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Introduction

HAEMOPHILUS INFLUENZAE TYPE B (Hib)

Hib disease was the leading cause of bacterial meningitis and a major cause of other serious invasive diseases among children aged <5 years in the U.S. before Hib conjugate vaccines became available in 1987. Since the introduction of the Hib vaccine, cases of Hib disease have dropped from 20,000 in 1980 to a total of 341 cases from 1996-2000. In 2007, the incidence of Hib disease in the United States in children < 5 years of age was 0.11/100,000. However, the disease continues to circulate in both industrialized and developing countries and it is estimated that the disease still kills as many as 400,000 children globally every year. Although Hib disease has been reduced by 99% in the U.S., the disease could easily make a comeback should Hib vaccination rates drop.

Worldwide, the Hib vaccine has been relatively unavailable. However, great strides have been made in making the Hib vaccine available for the poorest children of the world. In 2007, the number of countries (n=64) that have access to the Hib vaccine had increased from 18 to 65 percent, largely due to the efforts of the Global Alliance for Vaccines and Immunization (GAVI). While there are six strains of H. influenzae that have been classified (types a through f) and other non-typeable strains, type b accounts for 95 percent of all strains causing invasive disease. Thus the development of the vaccine to prevent against the type b infection.

Invasive Hib disease usually manifests itself clinically as meningitis, accounting for 50 to 65 percent of all cases. Hallmarks of meningitis are fever, decreased mental stability, seizures and stiff neck. The pneumonia that either follows Hib meningitis or is manifested alone can be mild or severe with some cases extending to respiratory failure in the very young or immunocompromised child. Hib disease can also produce epiglottitis, septic arthritis, cellulitis, and other conditions. Septic arthritis manifests itself as joint infection; cellulitis is a rapidly growing skin infection, usually on the face, head or neck. Epiglottitis is an infection and swelling of the tissue in the throat that covers and protects the larynx during swallowing, sometimes causing a life threatening airway obstruction. H. influenzae enter the body through the nasopharynx, where the bacteria colonize; the mode of transmission into the bloodstream is unknown. However, once in the bloodstream, H. influenzae can affect many organ systems and result in serious complications, including death.

As previously noted, Hib disease susceptibility is generally age-dependent. Hib disease generally affects children under 5 years of age; 60 percent of invasive disease occurs in those younger than 12 months with a peak occurrence at 6 to 11 months of age (prior to the introduction of Hib conjugate vaccines). When a young child presents with fever, general malaise and decisions for evaluation are made, immunization for Haemophilus as well as pneumococcal disease should be verified.

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Epidemiology

Occurrence - Hib disease occurs worldwide because the organism continues to circulate in both industrialized and developing countries. Hib disease remains a public health concern in the U.S. and other industrialized countries due to the reservoir of disease in the adult population and continuous circulation of the organism in the community.

Reservoir/Communicability - Humans remain the only reservoir of Hib disease. Hib does not survive in the environment on inanimate surfaces. Close contact with an infected individual (e.g., household, day care, or institutional setting) can lead to outbreaks or direct secondary transmission of the disease, especially to an unimmunized child. Carriage (or colonization) rates are highest in pre-school age children. Carriage rates can be as high as 58-91% in households or daycare centers in which a case has occurred. High immunization rates are essential to continue to control this disease in the U.S.

Transmission - The primary mode is presumably by the spread of respiratory droplets, although firm evidence for this mechanism is lacking.

Temporal Pattern - Several studies in the prevaccine era described a bimodal seasonal pattern in the U.S., with one peak between September and December, and a second peak between March and May. The reason for this bimodal pattern is not known.

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Diagnosis/Treatment

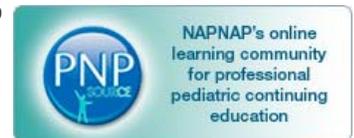
A gram stain of an infected body fluid may demonstrate small gram-negative coccobacilli suggestive of invasive Hib disease. Cerebrospinal fluid (CSF), blood, pleural fluid, joint fluid, and middle ear aspirates should be cultured on the appropriate media. A positive culture for H. influenzae establishes the diagnosis.

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All isolates of *H. influenzae* should be serotyped. This is an essential laboratory procedure that needs to be performed on every isolate of *H. influenzae*, especially those obtained from children <15 years of age. This test determines whether an isolate is type b, and therefore vaccine preventable. Serotyping is performed at either a state health department laboratory or a reference laboratory.

Hospitalization for supportive care is generally required in infants and others with severe Hib disease. Antimicrobial therapy should begin immediately with treatment usually lasting 10 to 14 days.

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Trends In The United States

H. Influenzae infections became nationally reportable in 1991. Serotype-specific reporting continues to be incomplete. Prior to the availability of national reporting data, several areas carried out active surveillance for *H. influenzae* disease, which allowed estimates of disease nationwide. In the early 1980s, it was estimated that about 20,000 cases occurred annually in the U.S., primarily among children younger than 5 years of age (40-50 cases per 100,000 population). The incidence of invasive Hib disease began to fall dramatically in the late 1980s due to the introduction of Hib conjugate vaccines, and has since declined by >99% compared to the prevaccine era.

According to the CDC, the U.S. experience with Hib conjugate vaccines has shown a decreased rate of Hib carriage among vaccinated children, thereby decreasing the chance that unvaccinated children will be exposed. This trend would indicate that high immunization levels also decrease the circulation of the organism. According to the CDC, most recent cases of Hib disease in the U.S. have occurred in unvaccinated or incompletely vaccinated children. In 2008, five children in Minnesota, ages 5 months to 3 years, contracted invasive *Haemophilus influenzae* type B disease, one died. Only one of the children had completed the primary Hib vaccination series. Three of the children had not received the Hib vaccine because of parental refusal, the 5 month old had received two doses due to age, and the fifth child had received 2 doses but no booster dose.

From 1996 through 2000, an average of 1,247 invasive *H. influenzae* cases were reported to CDC in all age groups (range 1,162-1,398 per year). Of these, an average of 272 (approximately 22%) per year were among children <5 years of age. Serotype was known for 76% of the invasive cases among children aged <5 years. Three-hundred-forty-one (average of 68 cases per year) were due to type b.

There are both active and passive surveillance systems for monitoring invasive Hib disease in the U.S. The passive system is based on case reports from state health departments while the active system is laboratory-based.

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The information contained on the Hib Disease Information Center Web site should not be used as a substitute for the medical care and advice of your healthcare provider. There may be variations in treatment that your healthcare provider may recommend based on individual facts and circumstances.

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