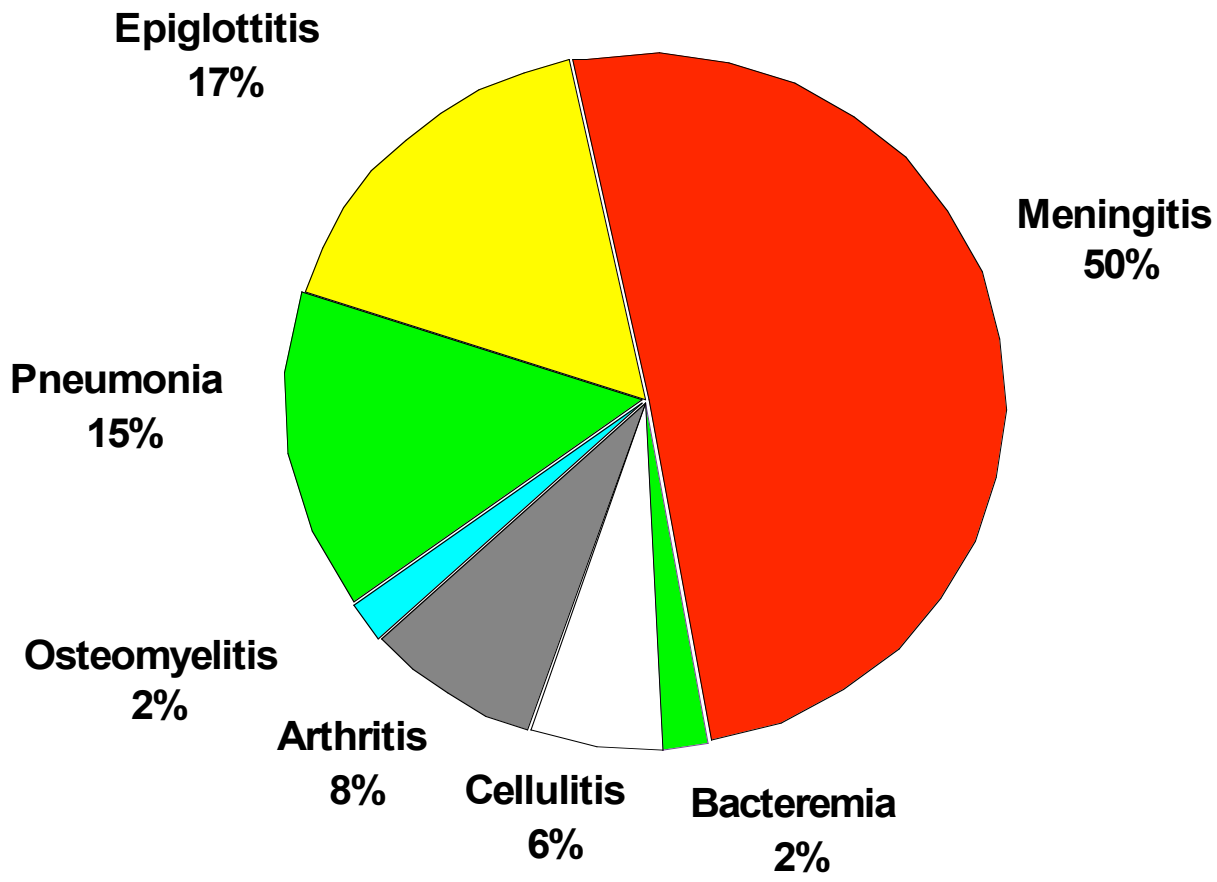
Haemophilus influenzae type B and Hib Vaccine

Chapter 9

Haemophilus influenzae

- Aerobic gram-negative bacteria
- Polysaccharide capsule
- Six different serotypes (a-f) of polysaccharide capsule
- 95% of invasive disease caused by type b

Haemophilus influenzae type b Clinical Features*



Haemophilus influenzae type b Medical Management

- Hospitalization required
- Treatment with an effective 3rd generation cephalosporin, or chloramphenicol plus ampicillin
- Ampicillin-resistant strains now common throughout the United States

Haemophilus influenzae type b Epidemiology

- Reservoir — Human
Asymptomatic carriers
- Transmission — Respiratory droplets
- Temporal pattern — Peaks in Sept-Dec
and March-May
- Communicability — Generally limited but higher in some circumstances

Haemophilus influenzae type b Risk Factors for Invasive Disease

- Exposure factors
  - household crowding
  - large household size
  - child care attendance
  - low socioeconomic status
  - low parental education
  - school-aged siblings
- Host factors
  - race/ethnicity
  - chronic disease

Haemophilus influenzae type b Polysaccharide Vaccine

- Available 1985-1988
- Not effective in children younger than 18 months of age
- Effectiveness in older children variable
- Age-related immune response
- Not consistently immunogenic in children 2 years of age and younger
- No booster response
- Antibody with less functional activity

Haemophilus influenzae type b Conjugate Vaccines

- Two conjugate vaccines licensed for use in infants as young as 6 weeks of age
- Use different carrier proteins
- 3 doses of any combination confers protection

Conjugate Hib Vaccines*

PRP-T	**ActHIB, TriHIBit**
PRP-OMP	**PedvaxHIB, Comvax**

PRP is polyriosyl-ribitol phosphate
T-Tetanus
OMP-outer membrane protein of *Neisseria meningitidis*

***HbOC (HibTiter) no longer available in the United States**

Haemophilus influenzae type b Vaccine Routine Schedule

Vaccine	2 mo	4 mo	6 mo	12-18 mo
PRP-T	x	x	x	x
PRP-OMP	x	x		x

Haemophilus influenzae type b Vaccine Delayed Vaccination Schedule

- Unvaccinated children 7 months of age or older may not need entire 3 or 4 dose series
- Number of doses child requires depends on current age
- All children 15-59 months of age need at least 1 dose

Haemophilus influenzae type b Vaccine Vaccination Following Invasive Disease

- Children younger than 24 months may not develop protective antibody after invasive disease
- Vaccinate during convalescence
- Complete series for age

Combination Vaccines Containing Hib

- DTaP—Hib
  - TriHIBit
- Hepatitis B—Hib
  - Comvax

Rotavirus and Rotavirus Vaccine

Chapter 20

Rotavirus

- First identified as cause of diarrhea in 1973
- Most common cause of severe diarrhea in infants and children
- Nearly universal infection by 5 years of age
- Responsible for up to 500,000 diarrheal deaths each year worldwide

Rotavirus

- Reovirus (RNA)
- VP7 (G protein) and VP4 (P protein) antigens define virus serotype.
- 5 predominant strains in U.S. (G1-G4, G9) and account for 90% of isolates
- G1 strain accounts for 73% of infections
- Very stable and may remain viable for weeks or months if not disinfected

Rotavirus Pathogenesis

- Entry through mouth
- Replication in epithelium of small intestine
- Replication outside intestine and viremia uncommon
- Infection leads to isotonic diarrhea

Rotavirus Immunity

- Antibody against VP7 and VP4 probably important for protection
- First infection usually does not lead to permanent immunity
- Reinfection can occur at any age
- Subsequent infections generally less severe

Rotavirus Clinical Features

- Incubation period 1-3 days
- Clinical manifestations depend on whether it is the first infection or reinfection
- First infection after age 3 months generally most severe
- May be asymptomatic or result in severe dehydrating diarrhea with fever and vomiting
- Gastrointestinal symptoms generally resolve in 3 to 7 days

Rotavirus Complications

- Severe diarrhea
- Dehydration
- Electrolyte imbalance
- Metabolic acidosis
- Immunodeficient children may have more severe or persistent disease

Rotavirus Epidemiology

- Reservoir — Human-GI tract
- Transmission — Fecal-oral, fomites
- Temporal pattern — Fall and winter (temperate areas)
- Communicability — 2 days before to 10 days after onset

Rotavirus Vaccine (RotaTeq®)

- Approved by FDA in February 2006
- Contains five reassortant rotaviruses developed from human and bovine parent rotavirus strains
- Vaccine viruses suspended in a solution of buffer (sodium citrate and phosphate) and stabilizer
- Contains no preservatives or thimerosal

Rotarix® Rotavirus Vaccine

- Approved by FDA in April 2008
- Contains one strain of live attenuated human rotavirus (G1P[8])
- Two oral doses at 2 and 4 months of age (minimum interval 4 weeks)
- Minimum age 6 weeks
- Maximum age 24 weeks
- ACIP recommendations for use are pending

RotaTeq Vaccine Efficacy

- Phase III trials included more than 70,000 infants in 11 countries
- Efficacy
  - All rotavirus disease - 74%
  - Severe rotavirus disease - 98%
  - Physician visits for diarrhea-86% reduction
  - Rotavirus-related hospitalization-96% reduction
- Efficacy of fewer than 3 doses is not known

Rotavirus Vaccine Recommendations

- Routine immunization of all infants without contraindications
- Administered at 2, 4, and 6 months of age*
- Minimum age of first doses is 6 weeks
- First dose should be administered between 6 and 12 weeks of age (until age 13 weeks)
- Do not initiate series after 12 weeks of age

***2 doses at 2 and 4 months for Rotarix**

***MMWR* 2006;55:(RR-12):1-13.**

Rotavirus Vaccine Recommendations

- Minimum interval between doses is 4 weeks
- Maximum age for ANY dose is 32 weeks*
- Do not administer on or after age 32 weeks*, even if fewer than three doses have been administered

***24 weeks for Rotarix**

***MMWR* 2006;55:(RR-12):1-13.**

Rotavirus Vaccine Recommendations

- Administer simultaneously with all other indicated vaccines
- Breastfeeding infants should be vaccinated on usual schedule
- Vaccinate infants who have recovered from documented rotavirus infection
- Do not repeat dose if infant spits out or regurgitates vaccine- administer remaining doses on schedule

***MMWR* 2006;55:(RR-12):1-13.**

Rotavirus Vaccine and Intussusception*

	Vaccine Recipients	Placebo Recipients
Within 42 days of vaccination	**6 cases**	**5 cases**
Within 1 year of vaccination	**13 cases**	**15 cases**

***data shown are for RotaTeq; no increased risk of IS was observed in Rotarix clinical trials.**
***New Eng J Med* 2006;354:23-33**

Rotavirus Vaccine Adverse Reactions

- Vomiting 15%
- Diarrhea 24%
- Nasopharyngitis 7%
- Fever 43%
- No serious adverse reactions reported

***data shown are for RotaTeq**
***MMWR* 2006;55:(RR-12):1-13.**

Rotavirus Vaccine Precautions*

- Altered immunocompetence
- Recent receipt of blood product
- Acute, moderate to severe gastroenteritis or other acute illness
- Pre-existing chronic GI disease
- Infants with history of intussusception

***the decision to vaccinate if a precaution is present should be made on a case-by-case risk and benefit basis**