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1.0 GOAL

To eliminate vaccine preventable cases of invasive *Haemophilus influenzae* type b (Hib) disease in children under 5 years of age and in select vulnerable populations by:

1) delivery of routine on-time immunization to children at ages 2, 4, 6 and 18 months
2) immunization of previously unimmunized children under 5 years of age
3) immunization of high risk individuals aged older than 5 years
4) case management and contact follow-up with chemoprophylaxis if indicated
5) immunization of select populations identified as at high risk epidemiologically
6) reporting of cases of invasive Hib disease

2.0 CLINICAL DESCRIPTION

Haemophilus influenzae type b was the most common cause of bacterial meningitis and a leading cause of other serious invasive infections in young children before the introduction of Hib vaccines. About 55% to 65% of affected children had meningitis, the remainder suffering from epiglottitis, bacteremia, cellulitis, pneumonia, or septic arthritis. The case fatality rate for meningitis is about 5%. Severe neurologic sequelae occur in 10% to 15% of survivors and deafness in 15% to 20% (severe 3% to 7%).

The risk of Hib meningitis is at least twice as high for children attending full-time day care as for children cared for at home. Other factors that predispose to invasive disease include sickle cell disease, asplenia, HIV infection, certain immunodeficiency syndromes, and malignant neoplasm.

The onset can be subacute but is usually sudden, with fever, vomiting, lethargy, and meningeal irritation; bulging fontanelle in infants; or stiff neck and back in older children. Progressive stupor or coma is common.

H. influenzae is also commonly associated with otitis media, sinusitis, bronchitis, and other respiratory tract disorders. However, since type b organisms seldom cause these disorders, Hib vaccines have not affected their incidence.

Incubation period - unknown; probably short (2 to 4 days).

Period of communicability – as long as organisms are present, which may be for a prolonged period even without nasal discharge. Communicability ends within 24-48 hours after starting effective antibiotic therapy.

3.0 EPIDEMIOLOGY

Haemophilus influenzae type b (Hib) disease has declined dramatically since the introduction of Hib vaccines in the early 1990s, with a small residual burden of illness almost exclusively in adults and unimmunized children. Risk factors include both exposure (such as household crowding, low socio-economic status) and host factors; the latter include very young and old age, and immunodeficiency states (e.g., functional and anatomic asplenia, HIV infection, immunoglobulin deficiency, complement deficiency, receipt of chemotherapy or stem cell transplant, chronic renal failure). Indigenous peoples are disproportionately affected by *Haemophilus influenzae* disease because of longstanding inequities related to the social determinants of health due to the impacts of colonization.[1]

Statistics on invasive *Haemophilus influenzae* disease are available in the BCCDC Reportable Diseases Data Dashboard and in the Annual Summaries of Reportable Diseases.

4.0 CASE DEFINITION

All invasive *Haemophilus influenzae* disease is reportable in BC. Encapsulated strains of the bacterium are differentiated by serotype (a, b, c, d, e, and f), and unencapsulated strains are undifferentiated and non-typeable.

Confirmed Case

Clinical evidence* of invasive disease with laboratory confirmation of infection:

- isolation of *H. influenzae* from a normally sterile site, OR
- isolation of *H. influenzae* from the epiglottis in a person with epiglottitis

Probable Case
Haemophilus influenzae serotype b

Clinical evidence* of invasive disease with laboratory evidence of infection:

- demonstration of *H. influenzae* type b antigen in cerebrospinal fluid, OR
- demonstration of *H. influenzae* DNA in a normally sterile site, OR
- Buccal cellulitis or epiglottitis in a child < 5 years of age with no other causative organisms isolated

* Clinical illness associated with invasive disease due to *H. influenzae* includes meningitis, bacteraemia, epiglottitis, pneumonia, pericarditis, septic arthritis and empyema.

[1] Truth and Reconciliation Committee of Canada. Honouring the Truth, Reconciling the Future. Summary of the Final Report of the Truth and Reconciliation Commission of Canada [Internet]. 2015. [cited 2022 Dec 2]. Available from: https://ehprnh2mwo3.exactdn.com/wp-content/uploads/2021/01/Executive_Summary_English_Web.pdf

5.0 REPORTING

All cases of invasive *Haemophilus influenzae* are reportable in BC, including those due to non-b serotypes. Report in the electronic public health information system within the timelines defined by CD Policy (1 day of receiving the report for type b; 5 days for other types). The minimum dataset for type b disease is outlined on the "Invasive Haemophilus influenzae type b" surveillance form. Follow the instructions on this form for reporting to the BCCDC. The minimum dataset for the other types is limited to the data elements collected for all reportable communicable diseases.

6.0 CONTACT MANAGEMENT

Secondary cases caused by non-type b or non-typeable *Haemophilus influenzae* strains are rare and chemoprophylaxis is not recommended for contacts of invasive non-type b *Haemophilus influenzae* disease. Therefore this section only applies to contacts of a case of invasive *Haemophilus influenza* type b disease.

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. It is assumed that when children have spent 4 or more hours together per day, they are likely to have napped and/or eaten together, which increases transmission risk.

Identify contacts of the index case by name, date of birth or age, and Hib immunization status. Consult with the Medical Health Officer immediately to determine whether chemoprophylaxis and/or Hib immunization is necessary.

6.1 Immunoprophylaxis of Contacts

Post-exposure Hib immunization alone is probably ineffective in preventing secondary cases because vaccination requires time to generate an immune response, and most secondary cases occur within the first week after the index case.

Offer immunization to contacts less than 60 months of age who are unimmunized or not completely immunized for age and to individuals older than 5 years of age who have chronic conditions associated with increased risk of invasive Hib disease (e.g., sickle cell disease, asplenia, or immunodeficiency).

6.1.1 Immunoprophylaxis of Adults in Delineated Communities Following Occurrence of a Cluster or Case

Hib disease has not been recognized as a cause of community-based outbreaks until recently in BC, and this phenomenon is thought to be associated with a

clonal strain of the organism affecting adults, many of whom are homeless/ under-housed.

In the management of such invasive Hib clusters, Hib immunization may be considered for small, delineated populations by geography and factors such as use of specific settings or services. The decision to use Hib vaccine in this manner should be made in consultation by the regional MHO with the BCCDC Immunization Program and if a larger scale program is contemplated, also the Provincial Health Officer.

Following the occurrence of an invasive case in an adult associated with the homeless/underhoused population, social network contacts including those in shared accommodation such as a shelter or single room occupancy housing and accessing common services for these populations may be offered Hib vaccine at the discretion of the regional MHO; workers at these locations may also be offered Hib vaccine. Offer Hib vaccine regardless of prior Hib vaccine receipt. For those with a record of Hib vaccine within the past 12 months, an additional dose is not needed.

Consideration should be given to presence of the circulating strain including recent prior occurrence of the outbreak strain in the community or results of laboratory typing; however, if a high index of suspicion for this strain exists based on epidemiological factors, confirmation of strain is not required in order to avoid delay in offering vaccine.

Protective antibody levels are achieved 7-10 days after receiving the vaccine. Vaccination may prevent additional cases and has the potential to reduce nasopharyngeal carriage. Efficacy of vaccine may be reduced in immunocompromised people.

6.2 Chemoprophylaxis of Contacts

Ensure that all close contacts are offered chemoprophylaxis as specified in 6.3 Chemoprophylactic Agents for Close Contacts of Hib Infection.

Utilize the Provision of chemoprophylaxis of contacts of Haemophilus influenzae type b infection form (section 10.0) to communicate with MHO and/or Pharmacist regarding dispensing of chemoprophylactic agents.

The aim of chemoprophylaxis is to eliminate nasopharyngeal carriage of Hib bacteria and prevent transmission. To effectively prevent secondary spread, chemoprophylaxis should be given concurrently to all contacts (at the same time or within 3 days) to prevent reinfection within the contact group.

Rifampin given orally for 4 days is the prophylaxis of choice as it is highly effective. Ceftriaxone (IM) may be used as an alternative prophylaxis for pregnant people, individuals for whom rifampin is contraindicated or who cannot tolerate oral medication.[1, 2] When indicated, chemoprophylaxis should be initiated as soon as possible without first establishing whether the individual has nasopharyngeal carriage of the organism. If more than 14 days have passed since the last contact with the index case, the benefit of chemoprophylaxis is likely to be decreased. In previous studies that have looked at the risk of transmission in the 30 days following an index case in the household, 84% of secondary cases have occurred in the first 14 days after disease onset in the index case.

Contacts developing symptoms of invasive Hib disease (particularly fever and headache) should seek prompt medical attention, even if chemoprophylaxis has been taken.

Chemoprophylaxis is only recommended for cases of type b *Haemophilus influenzae*, not for other serotypes.

Chemoprophylaxis is recommended for:

(1) All household contacts, regardless of age, in the following circumstances:
- Household with at least 1 contact younger than 4 years of age who is unimmunized or incompletely immunized for age
- Household with a child younger than 12 months of age if the child has not received the primary series of three doses
- Household with an immunocompromised child regardless of that child's Hib immunization status (i.e., even if fully immunized).

(2) Preschool/day care contacts (including staff), regardless of age, when **2** or more cases of invasive Hib disease have occurred within 60 days among attendees and unimmunized or incompletely immunized children are attending.

(3) The case, if younger than 2 years of age or is a member of a household with a susceptible contact, and who had been treated with a regimen other than cefotaxime sodium or ceftriaxone sodium. Chemoprophylaxis usually is provided just before discharge from hospital.

Chemoprophylaxis MAY be considered in the following situations at the discretion of the Medical Health Officer:

- All household contacts of the case when at least one contact is a child of any age with immunodeficiency, sickle cell disease, asplenia, or leukemia

[1] Goldwater PN. Effect of cefotaxime or ceftriaxone treatment on nasopharyngeal *Haemophilus influenzae* type b colonization in children. Antimicrob Agents Chemother. 1995;39(9):2150-2.
[2] Ladhani S, Neely F, Heath PT, Nazareth B, Roberts R, Slack MP, et al. Recommendations for the prevention of secondary *Haemophilus influenzae* type b (Hib) disease. J Infect. 2009;58(1):3-14.

- Health care workers who have administered mouth-to-mouth resuscitation to the case
- A small well-defined population deemed at high risk of severe disease following the occurrence of one or more cases in the context of likely clonal transmission

If the index case attends preschool or day care, and the decision is to provide chemoprophylaxis to all contacts, inform all parents of the situation. Together with the facility operator, plan and provide parent education about invasive Hib disease. If rifampin is being provided, it is especially important to discuss contraindications and side effects.

6.3 Chemoprophylactic Agents for Close Contacts of Hib Infection

	Drug: Rifampin (Provided free for cases and contacts)
Dosage[1]	**Infants < 1 month of age:** 10 mg/kg per dose PO once daily x 4 days
	Children ≥ 1 month of age: 20 mg/kg (to maximum 600 mg) per dose PO once daily x 4 days
	Adults (≥ 18 years of age): 600 mg PO once daily x 4 days
Contraindications/ Precautions	1. Prematurity. 2. Jaundice. 3. Many HIV antiretroviral medications. Consult HIV specialist or pharmacist telephone: 1-800-665-7677. 4. History of an allergic reaction when used previously.
Counseling/ Side Effects	1. Advise client to take, preferably on an empty stomach, one hour before or two hours after eating food. 2. Advise client to seek medical advice if signs of drug hypersensitivity develop. 3. Advise pregnant individuals to consult their physician before taking rifampin as it is generally not recommended in pregnancy. The benefits of use need to be weighed against any potential risks. 4. Advise against wearing soft contact lenses to protect against permanent staining. Urine, feces, tears, saliva/sputum, and sweat can be stained red-orange. 5. <u>Drug Interactions:</u> a. Rifampin may affect how other drugs are metabolized. Refer to product monograph for list of relevant drugs.[2] Advise clients to consult with their physician regarding the need for medication dosing adjustments while taking rifampin. b. Rifampin may interfere with the efficacy of estrogen-containing contraceptives. Recommend the use of a second form of birth control (e.g., condoms) to prevent pregnancy for at least 28 days after completing a course of rifampin. Refer to health care provider for advice. c. Advise clients on warfarin to inform their physicians they are taking rifampin so that anticoagulant parameters can be monitored.

[1] If a child is unable to swallow rifampin capsules and a rifampin suspension cannot be prepared or accessed from a hospital pharmacy, advise client to obtain a prescription for rifampin suspension from the assessing physician and to present the prescription to a community pharmacy to be dispensed. The community pharmacy should then submit the invoice to BCCDC Pharmacy for payment.

[2] The product monograph for Rofact (Bausch Health, Canada Inc.) is available from the Health Canada Drug Product Database at http://www.hc-sc.gc.ca/dhp-mps/prodpharma/databasdon/index-eng.php and search for 'Rofact'.

	Drug: Ceftriaxone (Provided free for cases and contacts)
Dosage	**Adults and children ≥ 12 years of age**: A single dose of 250 mg, or up to 1 gram once a day for two days, given IM **Children < 12 yrs:** A single dose of 125 mg, or up to 50 mg/kg once a day for two days, given IM The lower dose is associated with lower effectiveness in eradication of nasopharyngeal carriage. Dilute in 1% lidocaine to reduce pain at injection site.
Contraindications/ Precautions	Hypersensitivity to penicillins or penicillin derivatives or to local anesthetics (especially lidocaine).
Counseling/ Side Effects	Advise client regarding possible local reactions (i.e., pain, induration, and tenderness at injection site). Advise client about diarrhea and other GI related adverse events. Ceftriaxone is the alternative prophylaxis for pregnant individuals and persons who cannot tolerate oral medication or for whom rifampin is contraindicated. Advise client to seek medical advice if signs of drug hypersensitivity develop.

7.0 STORAGE AND DISTRIBUTION OF CHEMOPROPHYLACTIC DRUGS

The location of the storage site(s) and means of distribution of the chemoprophylactic agents to cases and close contacts of a case of Hib disease is a local health unit decision. The supply of rifampin for Hib chemoprophylaxis shall be maintained separately from rifampin provided for anti-tuberculous therapy. Regardless of the means adopted, there must be **no patient charges for the drugs and no fees charged for the service.**

To order bulk supplies of chemoprophylactic drugs contact the Product Distribution Centre. To order pre-packaged dosage defined units, contact BCCDC Pharmacy. The medication order form can be found on the BCCDC Pharmacy webpage.

8.0 AUTHORITY

Public Health Act (SBC 2008) and Communicable Disease Regulation

9.0 REFERENCES

Public Health Agency of Canada. Case definitions: Nationally notifiable diseases [Internet]. Ottawa, ON: Public Health Agency of Canada; 2021. Available from: https://diseases.canada.ca/notifiable/diseases-list

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Heymann, D.L. (2015). Control of Communicable Diseases in Man. 20th ed. Washington, D.C: American Public Health Association.

Government of Canada. National Advisory Committee on Immunization. Canadian Immunization Guide. Part 4. Active Vaccines. *Haemophilus influenzae* type b vaccine. Accessed November 25 2022: https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-5-haemophilus-influenzae-type-b-vaccine.html

10.0 PROVISION OF CHEMOPROPHYLAXIS OF CONTACTS OF HAEMOPHILUS INFLUENZAE TYPE B INFECTION

Instructions:

- Public Health Nurse (PHN) completes non-shaded sections of form and forwards to MHO
- MHO forwards form to dispensing Pharmacist OR returns to PHN for provision of the chemoprophylactic agent
- Person providing drug to client(s) completes shaded section of form

This form authorizes the pharmacist OR PHN to provide the indicated chemoprophylactic agent

MHO: _____ Date: _____ Phone: (___)_____

Name of Contact (Surname/ Given name)	Personal health number	Age or DOB (y/m/d)	Wt (kg)	Contra-indications?♦		Name of Chemoprophylactic Agent to be Provided ♥		Date Client Provided Drug (y/m/d)	Name of Person Providing Drug (Surname/ Given Name)
Phone number				Yes	No	Rifampin (dose)	Ceftriaxone (dose)		

♥ Drug	Dosage	♦ Contraindications
Rifampin	**Infants <1 month of age:** 10 mg/kg per dose PO once daily x 4 days **Children ≥ 1 month of age:** 20 mg/kg (to maximum 600 mg) per dose PO once daily x 4 days **Adults (≥ 18 years of age):** 600 mg PO once daily x 4 days	Prematurity Presence of jaundice Many HIV antiretroviral medications. History of an allergic reaction when used previously.
Ceftriaxone	**Adults and children ≥ 12 years of age:** A single dose of 250 mg IM **Children < 12 yrs:** A single dose of 125 mg IM	Hypersensitivity to penicillins or penicillin derivatives or to local anesthetics (especially lidocaine).

11.0 WORKSHEET: CHEMOPROPHYLAXIS/IMMUNOPROPHYLAXIS OF CONTACTS OF HAEMOPHILUS INFLUENZAE TYPE B

Name of case: _____
(Surname) (Given name)

Period of communicability: From _____/___/___ to _____/___/___
yyyy/mm/dd yyyy/mm/dd

Person completing worksheet: _____
(Surname) (Given name)

Name of Contact (Surname/ Given name)	Personal Health Number	Age or DOB (y/m/d)	Wt (kg)	Contra-indications?		Name of Chemoprophylactic Agent to be Provided		Antibiotic provided		Vaccine provided	
Phone number				Yes	No	Rifampin (dose)	Ceftriaxone (dose)	Yes	No	Yes	No

♥ Drug	♦ Contraindications
Rifampin	Prematurity Presence of jaundice Many HIV antiretroviral medications. History of an allergic reaction when used previously.
Ceftriaxone	Hypersensitivity to penicillins or penicillin derivatives or to local anesthetics (especially lidocaine).

12.0 Rifampin: Client information for the Prevention of *Haemophilus influenzae* type b Infection

Haemophilus influenzae type b (Hib) infection is caused by the bacteria *Haemophilus influenzae* type b and can cause serious and life-threatening infections including meningitis, an infection of the lining that covers the brain, and septicemia, an infection of the blood. Hib bacteria can also cause a serious and life-threatening infection in the throat called epiglottitis. Hib infection is spread by coughing, sneezing or close face-to-face contact. It can also be spread through saliva when people kiss or share things such as food, utensils and drinks. Babies and children can become sick through sharing soothers, bottles or toys used by other children.

Rifampin is an antibiotic prescribed for close contacts of people who are ill with Hib infection. Such close contacts may be carrying the bacteria in their throat, but not have any symptoms of this infection. Rifampin will eliminate the Hib bacteria from the nose and throat and lessen the risk of getting Hib infection or spreading it to others.

- Rifampin when used to prevent Hib infection is usually taken by mouth once a day for 4 days (total of 4 doses)
- Doses should be taken 24 hours apart on an empty stomach (one hour before or two to three hours after eating food)
- It is important that you take all of the doses prescribed. Your dose of rifampin is based on your age and weight. For infants and young children unable to swallow capsules, a pharmacist can prepare the rifampin into a liquid suspension.
- You will not be tested to see if you are carrying the bacteria prior to treatment in order to provide timely protection.

Caution

Tell your healthcare provider if:

- You are allergic to rifampin
- Have liver disease
- Are taking antiretroviral medications for HIV
- Are pregnant
- Are taking any other medicines, especially anticoagulants ('blood thinners') such as warfarin, cyclosporine, estrogen, hydrocortisone, medications for heart disease or diabetes, methadone, prednisone, theophylline, verapamil, and vitamins.

Rifampin may cause estrogen-containing contraceptives to be less effective. You will need to use a second form of birth control (e.g., condoms) to prevent pregnancy for at least 28 days after completing a course of rifampin. Ask your health care provider for advice. Individuals who are breast/chest feeding can take rifampin, as only small amounts are secreted into breast milk.

- Rifampin may color urine and tears a red-orange color. This is harmless. However, since this may cause permanent staining of soft contact lenses, do NOT wear soft contact lenses until you have finished taking rifampin.
- Rifampin may cause drowsiness. Do not drive or operate dangerous machinery until you know how the drug affects you.
- Avoid drinking alcohol while taking rifampin.