Requirements

1. **Health Practitioners**
   Health practitioners, shall, in accordance with the Notifiable Diseases and Conditions and Communicable Diseases Regulations(1), as part of the Prince Edward Island (PEI) *Public Health Act* (2) report all confirmed and probable cases by phone to the Chief Public Health Officer (CPHO) (or designate) and in any case not later than 1 hour after observation, as per the PEI Reporting Notifiable Diseases, Conditions, and Events Regulations (3).

2. **Laboratories**
   The Provincial Laboratory shall, in accordance with the PEI *Public Health Act* (2), report all positive laboratory results by phone and mail, fax or electronic transfer, as soon as the result is known, to the CPHO (or designate) and in any case not later than 1 hour after observation, as per the PEI Reporting Notifiable Diseases, Conditions, and Events Regulations (3)

[1] Clinical evidence of invasive disease due to *H. influenzae* includes meningitis, bacteremia, epiglottitis, pneumonia, pericarditis, septic arthritis, or empyema.

[2] Detection of *H. influenzae* DNA is considered probable, not confirmed, because Hib may be present in a non-pathogenic role and thus, depending on the site, may NOT reflect the actual pathogen. Additionally, detection of *H. influenzae* DNA in a sterile site does NOT indicate that it is type b since this test does not differentiate between serotypes.

[3] Specimens from a normally sterile site are defined as blood, cerebrospinal fluid (CSF), pleural fluid, peritoneal fluid, pericardial fluid, bone, joint fluid, or specimens taking during surgery (e.g. muscle collected during debridement for necrotizing fasciitis or fluid from a deep abscess). **NOTE**: A specimen collected from a non-sterile site during a sterile procedure is not considered a “normally sterile site”.

Etiology

Haemophilus influenzae serotype b is a gram negative coccobacilli bacterium (4). It does not survive in the environment or on inanimate surfaces.

Clinical Presentation

Prior to the introduction of an effective vaccine, Hib was the leading cause of bacterial meningitis and other invasive bacterial diseases among children less than five years of age (5). Almost all serious Hib infections were in children less than five; two thirds of these cases were in children less than 18 months old (6).

Hib is a bacterial infection. The organism enters the body through the nasopharynx (6). Here the organism colonizes and may remain only transiently or may persist for several months with no symptoms. In some individuals the organism causes an invasive infection but the exact mode of invasion into the bloodstream is unknown (6). An infection of the upper respiratory tract may be a contributing factor (7). This organism has the ability to cause meningitis (usually associated with bacteremia), epiglottitis, pneumonia, septic arthritis, bacteremia, cellulitis, pericarditis, empyema, and osteomyelitis (7). The onset is typically acute but can be subacute. Symptoms can include fever, vomiting, lethargy, and meningeal irritation with a bulging fontanelle in infants or a stiff neck/back in other children (4). Progressive stupor or coma is common (4). Five percent of invasive cases are fatal and up to 15% to 20% of survivors have permanent hearing loss; also 15% to 30% of survivors have some form of permanent disability (7).

Diagnosis

The diagnosis is made by the isolation of the *H. influenzae* organism from a normally sterile site (see case definition) at the Provincial Laboratory at the Queen Elizabeth Hospital. Clinical specimens should be inoculated onto appropriate culture media as soon as possible following collection as the viability of the organism is lost quickly. If the Provincial Laboratory determines a positive sample, it is sent to the National Microbiology Laboratory for typing. Confirmation of typing can take up to 2 to 3 weeks.

Epidemiology

1. **Reservoir**
   The reservoir is humans (4).

2. **Transmission**
   Transmission of Hib is person to person via droplet infection and direct or indirect contact with discharges from the nose and throat during the infectious period (4). Typically the nasopharynx is the portal of entry (4). In neonates the source of infection may be the aspiration of amniotic fluid or genital tract secretions containing the organism (6).

3. **Incubation Period**
   The incubation period remains unknown, probably 2-4 days (4).

4. **Period of Communicability**
   The exact period of communicability is unknown but considered communicable as long as Hib bacteria are present which may be for a prolonged period of time even without nasal discharge (6). The individual becomes non-infectious approximately 24 hours after starting effective antibiotic therapy (4).

5. **Host Susceptibility**
   There is universal susceptibility in children less than five years of age. Most at risk are infants and young children, household and daycare contacts of confirmed cases. Immunity is associated with the presence of circulating bactericidal and/or anticapsular antibody that is acquired transplacentally, from prior infection or from immunization (4). Children who acquire an invasive Hib infection prior to two years of age may not develop immunity, should be considered susceptible, and should be vaccinated.

   Risk factors for disease include health (chronic diseases) and environmental factors (household crowding, large household size, child care or nursery school attendance, low socioeconomic status, low parental education levels, and school-aged siblings).

   Hib is most prevalent in children aged 2 months to 2 years. Those within this age group are at even higher risk if they are also children who:
   - Have splenic dysfunction (sickle cell disease or asplenia),
   - Have antibody deficiencies,
   - Attend childcare centres,
   - Are from an Inuit community, or
   - Have cochlear implants (8).

Occurrence

1. **General** (6)
   There is a worldwide distribution of Hib. It is not a common disease in children over five years of age in developed countries, but continues to be a major cause of lower respiratory tract infections in infants and children in developing countries due to the absence of immunization programs.

   A conjugate vaccine was first introduced in the U.S. for children in 1987; the vaccine indication was expanded to include infants in 1990. From 1996 to 2000 there were a total of 341 cases (average of 68 per year) of Hib reported in the US. The majority of these cases were in unimmunized or incompletely immunized children.

2. **Canada**
   Invasive Hib disease has been reportable in Canada since 1979 (1). The first Hib vaccine, a polysaccharide, was licensed in 1985 for children over two years of age (5). Due to the inability of infants to respond to the polysaccharide vaccine, a conjugate vaccine was licensed in 1988 with indication for children aged children two months of age and over. Prior to the introduction

of Hib conjugate vaccine there were approximately 2,000 cases of Hib disease reported per year. The number of cases has declined by 95% since the vaccine was introduced (6).

The number of cases of Hib infection in children less than 16 years of age had a remarkable decline beginning in 1995 (as observed by the Canadian Immunization Monitoring Program ACTive [IMPACT]). Monitoring of disease in children up to 16 years old is done through IMPACT in 12 pediatric hospitals across Canada. This program reported a reduction from 485 cases in 1985 to only 20 cases in 1995 and fewer yet in 1997 with eight cases being reported. From 2011 to 2015, a total of 137 cases of invasive Hib were reported in Canada in all age groups (47 cases in children 14 years and younger). The annual number of reported cases ranged from 24 to 33, with a median of 27 cases reported per year. Based on data obtained through IMPACT, four cases of preventable (i.e. un-vaccinated or under-vaccinated for age) Hib were reported among children less than 5 years of age between 2011 and 2015 (9). Parent refusals or failure to ensure their children are immunized outnumber vaccine failures by three to one (6) (10).

3. **Prince Edward Island**

There have been no cases of Hib reported in PEI in greater than 10 years.

Control

Management of a Case

- Follow up is only done if the responsible organism is Hib and the disease is invasive e.g. meets the case definition.
- Contact tracing and counselling are to be completed[3] for all reported cases. See Management of Contacts for criteria.
- Droplet precautions are to be put in place until 24 hours of appropriate antibiotic therapy have been completed.
- Vaccine failures should be investigated. Serum antibody responses occur 1-2 weeks after immunization, hence, vaccine recipients may not be protected during this period[4].

Treatment of a Case

- Treat case with cefotaxime or ceftriaxone.
- Rifampin is recommended if the case was treated with antibiotics other than cefotaxime or ceftriaxone and should be initiated during hospitalization. Rifampin can be given up to seven days following the completion of therapy. It is not indicated in those treated with cefotaxime or ceftriaxone as these drugs eradicate Hib from the nasopharynx.

[3] To be completed by Public Health Nursing.

[4] Vaccine failures have been reported in Canada. From 1991 to 1995, 8-12 vaccine failures were reported annually and from 1996 to 1999, three to four annually. The US reports approximately 15 cases of invasive Hib disease annually in children less than five years of age who have previously received the primary Hib vaccine series

Management of Contacts

Definition of a contact of a case of Invasive Hib disease;

A person residing with the case of invasive Hib disease or a person who has spent 4 or more hours per day with the case for at least 5 of the 7 days preceding the day of hospital admission of the case.

Chemoprophylaxis of Contacts

The aim of Rifampin chemoprophylaxis is to eliminate nasopharyngeal carriage of Hib bacteria and prevent transmission. To effectively prevent secondary spread, Rifampin should be given concurrently to all contacts to prevent reinfection within the contact group.

Chemoprophylaxis is recommended for:

1. All household contacts, regardless of age, in the following circumstances:
    - Household with at least one contact younger than 4 years of age who is unimmunized or incompletely immunized[5].
    - Household with an immunocompromised child, regardless of child's immunization status (i.e., even if fully immunized)
2. Preschool/Daycare contacts:
    - If one case of Hib invasive disease has occurred, chemoprophylaxis should be provided to incompletely or unimmunized children younger than 4 years of age
    - If 2 or more cases of Hib invasive disease have occurred within 60 days and unimmunized or incompletely immunized children attend the facility, chemoprophylaxis for all attendees and childcare providers should be considered.

Preventative Measures

- Hib immunization is offered to all infants in PEI at 2, 4, 6, and 18 months of age (please refer to the PEI Childhood Immunization Schedule)[6].
- Healthy children over the age of 5, including adults, do not need a Hib-containing vaccine however certain persons would be at higher risk and should therefore be immunized[7] including:
    - Persons who have splenic disorders,
    - Persons who have congenital and primary immunodeficiency,
    - Persons who have had a solid organ transplant,

[5] Complete immunization is defined as having at least one dose of Hib conjugate vaccine at 15 months of age or older, two doses between 12 and 14 months of age, or a two or three dose primary series when younger than 12 months with a booster at 12 to 18 months of age. Refer to the Canadian Immunization Guide for further immunization information.

[6] For more information, please refer to the Canadian Immunization Guide.

[7] Vaccine failures have been reported in Canada. From 1991 to 1995, 8 to 12 vaccine failures were reported annually and from 1996 to 1999, three to four annually. The US reports approximately 15 cases of invasive Hib disease annually in children less than five years of age who have previously received the primary Hib vaccine series.

  - Persons who have received a cochlear implant,
  - Persons who have human immunodeficiency virus (HIV), and
  - Persons who have had a hematopoietic stem cell transplant (as per the PEI Adult Immunization Schedule).
- Children who develop invasive Hib disease before 24 months of age should receive the vaccine as recommended, since natural disease may not induce protection.
- Children who develop invasive Hib disease after complete or partial immunization[8] should be referred to a pediatrician for an immunologic assessment.
- Careful observation of exposed unimmunized or incompletely immunized household, non-household, childcare or nursery contacts is vital. Exposed children who develop a febrile illness should receive prompt medical attention and, if indicated, appropriate antimicrobial therapy should be initiated.

Key Investigation

- Verify serotype with lab. Once growth on the culture media has occurred, serotyping for type b will be sent to the National Microbiology Laboratory and will take approximately 2 to 3 weeks. (V. Arsenau, personal communication, May 9, 2018)

- Determine immunization status of the case. This will assist with determining the likelihood of Hib infection i.e., if the case has completed a full series of vaccine it is less likely to be Hib.

- Identify contacts and obtain the ages, immunization status, and weights (if the contact is less than 12 years of age). Contacts include:
  - all persons living in the household,
  - any individual (household or non-household) who has had 4 or more hours of contact with the case for 5 of the 7 days prior to the onset of illness regardless of the age of the case,

    AND one of the following lives in the same household as the case:
    - at least one unvaccinated child younger than 48 months, and/or
    - a child younger than 12 months (who has not received a primary series i.e., three doses of vaccine), and/or
    - an immunocompromised child of any age (regardless of the child's immunization status).

- Determine attendance in a preschool or daycare centre. Obtain the ages, immunization status, and weights (if less than 12 years of age) of attendees.

- All staff and children attending preschool or daycare centre (daycare or day home) are considered contacts when two or more cases of invasive Hib have occurred within 60 days and unimmunized or incompletely immunized children attend.

[8]Complete immunization is defined as having at least one dose of Hib conjugate vaccine at 15 months of age or older, two doses between 12 and 14 months of age, or a two or three dose primary series when younger than 12 months with a booster at 12 to 18 months of age. Refer to the Canadian Immunization Guide for further immunization information.

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Annex A: Rifampin Dosing Chart

Drug	Dosage	Comments
Rifampin	**Adults:** 600 mg PO q 24h x 4 doses	Contraindicated in pregnancy. Urine and tears may be stained red or orange. Advise against wearing soft contact lenses as they can also become stained. Can reduce effectiveness of contraceptives. Advise use of alternative contraceptive measures. Can interact with multiple other medications.
	Children ≥ 1 month of age: 20 mg/kg per dose (maximum daily dose 600 mg) PO q 24h x 4 doses	
	Infants < 1 month of age: 10 mg/kg per dose PO q24h x 4 doses	

Annex B: Information for Patients Taking Rifampin

RIFAMPIN is an antibiotic which has been recommended for close contacts of some illnesses.

You are advised to take this medication as prescribed by your physician. While taking Rifampin you should be **aware** of the following:

1. Your urine or tears may become an orange colour.
2. Soft contact lenses should not be worn because they may stain red or orange and become damaged.
3. Rifampin may interfere with the effectiveness of oral contraceptives (other birth control methods are recommended while on Rifampin.)
4. Persons who are **pregnant** should inform their physician before taking Rifampin.
5. Be aware that Rifampin may interact with other medications you are taking. Talk with your healthcare provider before starting any new medication, including over-the-counter, natural products, or vitamins.
6. Possible side effects may include:
    - Abdominal pain, nausea, vomiting, diarrhea, headache, dizziness,
    - Jaundice,
    - Red or orange discoloration of urine,
    - Discoloration of contact lenses,
    - Ineffectiveness of birth control pills.
7. Seek medical treatment if you experience any signs of an allergic reaction (rash, swelling) or if you develop any severe or unusual side effects.

Annex C: Fact Sheet Haemophilus Influenzae Serotype B

What is *Haemophilus influenzae* serotype b (Hib)?

Haemophilus influenza serotype b (Hib) is a bacterial infection that usually affects children under the age of 5 or those whose immune systems are weakened. There are several types (strains) of these bacteria. Some strains cause mild disease in the nose or throat, while others cause more serious disease.

How could I get Hib?

Haemophilus influenzae is spread by person to person through direct and indirect contact with secretions or discharge from the nose and mouth;

- coughs and sneezes from an infected person;
- touching objects that were recently exposed to an infected person's mucus or saliva (such as shared utensils, cups, tissues and toys) then rubbing your eyes, nose or mouth.

What are the symptoms?

Haemophilus influenzae can cause symptoms ranging from mild to severe. The most common infections are in the nose and mouth such as ear infections, sinus infections, and lung infections. In rare cases the bacteria can invade other parts of the body such as the brain, heart , bones and skin which leads to very serious disease and symptoms such as; sudden fever, drowsiness, fussiness, intense headache, vomiting, and stiff neck and back.

When is an infected person contagious?

Haemophilus influenzae can be contagious seven days before symptoms occur and a person is contagious until the bacteria are no longer in the body, usually 24-48 hours after starting appropriate antibiotic therapy.

How can I prevent Hib infection?

There is a vaccine to prevent Hib infections. In Prince Edward Island, all infants at 2, 4, 6, and 18 months of age are offered this vaccine as part of the routine childhood immunization schedule. In addition, adults who have certain risk factors may also be eligible for the vaccine free of charge. For more information, please contact your health care provider or local public health nursing office.

In addition, thorough hand washing can help prevent infection with Hib.

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