

# Invasive *Haemophilus Influenzae*

*H Flu*

## IMMEDIATELY REPORTABLE DISEASE

Per N.J.A.C. 8:57, healthcare providers and administrators shall immediately report by **telephone** confirmed and suspected cases of H flu to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. The health officer (or designee) **must immediately institute the control measures listed below in section 6, “Controlling Further Spread,”** regardless of weekend, holiday, or evening schedules. A directory of local health departments in New Jersey is available at <http://www.state.nj.us/health/lh/directory/lhdselectcounty.shtml>.

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609.826.5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.



August 2011



# 1 THE DISEASE AND ITS EPIDEMIOLOGY

### A. Etiologic Agent

*Haemophilus influenzae* is a pleomorphic gram-negative coccobacillus that is divided into encapsulated (typeable) and unencapsulated strains (nontypeable). The encapsulated strains are further classified into the following serotypes: types a through f. *H. influenzae* type b is the most pathogenic. Before the introduction of the *H. influenzae* type b (Hib) conjugate vaccine, Hib invasive disease was the leading cause of bacterial meningitis among children younger than five. *H. influenzae*, including all serotypes and nontypeable strains, can cause invasive infection.

### B. Clinical Description and Laboratory Diagnosis

Invasive *H. influenzae* disease may produce various clinical syndromes, including meningitis, bacteremia, epiglottitis, pneumonia, septic arthritis, peritonitis, osteomyelitis, endocarditis, and pericarditis. In contrast, mucosal infections such as bronchitis, sinusitis, and otitis media, which can be caused by *H. influenzae* (usually not type b), are considered noninvasive disease and are not reportable to the New Jersey Department of Health and Senior Services (NJDHSS).

Laboratory diagnosis is made by isolation of the organism from normally sterile sites, such as blood or cerebrospinal fluid (CSF), or, less commonly, joint, pleural, or pericardial fluid.

Specific capsular polysaccharide may be identified by coupled-integral-equation or laboratory analysis techniques.

### C. Reservoir

Humans.

#### **D. Modes of Transmission**

*H. influenzae* is transmitted person-to-person by inhalation of respiratory droplets or through direct contact with respiratory secretions of an infected person. The most common portal of entry is the nasopharynx. Newborns can become infected by inhaling amniotic fluid or genital tract secretions containing the organism.

#### **E. Incubation Period**

The exact incubation period is unknown but is most likely two to four days.

#### **F. Period of Communicability**

*H. influenzae* is communicable as long as organisms are present and the person is not receiving antibiotic therapy. Organisms may be present in the upper respiratory tract, sometimes for a prolonged period even without nasal discharge.

If the person is on antibiotic therapy, *H. influenzae* is noncommunicable within 24 to 48 hours after effective antibiotic therapy is started.

#### **G. Epidemiology**

*H. influenzae* invasive infection occurs worldwide and is most prevalent among children aged two months to three years and is uncommon in healthy persons older than five. Before the widespread use of Haemophilus influenzae type B (HIB) conjugate vaccine, *H. influenzae* serotype B was the most pathogenic strain of haemophilus bacterium and was the leading cause of bacterial meningitis and other life-threatening invasive bacterial disease in the United States among children younger than five. Meningitis occurred in approximately two thirds of children and often resulted in severe permanent neurologic sequelae that included hearing impairment, mental retardation, seizures, paralysis, and cognitive or developmental delay. Since 1991 in the United States, the incidence of *H. influenzae* serotype B disease in infants and children younger than five has decreased by 99%. The incidence of invasive infection caused by all other serotypes combined is similarly low. Currently, invasive *H. influenzae* serotype B disease usually occurs primarily in children who have not been immunized or have not completed their Hib vaccine series. However, all serotypes—a, b, c, d, e, and f—still can cause invasive disease. Factors predisposing children and other persons to *H. influenzae* invasive disease include certain immunodeficiency syndromes, sickle cell disease, asplenia, HIV infection, and certain malignancies.

## 2 REPORTING CRITERIA AND LABORATORY TESTING SERVICES

### A. New Jersey Department of Health and Senior Services Case Definition

#### 1. CASE CLASSIFICATION

##### **Clinical Description:**

Invasive disease caused by *Haemophilus influenzae* may produce any of several clinical syndromes, including meningitis, bacteremia, epiglottitis, or pneumonia.

##### **Laboratory Criteria for Diagnosis:**

Isolation of *H. Influenzae* from a normally sterile site (e.g., blood or cerebrospinal fluid (CSF) or, less commonly, joint, pleural, or pericardial fluid).

##### **CONFIRMED**

A clinically compatible case that is laboratory confirmed by positive culture of *H. influenzae* isolated from a normally sterile body site (blood, CSF, or, less commonly, joint, pleural, or pericardial fluid).

##### **PROBABLE**

A clinically compatible case AND

Detection of *H. influenzae* type b antigen in CSF.

**NOTE: Positive antigen test results from urine or serum samples are unreliable and, therefore, not confirmatory.**

##### **POSSIBLE**

Not used.

**NOTE: All isolates from invasive *H. influenzae* must be sent for serotyping within three business days to NJDHSS, Division of Public Health and Environmental Laboratories, Specimen Receiving and Records, PO Box 361, John Fitch Plaza, Trenton, NJ 08625-0361.**

### B. Laboratory Testing Services Available

Confirmation and serotyping of *H. influenzae* isolates are available at NJDHSS Public Health and Environmental Laboratories (PHEL). All strains of *H. influenzae* isolated from normally sterile sites must be submitted within three days to PHEL (NJDHSS, PHEL Specimen Receiving and Records, PO Box 361 Trenton, NJ 08365) to identify the strain and serotype.

# 3 DISEASE REPORTING AND CASE INVESTIGATION

## A. Purpose of Surveillance and Reporting

- Ensure that all cases of invasive *H. influenzae* are serotyped to identify *H. influenzae* serotype B.
- Identify and recommend prophylaxis for household contacts and possibly childcare contacts of confirmed and probable *H. influenzae* serotype B cases.
- Distinguish between failure to vaccinate and HIB vaccine failure.

## B. Laboratory and Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57) stipulates that healthcare providers and laboratories immediately report by telephone any suspect or confirmed case of invasive *H. influenzae* to the local health officer having jurisdiction over the locality in which the patient lives or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located.

If this is not possible, call the Vaccine Preventable Disease Program (VPDP) at 609.826.4860 during business hours and at 609.392.2020 after business hours, or on weekends and holidays. Also, enter the case information electronically into the Communicable Disease Reporting and Surveillance System (CDRSS) within 24 hours of the initial telephone report.

## C. Local Department of Health Reporting and Follow-up Responsibilities

### 1. Reporting Requirements

NJAC 8:57 stipulates that each local health officer must report by telephone immediately the occurrence of any probable or confirmed case of invasive *H. influenzae* disease, as defined by the reporting criteria in section 2A, to VPDP at 609.826.4860 during business hours, and at 609.392.2020 after business hours or on weekends and holidays. A telephone report shall be followed by the electronic report within 24 hours of the initial report. Electronically enter case information into CDRSS.

### 2. Case Investigation

- The local health officer must immediately report the case to NJDHSS.
- After notification to VPDP, it is the health officer's responsibility to ensure the case is entered into CDRSS.
- Use the following guidelines to enter all case information into CDRSS:
  - Accurately record all demographic information. Include the patient's name, date of birth, gender, home address, and telephone number.

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- Enter all clinical information. This must include illness onset date, presenting symptoms, treatment; laboratory specimen tests results, lab collection date, identified pathogen, and serotype if applicable. To obtain or verify information needed to confirm diagnosis or complete investigation, contact the hospital laboratory manager, infection control professional, or the treating physician.
- For probable or confirmed H. influenzae serotype B case investigation, identify in CDRSS all at risk case contact information (see section 4B below).
- For any other significant case information, such as exposure or travel history, enter this information in the CDRSS “Comments” section.
- Institution of disease control measures is an integral part of case investigation. It is the health officer’s responsibility to understand and institute the control guidelines listed below in section 4, Controlling Further Spread.

### D. Entry into CDRSS

The mandatory fields in CDRSS include: disease, last name, county, municipality, gender, race, ethnicity, case status, report status.

The following table can be used as a quick reference guide to determine which CDRSS fields need to be completed for accurate and complete reporting of *Haemophilus influenzae* cases. The “Tab” column includes the tabs which appear along the top of the CDRSS screen. The “Required Information” column provides detailed explanations of what data should be entered.

CDRSS Screen	Required Information
<b>Patient Info</b>	Enter the disease name (“HAEMOPHILUS INFLUENZAE”) patient demographic information, illness onset date, and the date the case was reported to the local health department (LHD). There are no subgroups for <i>H. influenzae</i> .
<b>Addresses</b>	Enter any alternate address (e.g., a daycare address). Use the <b>Comments</b> section in this screen to record this information about the alternate address. Entering an alternate address will allow disease investigators access to the case if the alternate address falls within their jurisdiction.

CDRSS Screen	Required Information
<b>Clinical Status</b>	Record initial diagnosis and pregnancy status under the <b>Clinical Status</b> section. Enter any treatment that the patient received and record the names of the medical facilities and physician(s) involved in the patient’s care. If the patient received care from two or more hospitals, be sure that all are entered so the case can be accessed by all infection preventionists (IPs) covering these facilities. Indicate pre-existing conditions under <b>Treatment selection</b> section, check all that apply. For cases < five years of age, document the Hib vaccine administration dates under the <b>Immunizations</b> section. If the patient died, record under the <b>Mortality</b> section.
<b>Signs/Symptoms</b>	Check appropriate boxes for signs and symptoms and indicate their onset date. Make every effort to get complete information by interviewing the physician, family members, IP, or others who might have knowledge of the patient’s illness.
<b>Risk Factors</b>	Enter complete information about risk factors to facilitate study of <i>H. influenzae</i> disease in New Jersey. If patient has not received immunizations due to a medical or religious exemption, please check no vaccine in <b>Risk factor(s)</b> section.
<b>Laboratory Eval</b>	Select “MICROORGANISM IDENTIFIED” if culture of a normally sterile site (e.g., blood, cerebrospinal fluid) was performed. <b>NOTE:</b> Antigen from urine or serum testing are not adequate for case confirmation (see case definition in Section 2). Specimen type, specimen collection date, test result, and, if applicable, test value should also be recorded. Indicate date when isolate was sent to PHEL for serotyping.
<b>Contact Tracing</b>	Information regarding contacts is required for this disease. Enter contact information under <b>Comments</b> section. For confirmed cases, follow prophylaxis guidelines for close contacts in Section 4.
<b>Case Comments</b>	Enter general comments (i.e., information that is not discretely captured by a specific topic screen or drop-down menu) in the <b>Comments</b> section. <b>NOTE:</b> Select pieces of information entered in the <b>Comments</b> section CANNOT be automatically exported when generating reports. Therefore, whenever possible, record information about the case in the fields that have been designated to capture this information; information included in these fields CAN be automatically exported when generating reports.

CDRSS Screen	Required Information
<p><b>Epidemiology</b></p>	<p>Under the <b>Other Control Measures</b> section, indicate if the patient falls into any of the categories listed under <b>Patient Role(s)/Function(s)</b> (e.g., “DAYCARE PROVIDER”). Record name of and contact information for case investigators from other agencies (e.g., CDC, out-of-state health departments). Document communication between investigators in the <b>Comments</b> section.</p>
<p><b>Case Classification Report Status</b></p>	<p>Case status options are: “REPORT UNDER INVESTIGATION (RUI),” “CONFIRMED,” “PROBABLE” AND “NOT A CASE”</p> <ul style="list-style-type: none"> <li>• All cases entered by laboratories should be assigned a case status of “REPORT UNDER INVESTIGATION (RUI).”</li> <li>• Cases still under investigation by the LHD should be assigned a case status of “REPORT UNDER INVESTIGATION (RUI).”</li> <li>• Upon completion of the investigation, the LHD should assign a case status on the basis of the case definition. “CONFIRMED”, “PROBABLE” and “NOT A CASE” are the only appropriate options for classifying a case of <i>H. influenzae</i> (see section 2A).</li> </ul> <p>Report status options are: “PENDING,” “LHD OPEN,” “LHD REVIEW,” “LHD CLOSED,” “DELETE,” “REOPENED,” “DHSS OPEN,” “DHSS REVIEW,” and “DHSS APPROVED.”</p> <ul style="list-style-type: none"> <li>• Cases reported by laboratories should be assigned a report status of “PENDING.”</li> <li>• Once the LHD begins investigating a case, the report status should be changed to “LHD OPEN.”</li> <li>• The “LHD REVIEW” option can be used if the LHD has a person who reviews the case before it is closed (e.g., health officer or director of nursing).</li> <li>• Once the LHD investigation is complete and all the data are entered into CDRSS, the LHD should change the report status to “LHD CLOSED.”</li> <li>• “LHD CLOSED” cases will be reviewed by DHSS and be assigned one of the DHSS-specific report status categories. If additional information is needed on a particular case, the report status will be changed to “REOPENED” and the LHD will be notified by e-mail. Cases that are “DHSS APPROVED” cannot be edited by LHD staff (see Section C below).</li> </ul> <p>If a case is inappropriately entered (e.g., a case of <i>Streptococcus</i></p>

CDRSS Screen	Required Information
	<p><i>pneumoniae</i> was erroneously entered as a case of <i>H. influenzae</i>) the case should be assigned a report status of “DELETE.” A report status of “DELETE” should NOT be used if a reported case of <i>H. influenzae</i> simply does not meet case definition. Rather, it should be assigned the appropriate case status, as described above.</p>

## 4 CONTROLLING FURTHER SPREAD

### A. Isolation and Quarantine Requirements (NJAC 8:57-1)

Quarantine: None.

Isolation: Droplet precautions for 24 hours after start of effective antimicrobial therapy.

### B. Treatment of the Case

- Antimicrobial therapy: antimicrobial therapy should be initiated. Up to 50% of strains worldwide produce beta-lactamase, meaning ampicillin or amoxicillin should only be used for significant infection if susceptibility is known. Treatment of *H. influenzae* serotype B disease with cefotaxime or ceftriaxone eradicates colonization, eliminating the need for prophylaxis of the case. Patients who are treated with an alternative regimen and who are younger than two years of age or have a susceptible household contact should receive rifampin prophylaxis at the end of therapy for invasive infection.
- Vaccination: unimmunized or incompletely immunized children should receive a dose of vaccine and should be scheduled for completion of the recommended age-specific immunization schedule as per ACIP guidelines.

### C. Prophylaxis for Contacts of Index Cases of Hib Disease

- Rifampin prophylaxis is recommended only for household contacts and possibly childcare contacts of confirmed and probable *H. influenzae* serotype B cases in certain circumstances.
- Do not wait for serotype information to begin the investigation of contacts.
- There may be occasions when prophylaxis of childcare contacts is indicated prior to obtaining serotype information. Please contact the DHSS VPDP for guidance.
- Prophylaxis is not recommended for contacts of *h. influenzae* serotype nontypeable or serotypes a, c, d, e, and f.
- Regardless of serotype, testing of contacts is not recommended.

Determining the need for prophylaxis of contacts for *H. influenzae* serotype B (not other serotypes):

- Is the serotype known? Is it serotype B?
- If not known when will serotype information be available?
- Are there any household contacts younger than 48 months of age? If yes, are they age-appropriately immunized for Hib?
- Are there any immunocompromised children in the household?
- Are there household contacts younger than 12 months of age? If yes, have they completed the three-dose Hib primary vaccine series?
- Does the patient attend childcare or nursery school? If yes, what are the ages of the children in the childcare setting?
- Are there children 12 to 36 months of age in the childcare setting? Are they age-appropriately immunized for Hib?
- Have there been any other Hib invasive disease cases at the childcare setting within the past 60 days?

The recommended schedule for Hib conjugate vaccine administration can be found at: <http://www.cdc.gov/vaccines/recs/schedules/child-schedule.htm>

### **Prophylaxis Guidelines: Household Contacts of Confirmed Hib Case**

Household contacts are defined as persons residing with the case patient or persons who are not household contacts but who spent four or more hours with the index case for at least five of the seven days preceding the day of hospital admission of the index case.

**Prophylaxis is recommended for all household contacts of confirmed and probable Hib cases, except pregnant women, if any of the following criteria are met:**

Prophylaxis is recommended for all household contacts where at least one contact is younger than four years of age (48 months) and is not immunized or has not been adequately immunized for Hib.

OR

Household contacts where there is a child younger than 12 months and that child has not completed the three-dose primary Hib series.

OR

Household contacts where there is a child under four years of age (48 months) who is not age-appropriately immunized for Hib.

OR

Household contacts where there is an immunocompromised child, regardless of that child's Hib immunization status.

**1. Prophylaxis Guidelines: Childcare Contacts**

- Childcare or nursery school contacts, regardless of age (children and staff) when two or more cases of Hib invasive disease have occurred within 60 days.
- For a single Hib case patient who attends childcare or nursery school, prophylaxis for the exposed children who have not completed or who are incompletely immunized against Hib is controversial and the efficacy of prophylaxis in preventing secondary cases in this setting has not been established. Prophylaxis recommendations can be determined if the event occurs.
- Careful observation of the exposed unimmunized or incompletely immunized childcare or nursery school contact is imperative. If a child/contact develops a febrile or respiratory infection, ensure the child/contact is medically evaluated.
- Unimmunized or incompletely immunized children should receive a dose of vaccine and be scheduled to complete the age-appropriate Hib immunization.
- The risk of secondary disease in children attending childcare centers appears to be lower than that observed for age-susceptible household contacts, and secondary disease in childcare contacts is rare when all contacts are older than two years.

**NOTE: If there is a delay in obtaining the serotype, prophylaxis of household contacts may be started without serotype information.**

<b>Rifampin Prophylaxis against Hib</b>	
<b>Age Group</b>	<b>Dosage/Schedule</b>
Infants < one month of age	10 mg/kg PO QD × 4 days
Children	20 mg/kg PO QD × 4 days (maximum: 600 mg/dose)
Adults	600 mg PO QD × 4 days

Ensure appropriate immunization of household and childcare contacts. The number of doses required is determined by the current age of the child and the number, timing, and type of Hib vaccine doses previously received.

The recommended schedule for Hib conjugate vaccine administration can be found at: [www.cdc.gov/vaccines/recs/schedules/downloads/child/2008/08\\_0-6yrs\\_schedule\\_pr.pdf](http://www.cdc.gov/vaccines/recs/schedules/downloads/child/2008/08_0-6yrs_schedule_pr.pdf)

Unvaccinated and under vaccinated children younger than five years should be scheduled for completion of the recommended age-specific immunization schedule. Infants should be placed on an accelerated schedule using minimum intervals between doses. The accelerated schedule for situations in which an incompletely vaccinated child has been exposed follows:

<b>Accelerated schedule for Hib vaccination—to be used for unvaccinated and under vaccinated children (including all infants) after exposure to invasive Hib disease.</b>				
<b>Type of Hib vaccine</b>	<b>Minimum age for first dose</b>	<b>Minimum interval from dose 1 to 2</b>	<b>Minimum interval from dose 2 to 3</b>	<b>Minimum interval from dose 3 to 4</b>
HbOC (HIB-TITER)	6 weeks	1 month	1 month	This booster at $\geq 12$ months of age and $\geq 2$ months after previous dose
PRP-T (ActHIB, OmniHIB)	6 weeks	1 month	1 month	
PRP-OMP (PedVax-HIB)	6 weeks	1 month	This booster at $\geq 12$ months of age and $\geq 2$ months after previous dose	Not required

#### D. Preventive Measures

- Routine childhood vaccination is the best preventive measure against Hib disease. Visit the Centers for Disease Control and Prevention (CDC) National Immunization Program Web page at <http://www.cdc.gov> to print the most recent childhood immunization schedule.
- Please consult the chapter on *Haemophilus influenzae* in the Red Book of the American Academy of Pediatrics for a full discussion of vaccines, immunization schedules, and special circumstances. For example, children with underlying conditions predisposing them to Hib disease, including children five years of age or older, may need additional doses.

#### Additional Information

A *Haemophilus influenzae* type b meningitis Questions and Answers Fact Sheet can be obtained at the NJDHSS Web site at [http://nj.gov/health/cd/documents/faq/haemophilus\\_faq.pdf](http://nj.gov/health/cd/documents/faq/haemophilus_faq.pdf)

The formal CDC surveillance case definition for invasive *H. influenzae* is the same as the criteria outlined in section 2A of this chapter. CDC case definitions are used by state health departments and CDC to maintain uniform standards for national reporting. For reporting to NJDHSS, always refer to section 3.

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