



What is invasive *Haemophilus influenzae* disease?

Caused by the bacterium: ***Haemophilus influenzae***, a Gram (-) negative coccobacillus

- There are six identifiable types of *H. influenzae* (named a–f) and other non-identifiable types (called non-typeable).
- *Haemophilus influenzae* type b or Hib is the most pathogenic. Before the Hib vaccine, Hib disease was the leading cause of bacterial meningitis among children under 5 years of age in the United States.
- While *H. influenzae* can cause many illness types, this document focuses on “invasive disease”, which includes sepsis and meningitis.

Signs and symptoms may include:

- Fever/chills.
- Headache.
- Stiff/immobile neck.
- Nausea/vomiting.
- Diarrhea.
- Photophobia (aversion to light).
- Shortness of breath.
- Fatigue.
- Altered mental status/anxiety.

Transmission occurs through direct contact with respiratory droplets

People can spread *H. influenzae* to others through their respiratory droplets, during close contact, or when a person coughs or sneezes. The majority of *H. influenzae* is spread by people who are not sick but have the bacteria in their nose and throat.

Asymptomatic carriage of Hib is uncommon; however, the non-b types are common colonizers of the respiratory tract. Transmission of these non-b types are frequent causes of ear infections, conjunctivitis, sinusitis, and bronchitis.

Case definition

Confirmed

- Isolation of *H. influenzae* from a normally sterile body site (for example, cerebrospinal fluid [CSF], blood, joint fluid, pleural fluid, pericardial fluid), **or**
- Detection of *H. influenzae*-specific nucleic acid in a specimen obtained from one of the normally sterile body sites listed above, using a validated polymerase chain reaction (PCR) assay.

Urine, sputum, throat, and bronchoalveolar lavage (BAL) specimens are not considered sterile sites.

Probable

- Meningitis with the detection of *H. influenzae* type b antigen in CSF.
 - Positive antigen test results from urine or serum samples are unreliable for diagnosis of *H. influenzae* and should not be used as a basis for classification.

Incubation period: It is not known exactly how long it takes after *H. influenzae* bacteria enters a person’s body for them to get sick. It could take as a little as a few days before symptoms start.

Infectious period: A patient is considered infectious for seven days prior to onset and until at least 24 hours after the initiation of appropriate antibiotic therapy.



Public health response

Upon identification of a confirmed or suspect case, **do not** wait for *H. influenzae* serotype information to begin the investigation of contacts. Specimens may not be sent and serotype determination can take several day from disease onset. Assume that the case has serotype b and begin appropriate control measures.

It is the responsibility of the clinician, infection preventionist (IP), **and** the laboratory to ensure the reporting of a suspect case **by phone** to their local or Tribal health department (LTHD) and state public health staff as soon as possible. Entering the case into the Wisconsin Electronic Disease Surveillance System (WEDSS) is **not** sufficient notification.

1. Gather clinical history of the patient to identify and confirm:

- Clinical signs and symptoms.
- Date of illness onset.
- Laboratory test results including specimen source, Gram stain and culture results, and CSF analysis if applicable.
- Hib vaccination history (include the date, manufacturer, and lot number for each vaccination).

The "Search WIR" button in WEDSS will upload vaccine data into the record.

2. Immediately report all suspect cases of invasive *H. influenzae* disease to the Wisconsin Department of Health Services (DHS) Bureau of Communicable Disease (BCD) by phone.

- The general number for DHS BCD staff should be used during weekdays: **(608) 267-9003**
- LTHDs and clinicians can contact DHS BCD after business hours and on weekends at **(800) 943-0003** (option 4).

3. Ensure that the diagnosing laboratory will send the bacterial isolate to the Wisconsin State Laboratory of Hygiene (WSLH) for serotype determination.

- Serotype results should be available within one day of arriving at WSLH. However, serotyping results are rarely received within 48 hours of disease onset.
- Assume that the case has serotype b (Hib) and try to determine exposures to unvaccinated children under 5 years of age.

4. Identify all contacts of the case less than 5 years of age with direct saliva contact in the seven days prior to patient illness onset.

- Determine the names, ages, and Hib vaccination histories.
- Determine if the case attended day care (in home or facility).
- Identify any household members who may be immunocompromised.

5. Advise direct contacts of the case on how to acquire prophylaxis, if indicated.

(see *Contact investigation* on the following page).

6. Enhance surveillance for additional cases.

- Rapidly investigate additional suspect cases.
- Consider alerting clinicians, health, and school officials in the area of the case, especially if the case had a lot of contacts in a group or school environment.

7. Investigate potential links between any additional cases identified.

8. If there are multiple cases, investigate potential links between them.

DHS will assist the LTHD in situations where there are additional cases in other jurisdictions, counties, or states.



Contact investigation: Who needs prophylactic treatment?

The following control measures apply only to *H. influenzae* type b (Hib). Because of the risk to children and delays with serotype determination, all cases of invasive *H. influenzae* should be treated assuming the case has serotype b (Hib). Given that most secondary cases in households occur during the first week after hospitalization of the index case, prophylaxis should be initiated as soon as possible. Identify contacts of the case during the 7 days before illness onset.

Chemoprophylaxis is recommended for

- Households with at least one contact^a younger than 4 years old who is unimmunized or incompletely immunized^b.
- Households with a child younger than 12 months who has not completed the primary Hib series.
- Households with a child who is immunocompromised, regardless of that child's immunization status or age.
- Preschool and child care center contacts when two or more cases of Hib invasive disease have occurred within 60 days.
- The index patient, if younger than 2 years or a member of a household with a susceptible contact and treated with a regimen other than ceftriaxone, chemoprophylaxis at the end of therapy for invasive infection.

Chemoprophylaxis generally **not recommended** for the following groups:

- Occupants of households with no children younger than 4 years other than index patient.
- Occupants of households when all household contacts are immunocompetent, all household contacts 12-48 months of age have completed their Hib immunization series, and when household contacts younger than 12 months have completed their primary series of Hib immunizations.
- Preschool and child care contacts of one index case.
- Pregnant people.

^aContacts are defined as people residing with the index patient or nonresidents who spend four or more hours with the index patient for at least five of the seven days preceding the day of hospital admission of the index patient.

^bComplete immunization is defined as having had at least 1 dose of conjugate vaccine at 15 months of age or older; two doses between 12 and 14 months of age; or the 2- or 3-dose primary series when younger than 12 months with a booster dose at 12 months of age or older.



Antibiotic regimens

The following regimens are appropriate for chemoprophylaxis and elimination of nasal carriage in high-risk contacts (Red Book, 2018–21, p.555).

Chemoprophylaxis

- The risk of invasive Hib disease is increased among unimmunized household contacts younger than 4 years.
- Rifampin eradicated Hib from the pharynx in approximately 95% of carriers.
- Ideally, provide chemoprophylaxis if indicated to contacts within 24 hours of diagnosis of index case.
- Because secondary cases may occur later, providing chemoprophylaxis seven or more days after hospitalization of index patient may still be beneficial.

Age	Dose	Duration	Cautions
Rifampin*			
Neonates (<1 months)	Dose not established; some experts recommend lowering dose to 10mg/kg, orally once per day	Once per day for 4 days	
Children less than 1 month	20 mg/kg orally once per day (600 mg is maximum daily dose)	2 days	Stains urine and tears; avoid contact lens use
Adults	600 mg orally once per day	4 days	Not recommended during pregnancy

*Rifampin could decrease the efficacy of oral contraceptives.

Ensure terminal prophylaxis of case patient.

- Treatment of Hib disease with cefotaxime or ceftriaxone eradicated Hib colonization, eliminating the need for prophylaxis of the index patient.
- Antimicrobial therapy of invasive *H. influenzae* with agents other than cefotaxime or ceftriaxone may not reliably eliminate nasopharyngeal carriage of *H. influenzae*.
- Patients who did not receive at least one dose of cefotaxime or cephtriaxone and who are younger than 2 years old should receive rifampin prophylaxis at the end of therapy for invasive infection.



Roles and responsibilities during a case investigation

Local or Tribal Health Department

See *public health response* on page 2.

Hospital Infection Preventionist (IP)

- Notify the LTHD about any confirmed or suspect cases of invasive *H. influenzae* by phone immediately. Provide LTHD with details about the clinical history and laboratory diagnosis.
- Ensure case patients receives terminal prophylaxis to eliminate carriage before release from the hospital.
- Request that the laboratory send the bacterial isolate to the WSLH for serotype determination.

Wisconsin State Laboratory of Hygiene (WSLH)

- Serotype the bacterial isolate.
- Perform PCR, pulse-field gel electrophoresis (PFGE), or antibiotic susceptibility testing on bacterial isolates if requested by DHS.
- Report results to submitted laboratory and DHS.

Wisconsin Department of Health Services Bureau of Communicable Diseases

- Coordinate investigations that are multi-jurisdictional.
- Assist in determining which contacts need chemoprophylaxis.
- Conduct enhanced surveillance for additional cases, as needed. Provide templates of letters to the LTHD (for example, to health care providers, to parents of children in school or daycare).
- Confirm that the bacterial isolate is received at the WSLH for serotype determination.
- Review historical and prospective data and investigate links between cases.
- Request PFGE analysis of select isolates when a possible link is identified.
- Report *H. influenzae* surveillance data to the Centers for Disease Control and Prevention (CDC).



The general number for BCD should be used during weekdays: **(608) 267-9003**. The emergency number for on-call BCD staff can be used after business hours and on weekends: **(800) 943-0003 (option 4)**. The on-call phone number is for LTHDs and clinicians only.



Vaccination

The United States began using Hib vaccine for children in 1987 and for infants in 1990. Since then, the annual incidence of invasive Hib disease in children aged younger than 5 years old decreased by **99%**.

There are several vaccines that can help prevent *Haemophilus influenzae* type b or Hib disease. These vaccines do not provide protection against other types of *Haemophilus influenzae* disease.

It is recommended that all children younger than 5 years old are vaccinated. Hib vaccination is not recommended for most people aged 5 years and older unless they:

- Have certain medical conditions and are unvaccinated.
- Receive a bone marrow transplant.

Parents should talk to their child's health care provider if they have questions about Hib vaccines.

Routine vaccination of infants and children

DHS recommends the routine administration of a conjugate hib vaccine series beginning at age 2 months. Infants 2–6 months of age should receive either:

- A 3-dose series of ActHIB, Hiberi, Pentacel, or Vaxelis.
- A 2-dose series of PedvaxHIB.

Providers can administer the first dose as early as age 6 weeks. DHS recommends a booster dose of any licensed conjugate Hib vaccine at age 12–15 months.

- Administer the booster dose at least 8 weeks after the most recent Hib vaccination.
- The booster dose will be dose 3 or 4 depending on vaccine type used in the primary series.

Contraindications

Hib vaccines should **not** be administered to:

- A person who has ever had a severe allergic reaction (for example, anaphylaxis) after a previous dose.
- A person who has a severe allergy to any vaccine component.
- A person younger than 6 weeks.

Hib vaccines may be administered if the provider and patient deem the benefits of vaccination outweigh the risks to a person who has a moderate or severe acute illness with or without fever.



References

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