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DEGLI STUDI DI BARI
ALDO MORO

CORSO DI IGIENE

**Scuola
di
Medicina**

Haemophilus influenzae
type b



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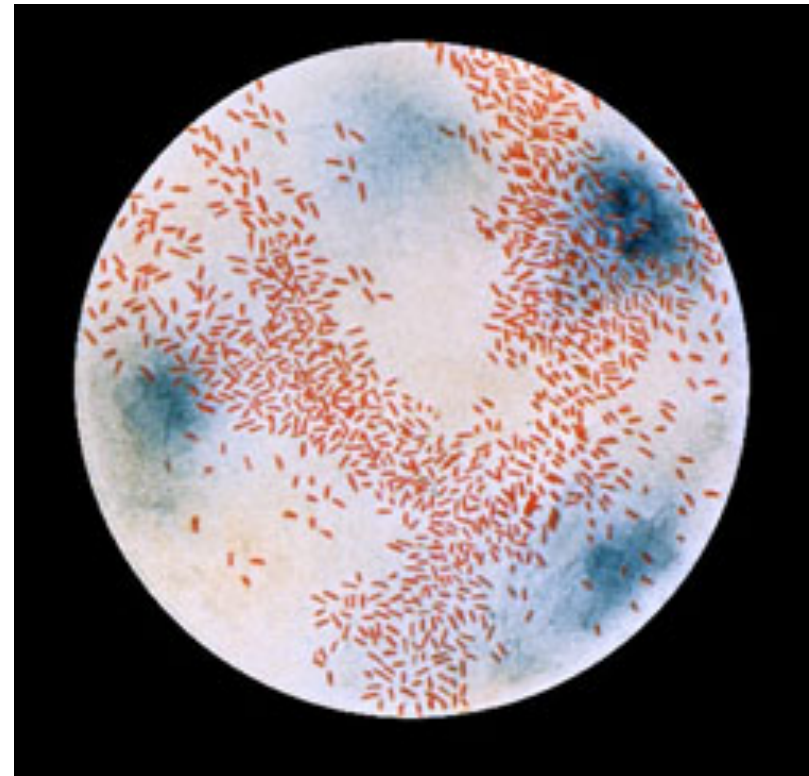
Haemophilus influenzae type b





Haemophilus influenzae type b

- Severe bacterial infection, particularly among infants
- During late 19th century believed to cause influenza
- Immunology and microbiology clarified in 1930s





Haemophilus influenzae

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



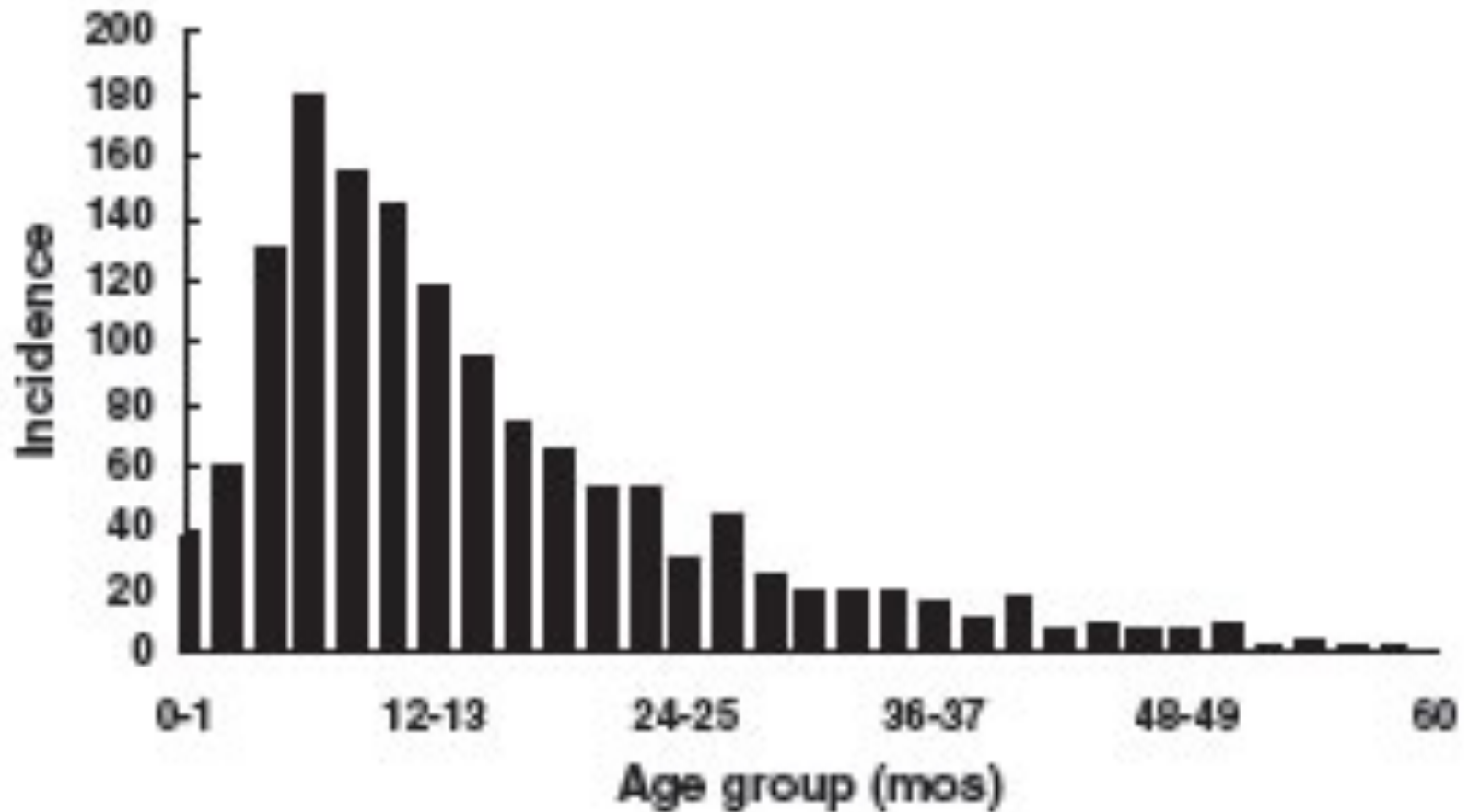
Haemophilus influenzae type b

Pathogenesis

- Organism colonizes **nasopharynx**
- In some persons organism invades **bloodstream** and causes infection at distant site
- Antecedent upper respiratory tract infection may be a contributing factor



Haemophilus influenzae type b 1986 Incidence* by Age Group

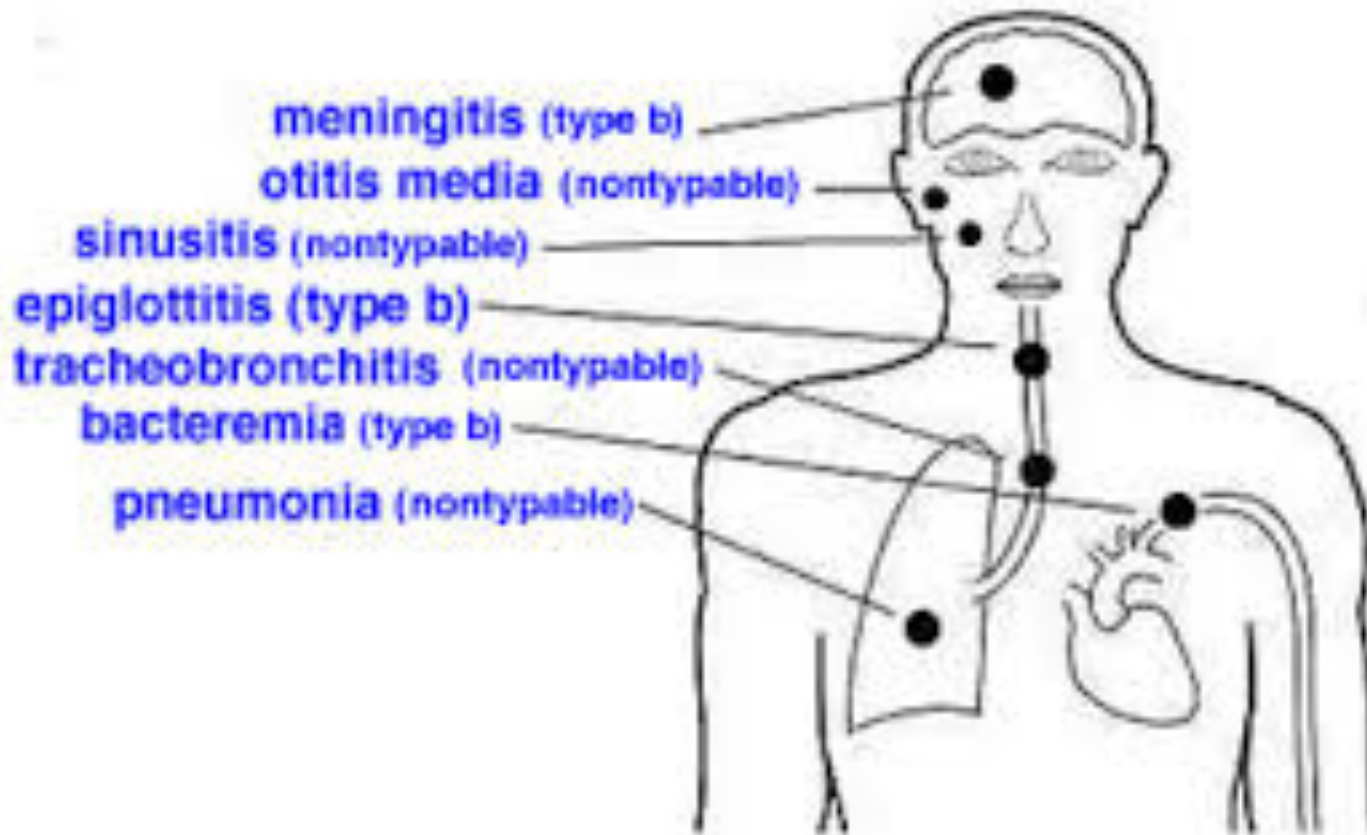


**Rate per 100,000 population, prevaccine era*



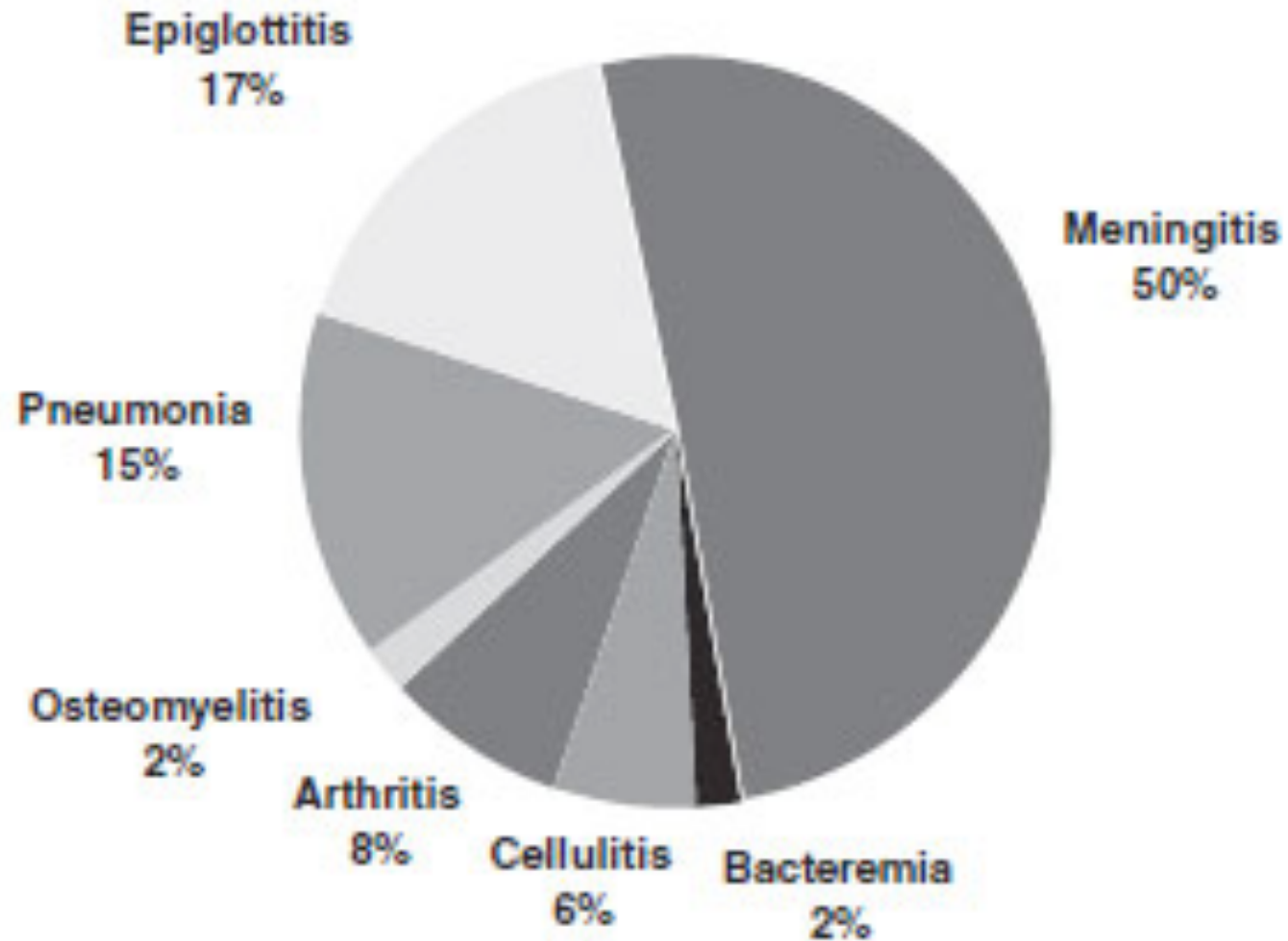
Haemophilus influenzae type b

Clinical Features





Haemophilus influenzae type b Clinical Features*



**prevaccine era*



Haemophilus influenzae type b Meningitis

- Accounted for approximately **50%-65%** of cases in the **prevaccine era**
- Hearing impairment or neurologic sequelae in 15%-30%
- **Case-fatality rate 3%-6%** despite appropriate antimicrobial therapy



Laboratory Diagnosis

- Culture of CSF, blood, pleural fluid, joint fluid, and middle ear aspirates
- Serotyping all isolates of *H. influenzae*
- PCR in blood, CSF, or other clinical specimens.



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Laboratory Diagnosis





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

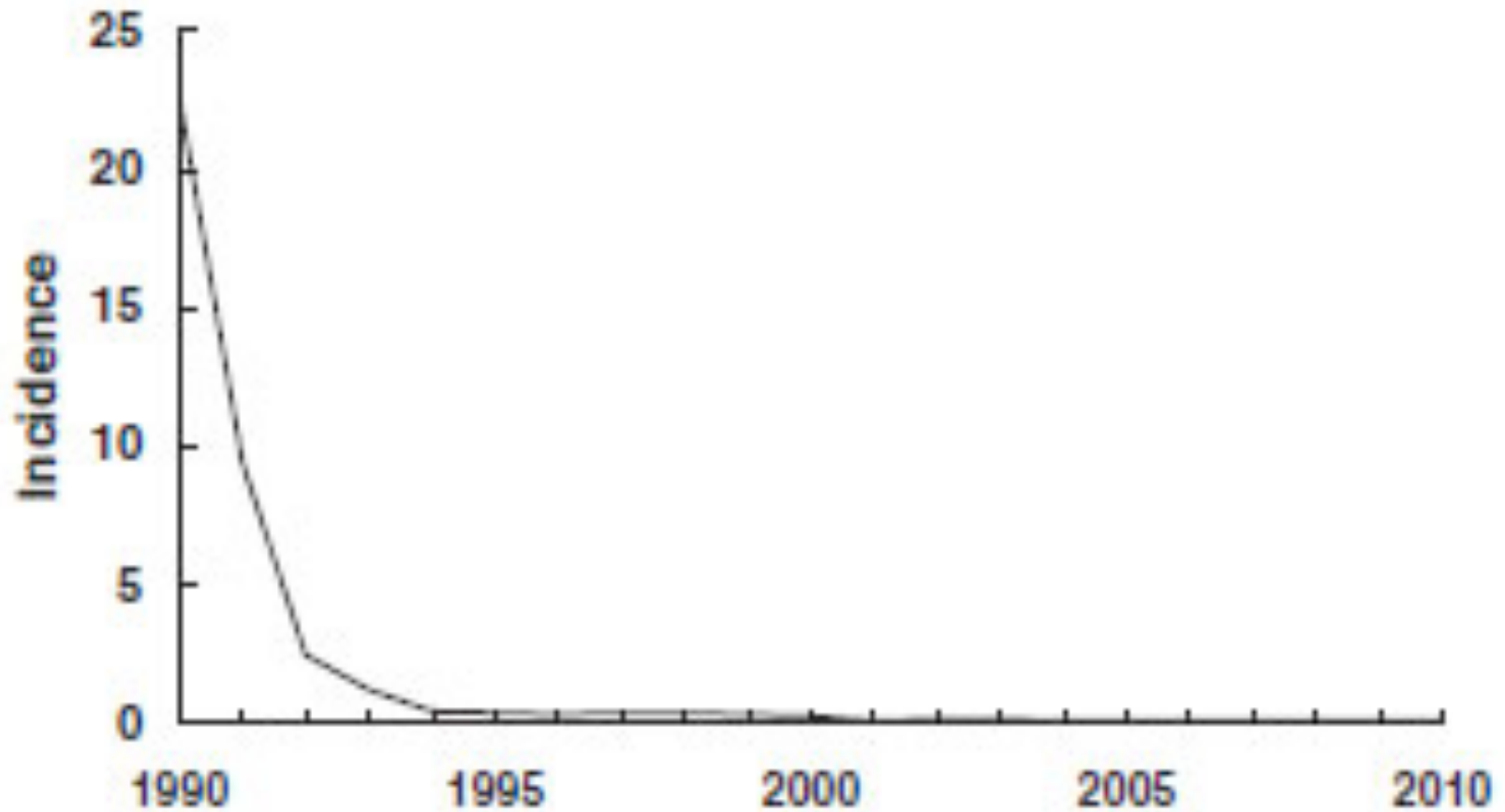
- Reservoir
 - human
 - asymptomatic carriers
- Transmission
 - respiratory droplet spread
 - neonates
 - aspiration of amniotic fluid
 - genital track secretions during delivery
- Temporal pattern
 - peaks in Sept-Dec and March-May
- Communicability
 - generally limited but higher in some circumstances



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Incidence* of Invasive Hib Disease, 1990-2010



*rate per 100,000 children <5 years of age



Haemophilus influenzae - United States, 2003-2010

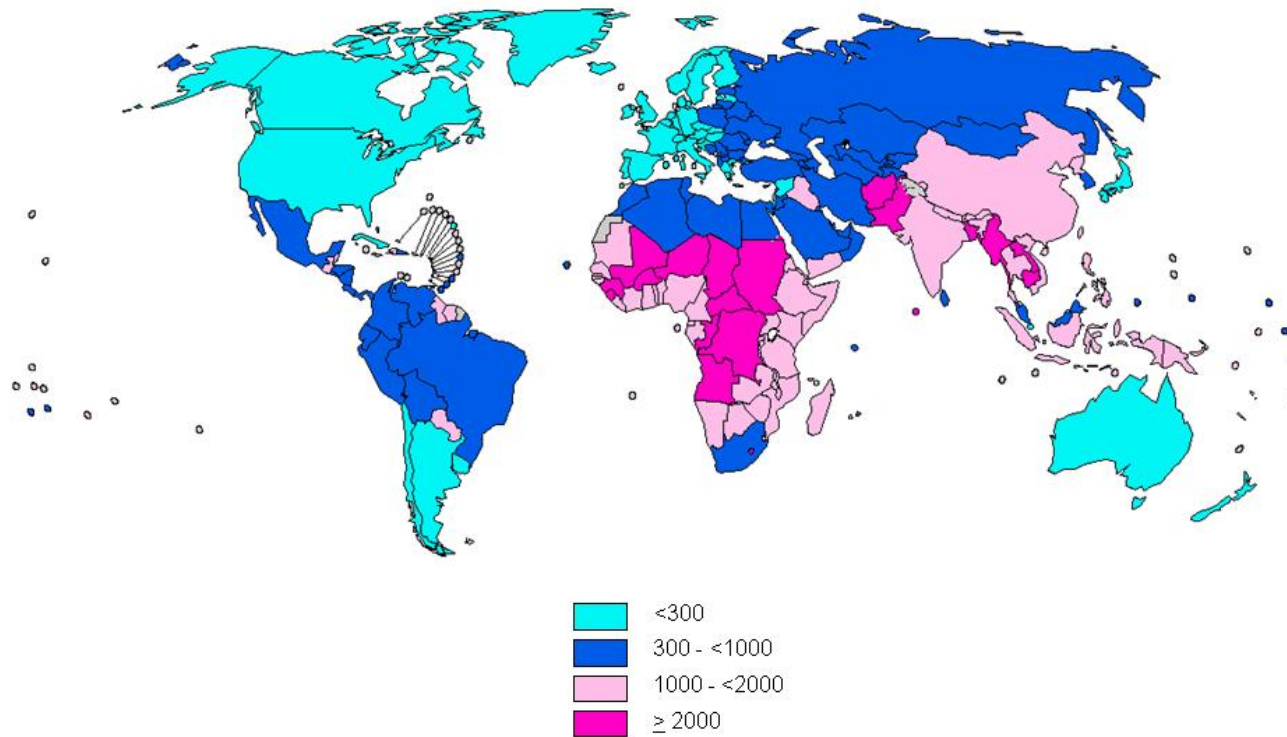
- Average of 2,562 infections per year reported to CDC in all age groups
- of these, 398 (16%) were children younger than 5 years



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HIB incidence rate per 100.000 children under age 5



Date of slide: 3 August 2009



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
- possibly gender (risk higher for males)



Haemophilus influenzae type b Polysaccharide Vaccine

- Available 1985-1988
- **Not effective in children younger than 18 months of age**
- Efficacy in older children varied
- **Age-dependent immune response**
- Not consistently immunogenic in children 2 years of age and younger
- No booster response



Polysaccharide Conjugate Vaccines

- Conjugation is bonding a polysaccharide (a somewhat ineffective antigen) to a protein “**carrier**” which is a more effective antigen
- Conjugated vaccines
 - Stimulates T-dependent immunity
 - Enhanced antibody production, especially in young children
 - Repeat doses elicit booster response



Immunogenicity and Vaccine Efficacy

- More than **95%** of vaccinated infants will develop **protective antibody levels**
- Clinical **efficacy** has been estimated at 95% to 100%
- Hib vaccine is immunogenic in patients with sickle-cell disease, leukemia, or human immunodeficiency virus (HIV) infection, and those who have had a splenectomy



Haemophilus influenzae type b (Hib) Vaccine

| Dose | Italy | USA |
|-----------|---------------|--------------|
| Primary 1 | 3 months | 2 months |
| Primary 2 | 5-6 months | 4 months |
| Primary 3 | 11-12 months | 6 months |
| Primary 4 | Not indicated | 15-18 months |



Haemophilus influenzae type b (Hib) Vaccine

- Recommended interval 8 weeks for primary series doses
- Minimum interval 4 weeks for primary series doses
- Vaccination at younger than 6 weeks of age may induce immunologic tolerance to subsequent doses of Hib vaccine
- Minimum age 6 weeks



Unvaccinated Children 7 months of Age and Older

| Age at 1st Dose (months) | Primary series | Booster |
|--------------------------|------------------------|----------------|
| 2-6 | 3 doses, 8 weeks apart | 12-15 months |
| 7-11 | 2 doses, 4 weeks apart | 12-15 months |
| 12-14 | 1 dose | 2 months later |
| 15-59† | 1 dose | -- |



Hib Vaccine Following Invasive Disease

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



Hib Vaccine Use in Older Children and Adults

- Generally not recommended for persons older than 59 months of age
- 3 doses recommended for all persons who have received a hematopoietic cell transplant



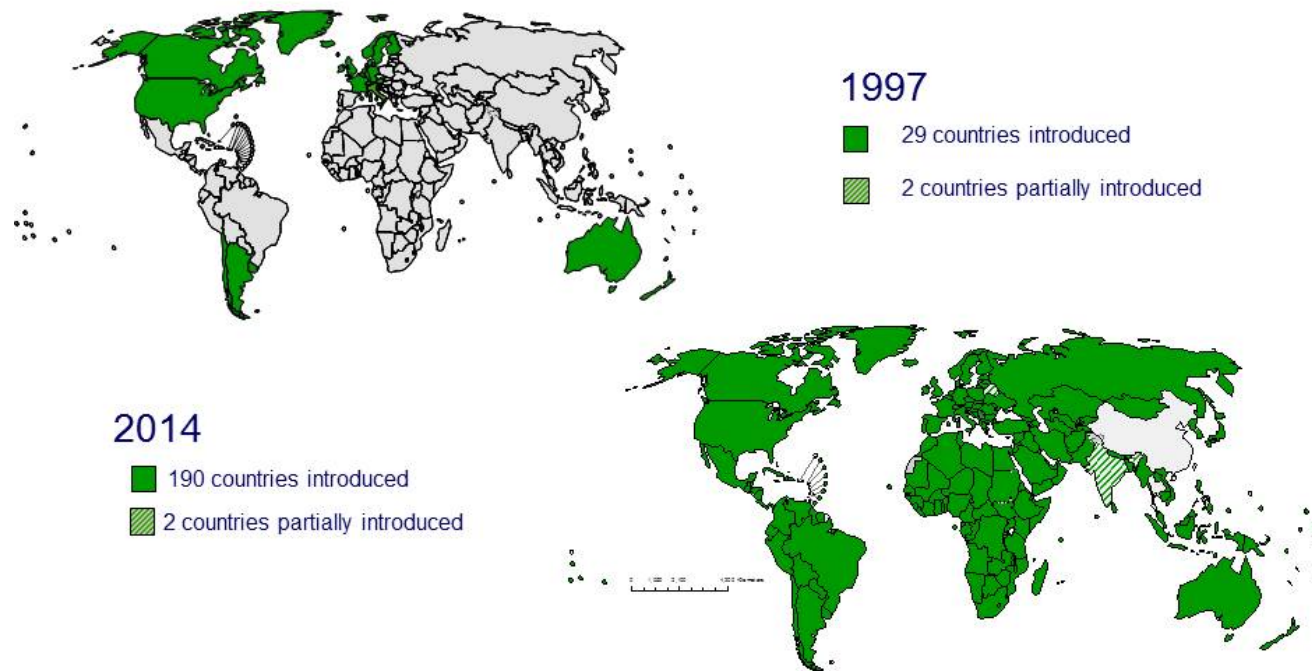
Combination Vaccines Containing Hib

- DTaP-IPV-HBV/Hib
- DTaP-IPV/Hib
- Hepatitis B-Hib
- Hib-MenCY



HIB Vaccine

Countries having introduced Hib vaccine
in 1997 and 2014



Source: WHO/IVB Database as at 24 July 2015.
Map production: Immunization Vaccines and Biologicals, (IVB),
World Health Organization.
194 WHO Member States. Date of slide: 28 July 2014



Haemophilus influenzae type b Vaccine Contraindications and Precautions

- Severe allergic reaction to vaccine component or following a prior dose
- Moderate or severe acute illness
- Age younger than 6 weeks



Haemophilus influenzae type b Vaccine Adverse Reactions

- Swelling, redness, or pain in 5%-30% of recipients
- Systemic reactions infrequent
- Serious adverse reactions rare