Controlling *Haemophilus influenzae*

A major public health achievement is use of vaccines to prevent diseases. One particular success is the near elimination of pediatric meningitis and other invasive disease due to *Haemophilus influenza* type b. This once common cause of morbidity and mortality has now become a rarity.

**The Agent**

*Haemophilus influenzae* is a small, gram-negative coccobacillus. Capsular antigens are used to distinguish at least six serotypes of *H. influenzae*, designated types a–f, with additional unencapsulated (nontypeable) strains.

Humans are the reservoir for the organism. *H. influenzae* organisms can colonize the nasopharynx and may either be transient or remain for months in the absence of symptoms (asymptomatic carriage). Thus, isolates from sputum or other non-sterile sites are **not** indicative of invasive disease. Asymptomatic carriage of *H. influenzae* organisms, especially the nontypeable strains, can be common. Transmission is through droplets and respiratory discharges from colonized or infected persons.

Non-invasive upper respiratory tract diseases, including otitis media, sinusitis, and bronchitis, are often caused by nontypeable strains of *H. influenzae*. Invasive disease caused by *H. influenzae* can affect many
organ systems. Meningitis is the most common clinical manifestation. Bacteremia, cellulitis in the periorbital area or other tissues, epiglottitis which could involve life-threatening airway obstruction, septic arthritis, osteomyelitis, pericarditis and pneumonia are other manifestations of invasive *H. influenzae* disease. Onset of symptoms is usually abrupt and may include fever, headache, lethargy, anorexia, nausea, vomiting, irritability or laryngeal stridor, depending on the system involved. Progressive stupor or coma is common with meningitis.

The organisms spread via the bloodstream after penetrating the mucous membranes of the nasopharynx. The exact mechanism allowing the penetration is unknown, but a history of recent upper respiratory tract infection may facilitate invasion. Having had a recent cochlear implant procedure also has been identified as a possible risk factor for invasive disease.

**Epidemiology**

*H. influenzae* serotype b (Hib) was responsible for 95% of invasive *H. influenzae* infections among children younger than 5 years of age in the pre-vaccine era. At that time, Hib could be isolated from the nasopharynx of 0.5%-3% of normal infants and children but was not commonly found in adults.

Prior to the introduction of an effective conjugate vaccine in 1988 and the subsequent recommendation for routine childhood vaccination, *H. influenzae* serotype b (Hib) was the most common cause of bacterial
meningitis and a major cause of other invasive bacterial disease in young children, including epiglottitis. One in every 200 children developed invasive Hib disease by the age of 5 years with peak rates at age 6–18 months. Meningitis occurred in approximately two-thirds of children with invasive Hib disease, resulting in hearing impairment or severe permanent neurologic sequelae (e.g. cognitive and developmental delay, seizure disorder, or paralysis) in 15%–30% of survivors. Approximately 4% of all cases were fatal.

By 2000, following the implementation of a routine vaccine program, a 99% reduction in invasive Hib disease among children younger than 5 years of age could be seen nationally when compared to 1989 rates of disease. Between 2000 and 2004, the average incidence of invasive Hib disease in the United States in this age group was 0.14 cases per 100,000. With rates this low, a concern arose as to whether the passive disease surveillance system would be sensitive enough to accurately detect all Hib cases.

There are six identifiable serotypes of *H. influenzae* bacteria (a through f) and other non-identifiable types (called nontypeable). Data from active surveillance sites suggest an expected rate of invasive disease due to non-type-b *H. influenzae* (non-Hib invasive *H. influenzae* disease) to be 0.9 per 100,000 children younger than 5 years. Because this rate can be used as a surveillance indicator for monitoring the completeness of invasive *H. influenzae* case reporting, invasive disease due to all types of *H. influenzae*, rather than only that due to serotype b, should be monitored.

**Recent Trends**

In 2000, due to the dramatic reduction in the rate of invasive Hib disease that followed the implementation of routine childhood immunization in 1990, Washington State mandated reporting of invasive *H. influenzae* disease due to any serotype. From 2001 through 2012 DOH received an annual average of 6 reports of invasive *H. influenzae* disease due to all serotypes in children under 5 years of age (1.6 cases/100,000 population in this age group) with a total of three deaths. Seventeen Hib cases were reported during this time period (0-3 cases per year) with an additional two cases reported in January 2013. All but one of the Hib cases in this time period were in infants too young to be fully vaccinated, or in children that were incompletely vaccinated. A single case was fully vaccinated, but had an underlying condition, so was considered high risk. These low numbers of case reports contrast with 1986 when there were 319 Washington reports of invasive disease due to serotype b only, most in young children, with 11 deaths in that year alone.
Universal vaccination has almost eliminated a previous health threat for children in this country. Maintaining high levels of vaccination in all children under 5 years of age will provide continued protection that can extend to infants too young to be fully vaccinated.

**Resources**
