Polio and Polio Vaccine

Raymond A. Strikas, MD, MPH,
Communications and Education Branch,
Immunization Services Division,
National Center for Immunization and Respiratory Diseases, CDC
Poliomyelitis Disease

First outbreak described in the U.S. in 1843

More than 21,000 paralytic cases reported in the U.S. in 1952

Global eradication within this decade
Poliovirus

Three serotypes of wild polio virus:
- WPV1
- WPV2
- WPV3

Minimal heterotypic immunity between serotypes

Rapidly inactivated by heat, chlorine, formaldehyde, and ultraviolet light
Poliomyelitis Pathogenesis

- Entry into mouth
- Replication in pharynx and GI tract
- Hematologic spread to lymphatics and central nervous system
- Viral spread along nerve fibers
- Destruction of motor neurons

Racaniello VR. One hundred years of poliovirus pathogenesis. Virology 2006;344:9-16
Outcomes of Poliovirus Infection

- Asymptomatic: 70%
- Minor non-specific illness: 20%
- Aseptic meningitis: 10%
- Flaccid paralysis: 0%

0% 10% 20% 30% 40% 50% 60% 70% 80%
<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Human</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission</td>
<td>Fecal-oral</td>
</tr>
<tr>
<td></td>
<td>Oral-oral possible</td>
</tr>
<tr>
<td>Communicability</td>
<td>Most infectious: 7-10 days before onset</td>
</tr>
<tr>
<td></td>
<td>Virus present in stool</td>
</tr>
<tr>
<td></td>
<td>3-6 weeks</td>
</tr>
</tbody>
</table>
Poliomyelitis—United States, 1950-2011

Source: National Notifiable Disease Surveillance System, CDC

Cases

Inactivated vaccine

Live oral vaccine

Last indigenous case


Source: National Notifiable Disease Surveillance System, CDC
Poliomyelitis—United States, 1980-2010

Vaccine-associated paralytic polio = VAPP

Cases


VAPP  Imported
Poliovirus Vaccines

1955 - Inactivated vaccine

1963 - Trivalent OPV

1987 – Enhanced-potency (IPV)
Inactivated Polio Vaccine

Highly effective in producing immunity to poliovirus

≥90% of recipients immune after 2 doses

≥99% of recipients immune after 3 doses

Duration of immunity not known with certainty
Figure 1. Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger—United States, 2017.

(For those who fall behind or start late, see the catch-up schedule (Figure 2).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are shaded in gray.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16 yrs</th>
<th>17-18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td>1st dose</td>
<td></td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotavirus 2 (RV) / RV 1 (2-dose series); RV 3 (3-dose series)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP; &lt;7 yrs)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td>3rd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenza type b (Hib)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td>3rd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td>3rd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inactivated poliovirus (IPV) &lt;18 yrs</td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td>3rd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4th dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza a (IIV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Annual vaccination (IIV) 1 or 2 doses</td>
<td>Annual vaccination (IIV) 1 dose only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A (HepA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal C (MenC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal B (MenB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Range of recommended ages for all children
Range of recommended ages for catch-up immunization
Range of recommended ages for certain high-risk groups
Range of recommended ages for non-high-risk groups that may receive vaccine, subject to individual clinical decision making
No recommendation

NOTE: The above recommendations must be read along with the footnotes of this schedule.
## Childhood Polio Vaccination Schedule

<table>
<thead>
<tr>
<th>IPV Dose</th>
<th>Routinely Recommended at</th>
<th>Minimum Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 months of age</td>
<td>--------</td>
</tr>
<tr>
<td>2</td>
<td>4 months of age</td>
<td>4 weeks</td>
</tr>
<tr>
<td>3</td>
<td>6-18 months of age</td>
<td>4 weeks</td>
</tr>
<tr>
<td>4</td>
<td>4-6 years of age</td>
<td>6 months</td>
</tr>
</tbody>
</table>
Catch-up IPV Vaccination

In the first 6 months of life, minimum age and minimum intervals are only recommended if the person is at risk of imminent exposure to circulating poliovirus.

If 4 or more doses are administered before age 4 years, an additional dose should be administered at age 4 through 6 years and at least 6 months after the previous dose.

A fourth dose is not necessary if the third dose was administered at age 4 years or older and at least 6 months after the previous dose.

Only IPV is available in the United States

If both OPV and IPV were administered as part of a series, the series should be completed with IPV. Any combination of 4 doses of OPV and IPV by 4 to 6 years of age constitutes a complete series

If only OPV doses were administered, and all doses were given prior to 4 years of age, one dose of IPV should be given at 4 years or older, at least 4 weeks to 6 months after the last OPV dose

Only trivalent OPV (tOPV) counts toward the U.S. vaccination requirements (tOPV was used for routine poliovirus vaccination in all OPV-using countries until April 1, 2016).
Poliovirus-containing Vaccine Products

Single component vaccine - IPV (IPOL)

FOUR polio-containing combination vaccine products:

- DTaP-IPV/Hib (Pentacel)
- DTaP-HepB-IPV (Pediarix)
- DTaP-IPV (Kinrix)
- DTaP-IPV (Quadracel)
DTaP-IPV/Hib (Pentacel)

FDA-approved for:

- IPV doses 1 through 4
- Children 6 weeks through 4 years of age

Use DTaP-IPV diluent to reconstitute the Hib component

Reminder: Only use the manufacturer’s supplied diluent
DTaP-HepB-IPV (Pediarix)

FDA-approved for:

- IPV doses 1 through 3
- Children 6 weeks through 6 years of age
DTaP-IPV (Kinrix & Quadracel)

Kinrix

IPV dose 4

Children 4 through 6 years of age

Quadracel

IPV dose 4 or 5

4 through 6 years of age

Vaccine Administration error: Do NOT use Quadracel to reconstitute the Hib component of Pentacel vaccine
Polio Vaccination of Adolescents

*Routine* vaccination of U.S. residents 18 years of age or older is not necessary or recommended.

May consider vaccination of travelers to polio-endemic countries and selected lab workers.
Polio Vaccination of Unvaccinated Adults

Use standard IPV schedule if possible

  0, 1-2 months, 6-12 months intervals

May separate first and second doses by 4 weeks if accelerated schedule needed

The minimum interval between the second and third doses is 6 months
Polio Vaccination of Previously Vaccinated Adults

Previously completed series

Administer 1 dose of IPV to those at risk

Incomplete series

Administer remaining doses in series based on immunization history

No need to restart a valid documented series

Valid = minimum intervals met
Contraindications and Precautions

Severe allergic reaction to a vaccine component or following a prior dose of vaccine

Moderate to severe acute illness
IPV Adverse Reactions

Local reactions: 2.8% (pain, redness, swelling)

Severe reactions: rare
Polio Eradication

Last case in the United States in 1979

Western Hemisphere certified polio-free in 1994

Last isolate of WPV2 was in India in October 1999

Global eradication goal
The number of worldwide reported cases has decreased from an estimated 350,000 in 1988 to 8 as of August 9, 2017

Afghanistan – 5 cases of WPV1
Pakistan – 3 cases of WPV1
Nigeria – Polio-free

http://www.polioeradication.org
http://polioeradication.org/polio-today/polio-now/this-week/
Additional Polio Resources

- **Polio Eradication:** [www.cdc.gov/polio/](http://www.cdc.gov/polio/)

- **Polio Infection:** [www.cdc.gov/vaccines/vpd/polio/index.html](http://www.cdc.gov/vaccines/vpd/polio/index.html)
Haemophilus influenzae Type b and Hib Vaccine
Haemophilus influenzae

Severe bacterial infection, particularly among infants

Aerobic gram-negative bacteria

Polysaccharide capsule

6 different serotypes (a-f) of polysaccharide capsule

95% of invasive disease caused by type b (prevaccine era)
Impact of *Haemophilus influenzae* Type b Disease

Formerly the leading cause of bacterial meningitis among children younger than 5 years of age

Approximately 1 in 200 children developed invasive Hib disease

Almost all infections among children younger than 5 years
Haemophilus influenzae Type b
Clinical Manifestations*

*Prevaccine era

- Meningitis: 50%
- Epiglottitis: 17%
- Pneumonia: 15%
- Osteomyelitis: 2%
- Arthritis: 8%
- Cellulitis: 6%
- Bacteremia: 2%
- Bacteremia: 2%
- Cellulitis: 6%
- Arthritis: 8%
- Osteomyelitis: 2%
- Pneumonia: 15%
- Epiglottitis: 17%
- Meningitis: 50%

*Prevaccine era
Hib facial cellulitis
<table>
<thead>
<tr>
<th><strong>Reservoir</strong></th>
<th>Human asymptomatic carriers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission</strong></td>
<td>Respiratory droplets presumed</td>
</tr>
<tr>
<td><strong>Temporal pattern</strong></td>
<td>Peaks in Sept-Dec and March-May</td>
</tr>
<tr>
<td><strong>Communicability</strong></td>
<td>Generally limited but higher in some circumstances (e.g., household, child care)</td>
</tr>
</tbody>
</table>
Estimated Annual Incidence (per 100,000) of Invasive *Haemophilus influenzae* Type b (Hib) Disease in Children Aged <5 Years — United States, 1980–2012

Haemophilus influenzae, Invasive Disease

Incidence of reported cases (per 100,000), by serotype among children aged <5 years — United States, 2000–2013

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
Haemophilus influenzae Type b Conjugate Vaccines

Conjugation improves immunogenicity

Immune response with booster doses

Same polysaccharide capsule linked to different carrier proteins

3 monovalent conjugate vaccines

2 combination vaccines available that contain Hib vaccine
Conjugate Hib Vaccines

PRP-T
- ActHIB
- Hiberix
- Pentacel
- MenHibrix

PRP-OMP
- PedvaxHIB
Table: Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger—United States, 2017.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16 yrs</th>
<th>17-18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st dose</td>
<td>-------</td>
<td>---------</td>
<td>----------</td>
<td>-----------</td>
<td>-----------</td>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td>Rotavirus (RV) 1 (2-dose series); RV5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td>3rd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
<td></td>
<td>4th dose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenza type b (Hib)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3rd or 4th dose, See footnote 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal conjugate vaccine (PCV13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
<td></td>
<td>4th dose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inactivated poliovirus (IPV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella (VAR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A (HepA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal A (MenACWY-D, MenACYWY)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis (Tdap)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tdap</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** The above recommendations must be read along with the footnotes of this schedule.
Hib Vaccine

Recommended interval 8 weeks for primary series

Minimum interval 4 weeks for primary series

Minimum age 6 weeks

Booster dose at 12-15 months
# Hib Vaccine Routine Schedule

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>2 months</th>
<th>4 months</th>
<th>6 months</th>
<th>12-18 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRP-T</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PRP-OMP</td>
<td>X</td>
<td>X</td>
<td>NA</td>
<td>X</td>
</tr>
</tbody>
</table>
Unvaccinated Children 7 months of Age and Older

Children starting late may not need entire 3 or 4 dose series

Number of doses child requires depends on current age

See detailed schedule p. 128 of Pink Book, and 2017 catch-up schedule
Hib Vaccine
Use in Older Children and Adults

Generally not recommended for persons older than 59 months of age

High-risk older children and adolescents may be vaccinated if not vaccinated in childhood

Asplenia

Immunodeficiency

HIV infection

Receipt of chemotherapy or radiation therapy

Special populations
## Guidance for Hib Vaccination in High-risk Groups

<table>
<thead>
<tr>
<th>High-risk group</th>
<th>Hib vaccine guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective splenectomy</td>
<td>If unimmunized:</td>
</tr>
<tr>
<td></td>
<td>1 dose, prior to procedure</td>
</tr>
<tr>
<td>Asplenic patient</td>
<td>If unimmunized: 1 dose</td>
</tr>
<tr>
<td>HIV-infected children</td>
<td>If unimmunized: 1 dose</td>
</tr>
<tr>
<td>HIV-infected adults</td>
<td>Hib vaccination not recommended</td>
</tr>
<tr>
<td>Hematopoietic cell transplant</td>
<td>3 doses (at least 4 weeks apart) beginning 6-12 months after transplant</td>
</tr>
</tbody>
</table>
Special Populations

Children aged <24 months with invasive Hib disease

- Administer complete series as recommended for child’s age
- Vaccinate during the convalescent phase of the illness

American Indian/Alaska Natives

- PRP-OMP vaccines specifically recommended for primary series doses
- Hib disease peaks earlier in infancy
- PRP-OMP vaccines produce protective antibody after first dose/early protection
Monovalent Hib Vaccines

ActHIB (PRP-T)

Hiberix (PRP-T)

PedvaxHIB (PRP-OMP)
ActHIB (PRP-T)

Approved for all doses of primary schedule and booster dose

Can be used for previously unvaccinated children per the catch-up schedule

Must be reconstituted only with 0.4% sodium chloride (NaCl) ActHIB diluent
Hiberix (PRP-T)

Approved for all doses of primary schedule and booster dose

Can be used for previously unvaccinated children per the catch-up schedule
PedvaxHIB (PRP-OMP)

Approved for all doses of primary schedule and booster dose

Remember primary series for PRP-OMP vaccines is 2 doses

Can be used for previously unvaccinated children per the catch-up schedule
Hib-containing Combination Vaccines

- DTaP- IPV/Hib (Pentacel)
- Hib-MenCY (MenHIBrix)
Pentacel

Contains DTaP, Hib (PRP-T), and IPV

Approved for doses 1 through 4 among children 6 weeks through 4 years of age

Do NOT use for children 5 years or older

Package contains lyophilized Hib (ActHIB) that is reconstituted with a liquid DTaP-IPV solution
MenHibrix

Contains Hib (PRP-T) and *Neisseria meningitidis* serogroups C and Y

Approved for 4 doses between 6 weeks and 18 months of age

Only recommended for routine meningococcal vaccination of infants who are at increased risk for meningococcal disease

- Persistent complement pathway deficiencies
- Anatomic or functional asplenia, including sickle cell disease
Hib Vaccine Interchangeability

All monovalent conjugate Hib vaccines are interchangeable for primary series and booster dose.

3-dose primary series (4 doses total) if more than one brand of vaccine used at 2 or 4 months of age.

Whenever feasible use same combination vaccine for subsequent doses.

If vaccine used for earlier doses is not known or not available, any brand may be used to complete the series.
Contraindications and Precautions

Severe allergic reactions to vaccine component or following previous dose

Moderate to severe acute illness

Age younger than 6 weeks
Hib Vaccine Adverse Reactions

Swelling, redness, or pain in 5%-30% of recipients

Systemic reactions infrequent

Serious adverse reactions rare
Additional Hib Resources


Hib (*Haemophilus influenzae* type b) Vaccination: [www.cdc.gov/vaccines/vpd/hib/index.html](http://www.cdc.gov/vaccines/vpd/hib/index.html)

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Photographs and images included in this presentation are licensed solely for CDC/NCIRD online and presentation use. No rights are implied or extended for use in printing or any use by other CDC CIOs or any external audiences.