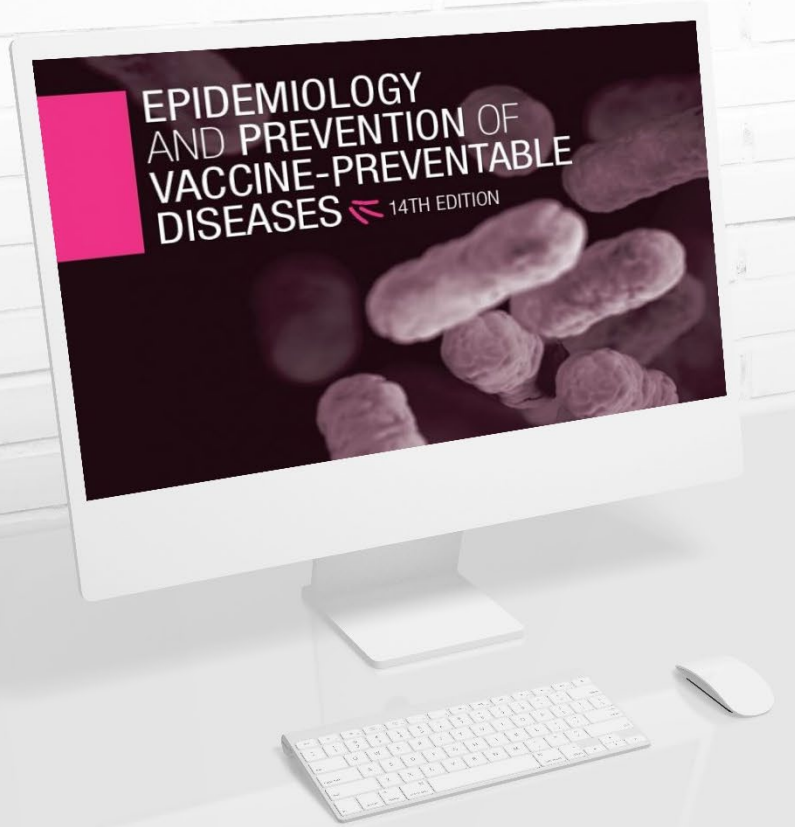
National Center for Immunization and Respiratory Diseases

Polio and *Haemophilus influenzae* type b Vaccines

Pink Book Web-on-Demand Series



Sarah Reagan-Steiner, MD
Medical Officer
Immunization Services Division

Learning Objectives

- Describe the fundamental principles of the immune response.
- Describe immunization best practices.
- Describe an emerging immunization issue.
- For each vaccine-preventable disease, identify those for whom routine immunization is recommended.
- For each vaccine-preventable disease, describe characteristics of the vaccine used to prevent the disease.
- Locate current immunization resources to increase knowledge of team's role in program implementation for improved team performance.

Continuing Education Information

- To claim continuing education (CE) for this course, please follow the steps below by July 1, 2026.
- Search and register for course **WD4810-080824** in **CDC TRAIN**.
- Pass the post-assessment at 80%.
- Complete the evaluation.
- Visit “Your Learning” to access your certificates and transcript.
- If you have any questions, contact **CDC TRAIN** at train@cdc.gov or CE Coordinator, Melissa Barnett, at MBarnett2@cdc.gov

https://www.train.org/cdctrain/welcome

Disclosure Statements

- **In compliance with continuing education requirements, all planners and presenters must disclose all financial relationships, in any amount, with ineligible companies during the previous 24 months as well as any use of unlabeled product(s) or products under investigational use.**
- **CDC, our planners, and content experts, wish to disclose they have no financial relationship(s) with ineligible companies whose primary business is producing, marketing, selling, reselling, or distributing healthcare products used by or on patients.**
- **Content will not include any discussion of the unlabeled use of a product or a product under investigational use with the exception of the discussion of the use of *Haemophilus influenzae* vaccines in a manner recommended by the Advisory Committee on Immunization Practices but not approved by the Food and Drug Administration.**

Disclosure Statements

- **CDC did not accept financial or in-kind support from any ineligible company for this continuing education activity.**
- **The findings and conclusions in this presentation are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.**

1

Polio Disease

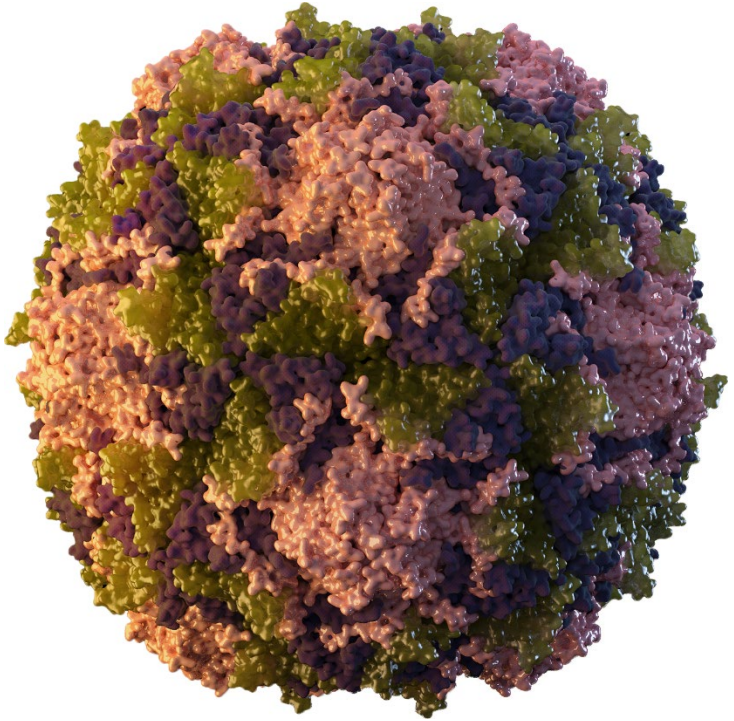
Poliomyelitis Disease

- **Caused by poliovirus**
- **Epidemics starting in the late 19th century**
- **Polio epidemics were reported each summer and fall.**
- **1952: More than 21,000 paralytic cases reported in the U.S.**
- **1955: Vaccine introduction; polio incidence declined rapidly**
- **1979: Last case of polio caused by *wild* poliovirus acquired in the U.S.**
- **2022: Most recent case of polio caused by *vaccine-derived* poliovirus in the U.S. occurred in New York in an unvaccinated, immunocompetent young adult.**

Chapter 18: Poliomyelitis | Pink Book | CDC, Clinical Overview of Poliomyelitis | Polio | CDC, Public Health Response to a Case of Paralytic Poliomyelitis in an Unvaccinated Person and Detection of Poliovirus in Wastewater — New York, June–August 2022 | MMWR

Poliovirus

- **Enterovirus (RNA)**
- **Three serotypes: type 1, type 2, type 3**
  - Immunity to one serotype does not produce significant immunity to other serotypes



Chapter 18: Poliomyelitis | Pink Book | CDC, Clinical Overview of Poliomyelitis | Polio | CDC

Poliomyelitis Pathogenesis

- **Enters through the mouth**
- **Replicates in oropharynx and gastrointestinal tract**
  - Invades local lymphoid tissue, may enter bloodstream then infect cells of the central nervous system
- **Viral spread along nerve fibers**
- **Destruction of motor neurons and brainstem cells**

Chapter 18: Poliomyelitis | Pink Book | CDC, Clinical Overview of Poliomyelitis | Polio | CDC

Poliovirus Epidemiology

Reservoir	Human
Transmission	Fecal-oral Oral-oral possible
Communicability	Most infectious: 7–10 days before onset Virus present in stool 3–6 weeks

Chapter 18: Poliomyelitis | Pink Book | CDC, Clinical Overview of Poliomyelitis | Polio | CDC

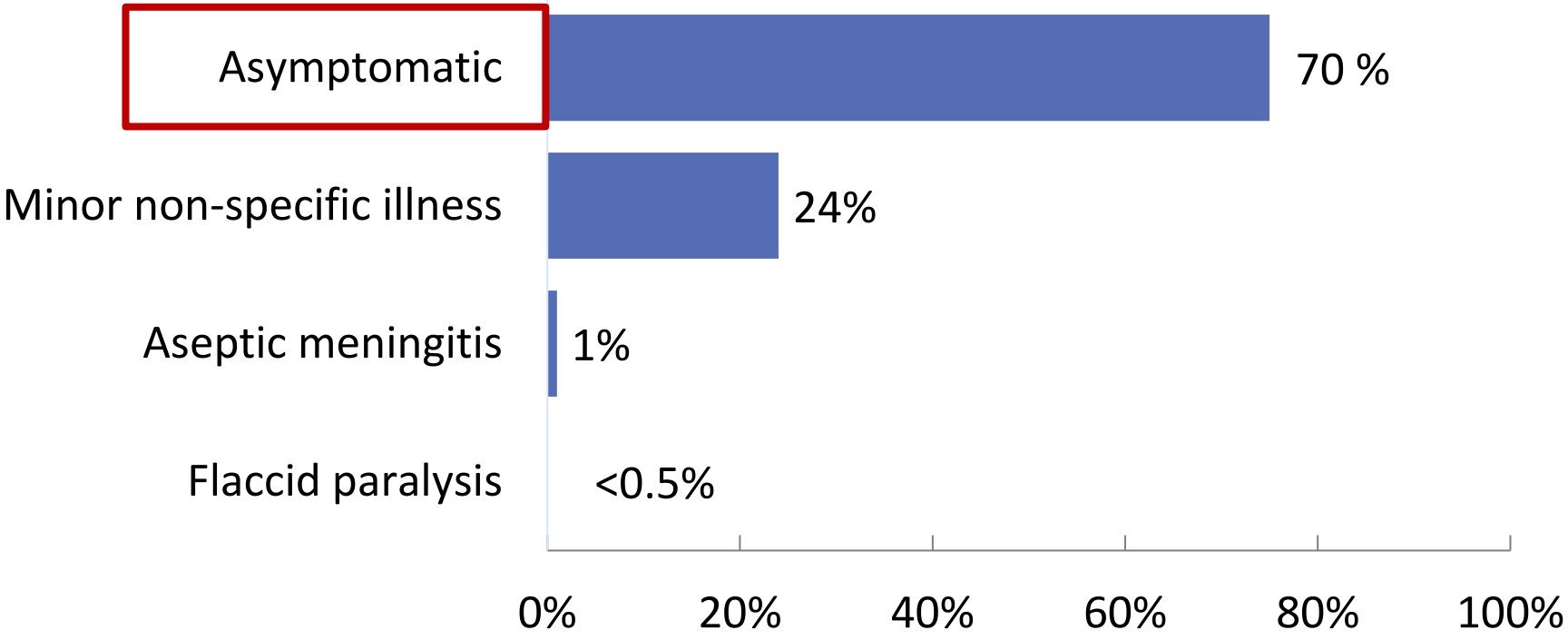
Poliomyelitis Clinical Features

- **Incubation period**
  - 3 to 6 days for nonparalytic poliomyelitis
  - 7 to 21 days for onset of paralysis in paralytic poliomyelitis

- **Risk of severe disease and death increases with age**

Chapter 18: Poliomyelitis | Pink Book | CDC, Clinical Overview of Poliomyelitis | Polio | CDC

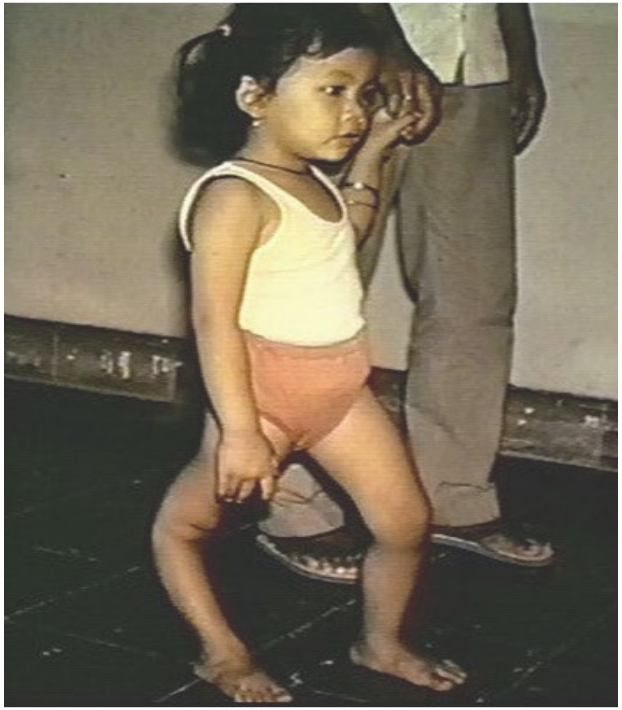
Poliomyelitis Clinical Features in Children



Chapter 18: Poliomyelitis | Pink Book | CDC, Clinical Overview of Poliomyelitis | Polio | CDC

Types of Paralytic Polio

- **Spinal polio**
  - Asymmetric paralysis that most often involves the legs
- **Bulbar polio**
  - Presents with weakness of facial, oropharyngeal, and respiratory muscles innervated by cranial nerves
- **Bulbospinal polio**
  - Combination of bulbar and spinal paralysis, accounted for 19% of cases



Asymmetric Paralysis

Chapter 18: Poliomyelitis | Pink Book | CDC, Clinical Overview of Poliomyelitis | Polio | CDC. Image link: https://phil.cdc.gov/details.aspx?pid=5578

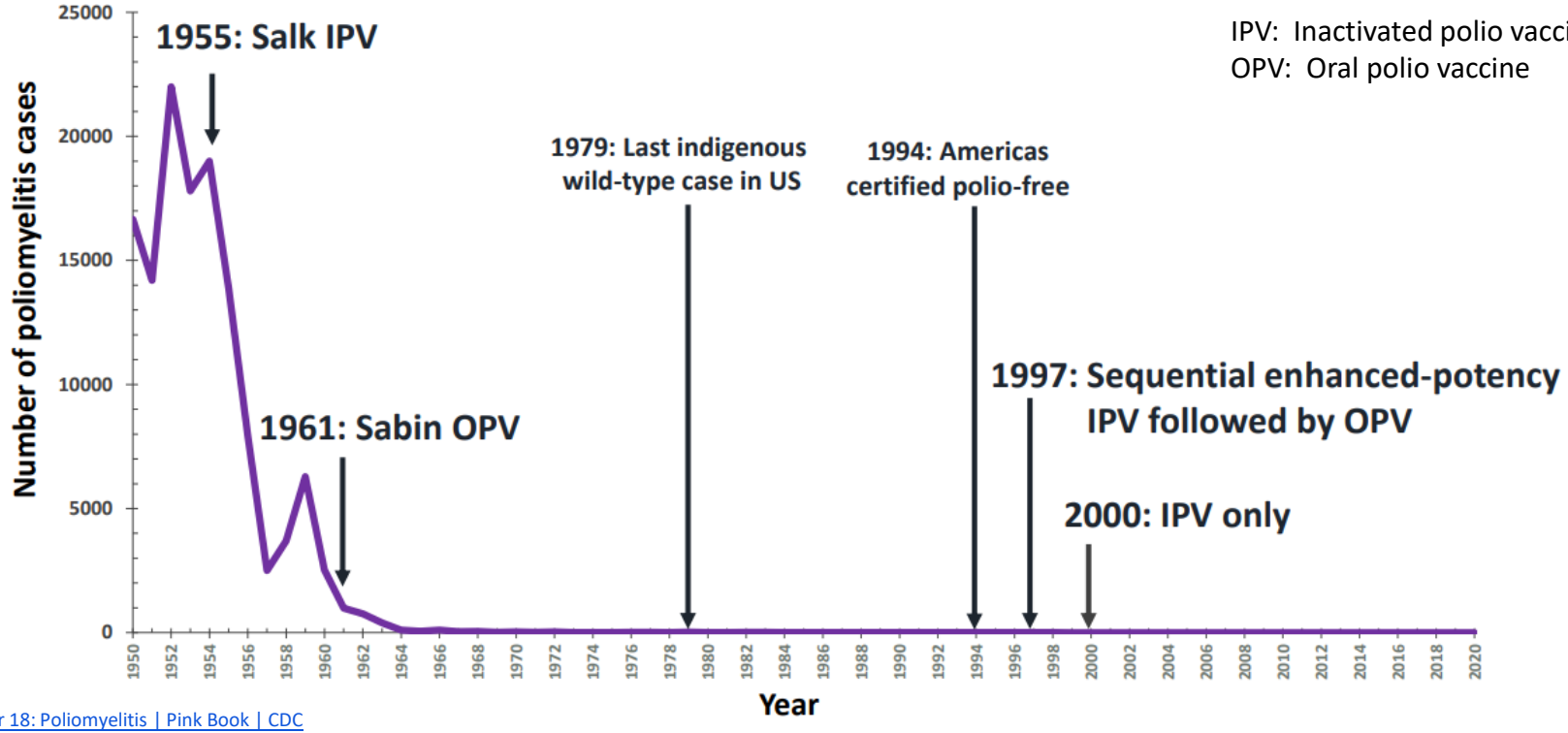
Poliomyelitis Clinical Features

- **Historic case fatality rate for paralytic polio**
  - 2% to 5% in children
  - 15% to 30% in adolescents and adults
  - 25% to 75% with bulbar involvement
- **Post-polio syndrome**
  - Slow, irreversible worsening of muscle weakness in the muscle groups involved during the original infection
  - Occurs in 25% to 40% of persons who had paralytic polio in childhood
  - Interval of 15 to 40 years after paralysis
  - Not infectious, affected persons do not shed virus

Chapter 18: Poliomyelitis | Pink Book | CDC, Clinical Overview of Poliomyelitis | Polio | CDC

Paralytic Polio Decreased Rapidly in the United States After Introduction of Polio Vaccine

IPV: Inactivated polio vaccine
OPV: Oral polio vaccine



Chapter 18: Poliomyelitis | Pink Book | CDC

Poliomyelitis in the United States, 2022–2024

- **CDC was notified of a case of paralytic polio in an unvaccinated individual from Rockland County, New York.**
  - The case was caused by vaccine-derived poliovirus type 2.
- **Genetic sequencing indicated a linkage to polioviruses collected in wastewater in Israel, United Kingdom, and Canada.**
- **No additional paralytic cases were identified.**

Clinical Overview of Poliomyelitis | Polio | CDC, Public Health Response to a Case of Paralytic Poliomyelitis in an Unvaccinated Person and Detection of Poliovirus in Wastewater — New York, June–August 2022 | MMWR

2

Poliovirus Vaccine

2 Types of Polio Vaccines

Inactivated polio vaccine (IPV)

- Protects against all 3 serotypes

Oral polio vaccine (OPV)

- Trivalent OPV (tOPV): Protects against all 3 serotypes
- Bivalent OPV (bOPV): Protects against serotypes 1 and 3
- Monovalent OPV (mOPV): Protects against only 1 serotype

Not available in U.S.

Chapter 18: Poliomyelitis | Pink Book | CDC

Polio Vaccine Products

Vaccine (Manufacturer)	Vaccine Components	Age Indication	Doses in Polio Vaccine Series	Injection Route
Ipol (SP)	IPV	6 weeks and older	Any	IM or SC
Pentacel (SP)	DTaP-IPV/Hib	6 weeks–4 years	1, 2, 3, 4	IM
Vaxelis (Merck)	DTap-IPV-Hib-HepB	6 weeks–4 years	1, 2, 3	IM
Pediarix (GSK)	DTaP-HepB-IPV	6 weeks–6 years	1, 2, 3	IM
Kinrix (GSK)	DTaP-IPV	4–6 years	4	IM
Quadracel (SP)	DTaP-IPV	4–6 years	4, 5	IM

IM = Intramuscular; SC = Subcutaneous; All vaccines in the table above are non-live.

Chapter 18: Poliomyelitis | Pink Book | CDC

IPOL, Kinrix, Pediarix, Pentacel, VAXELIS, Quadracel.

Inactivated Polio Vaccine Efficacy

- **Seroconversion rates and antibody titers after vaccination vary depending on:**
  - Age at receipt of the first dose
  - Vaccination schedule
- **IPV highly effective in producing immunity to poliovirus**
  - 95% or more of recipients develop protective antibodies after 3 doses
- **Duration of immunity not known with certainty**

Poliomyelitis Prevention in the United States, Chapter 18: Poliomyelitis | Pink Book | CDC, Use of Inactivated Polio Vaccine Among U.S. Adults: Updated Recommendations of the Advisory Committee on Immunization Practices — United States, 2023 | MMWR

Preparation and Administration for IPV-Containing Vaccines

- **Preparation: Prepare the vaccine just prior to administration.**
  - Pentacel requires reconstitution.
    - Reconstitute the lyophilized *Haemophilus influenzae* type b (Hib) vaccine with the DTaP-IPV liquid diluent supplied by the manufacturer.
    - *Do not* use Kinrix or Quadracel to reconstitute the Hib component of Pentacel.
- **Route:**
  - Intramuscular injection for all products
  - Ipol may be administered by subcutaneous injection.

Polio Vaccine Composition, Dosage, Administration, and Administration Errors | CDC, Pentacel | FDA

3

Clinical Considerations

Recommended Polio Vaccination Schedule for Children and Adolescents

Table 1 Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

These recommendations must be read with the notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars.
To determine minimum intervals between doses, see the catch-up schedule (Table 2).

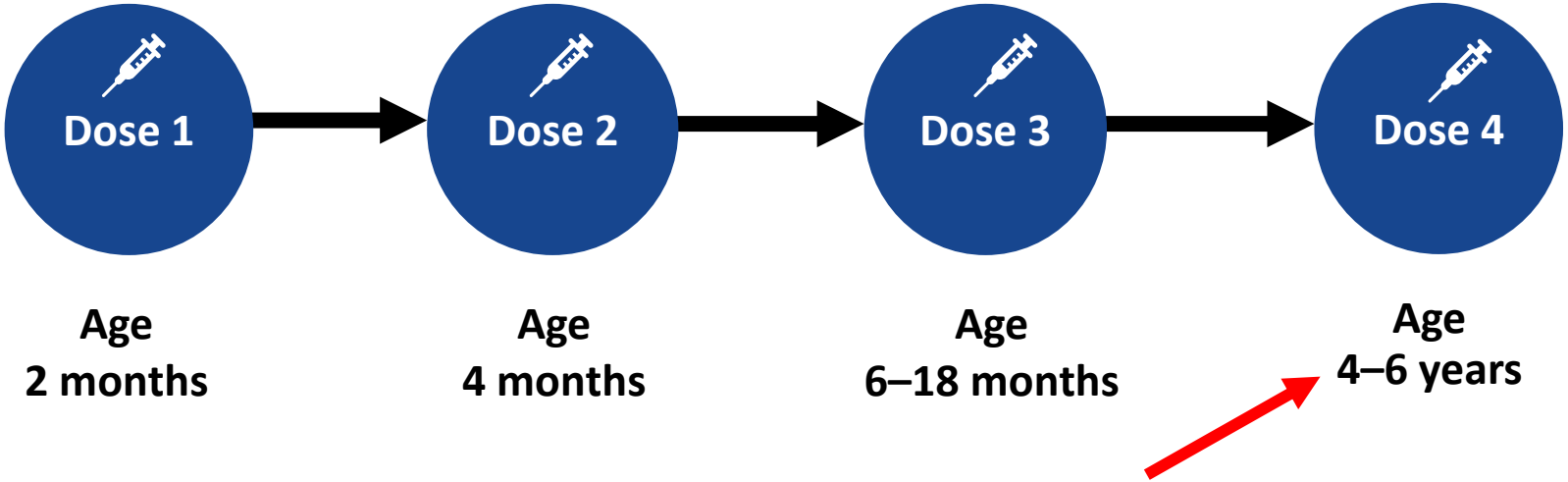
Vaccine and other immunizing agents	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2–3 yrs	4–6 yrs	7–10 yrs	11–12 yrs	13–15 yrs	16 yrs	17–18 yrs
Inactivated poliovirus (IPV)			1st dose	2nd dose	◄---------- 3rd dose ----------►							4th dose					See Notes

Range of recommended ages for all children

Range of recommended ages for catch-up vaccination

Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger; 2025 U.S. .

Polio Vaccination in Children: Routine Schedule



Final dose on or after age 4 years *and* at least 6 months after the previous dose.

Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger; 2025 U.S. .

Recommended Polio Vaccination Schedule for Children and Adolescents: Catch-up Vaccination

Table 2 Recommended Catch-up Immunization Schedule for Children and Adolescents Who Start Late or Who Are More than 1 Month Behind, United States, 2025

The table below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. **Always use this table in conjunction with Table 1 and the Notes that follow.**

Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
Children age 4 months through 6 years					
Inactivated poliovirus	6 weeks	**4 weeks**	**4 weeks** if current age is <4 years **6 months (as final dose)** if current age is 4 years or older	**6 months (minimum age 4 years for final dose)**	
Children and adolescents age 7 through 18 years					
Inactivated poliovirus	N/A	**4 weeks**	**6 months** 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.	A fourth dose of IPV is indicated if all previous doses were administered at <4 years **OR** if the third dose was administered <6 months after the second 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.

Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger; 2025 U.S. .

Accelerated Routine Polio Vaccination Schedule for Children and Adolescents Ages 17 Years and Younger

- **If accelerated protection is needed (e.g., travel to polio-endemic area), minimum age and intervals may be used as follows:**

Dose	Minimum Age	Minimum Interval to the Next Dose
Dose 1	6 weeks	4 weeks
Dose 2	10 weeks	4 weeks
Dose 3	14 weeks	6 months
Dose 4	4 years	----------

Routine Polio Vaccination | CDC

Recommended Polio Vaccination Schedule: People Ages 18 Years and Older

Table 1 Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

These recommendations must be read with the notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars.
To determine minimum intervals between doses, see the catch-up schedule (Table 2).

Vaccine and other immunizing agents	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2–3 yrs	4–6 yrs	7–10 yrs	11–12 yrs	13–15 yrs	16 yrs	17–18 yrs
Inactivated poliovirus (IPV)			1st dose	2nd dose	◄---------- 3rd dose ----------►							4th dose					See Notes

Range of recommended ages for all children

Range of recommended ages for catch-up vaccination

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2025

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Inactivated poliovirus (IPV)	Complete 3-dose series if incompletely vaccinated. Self-report of previous doses acceptable (See Notes)			

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of immunity

Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger; 2025 U.S., Recommended Adult Immunization Schedule for ages 19 years or older; 2025 U.S.

Routine Polio Vaccination Schedule for People Ages 18 Years and Older

- **Known or suspected to be incompletely vaccinated:**
  - Complete 3-dose series
    - Dose 1 at any time
    - Dose 2; 1 to 2 months later
    - Dose 3; 6 to 12 months after dose 2

- **Most adults born and raised in the United States can assume they were vaccinated as children.**
  - Unless there are specific reasons to believe otherwise

Polio Vaccine Recommendations | Polio | CDC, Use of Inactivated Polio Vaccine Among U.S. Adults: Updated Recommendations of the Advisory Committee on Immunization Practices — United States, 2023 | MMWR

Accelerated Polio Vaccination Schedule for People Ages 18 Years and Older

- **If accelerated protection is needed (e.g., travel to polio-endemic area), use the minimum intervals.**
- **If cannot complete accelerated schedule: give remaining doses as soon as possible, with dose 3 given at least 6 months after dose 2.**

Protection needed in	Accelerated Schedule
8 weeks or more	3 doses at least 4 weeks apart
More than 4 weeks, but less than 8 weeks	2 doses at least 4 weeks apart
Less than 4 weeks	1 dose

Polio Vaccine Recommendations | Polio | CDC, Use of Inactivated Polio Vaccine Among U.S. Adults: Updated Recommendations of the Advisory Committee on Immunization Practices — United States, 2023 | MMWR

Adults at Increased Risk of Poliovirus Exposure

Laboratory workers handling specimens that may contain polioviruses

Health care personnel treating patients who could have polio or have close contact with a person who could be infected with poliovirus

Travelers to areas where poliomyelitis is endemic or epidemic

Adults identified by public health authorities as part of a group or population at increased risk for exposure to poliovirus because of an outbreak

Polio Vaccination | Polio | CDC

Polio Vaccination in Adults with Increased Risk of Exposure

- **Has *not* completed polio vaccination series (at least 3 doses):**
  - Administer remaining doses to complete a 3-dose series
- **Has completed polio vaccination series (at least 3 doses):**
  - With increased risk, may administer one lifetime IPV booster

Use of Inactivated Polio Vaccine Among U.S. Adults: Updated Recommendations of the Advisory Committee on Immunization Practices — United States, 2023 | MMWR

OPV Administered Outside the United States

- **Persons with doses of OPV that do not count towards the U.S. vaccination requirements should receive IPV.**
- **Use the date of administration to make a presumptive determination of what type of OPV was received.**
- **Trivalent OPV was used throughout the world prior to April 1, 2016.**
  - OPV prior to April 1, 2016: count as valid (except campaign doses)
  - OPV on or after April 1, 2016: invalid dose

Poliomyelitis Prevention in the United States

Polio Vaccination Schedules that Include Both IPV and OPV

- **Mixed-product series containing both OPV and IPV is acceptable**
  - Only trivalent OPV (tOPV) counts toward completing the series
- **Children with an incomplete series:**
  - Administer IPV to complete a series that includes doses of tOPV
  - Ensure doses meet minimum ages and intervals
- **Administer 1 dose of IPV to children who received 4 doses of tOPV (or more) before 4 years of age**
  - Should be at least 6 months between the last dose of OPV and the IPV dose

Guidance for Assessment of Poliovirus Vaccination Status and Vaccination of Children Who Have Received Poliovirus Vaccine Outside the United States | MMWR

Fractional IPV Clinical Considerations

- **For persons who received fractional (1/5 full dose) IPV administered intradermally outside of the United States**
  - 2 fractional doses of IPV (fIPV) *should* be considered valid and counted as 1 full intramuscular dose of IPV towards the US vaccination schedule.

- **If a person received only 1 dose of fIPV, this dose *should <u>not</u>* be considered valid or counted towards the US vaccination schedule.**

Clinical considerations for children who received fractional dose inactivated polio vaccine (fIPV) in other countries (ACIP, Feb 28. 2024)

Unknown or Uncertain Polio Vaccination Status

- **Children and adolescents ages 17 years or younger**
  - Only accept written, dated records of tOPV or IPV as evidence of vaccination.
  - No or questionable documentation: administer IPV according to U.S. schedule.
- **People ages 18 years and older**
  - In general, self-reports are acceptable unless the clinician has specific reasons to believe the patient was not vaccinated such as:
    - Did not receive consistent medical care as an infant
    - Parents were against vaccination
    - Person has other reason to doubt their vaccination status.
  - Specific immigration programs might have additional polio documentation requirements.

Use of Inactivated Polio Vaccine Among U.S. Adults: Updated Recommendations of the Advisory Committee on Immunization Practices — United States, 2023 | MMWR, Routine Polio Vaccination | CDC

4

Safety

Contraindications to IPV

- **Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component**
- **The following ingredients are used in the production of this vaccine:**
  - Neomycin
  - Formaldehyde
  - Polymyxin B
  - Streptomycin
  - 2-phenoxyethanol

Package Insert - IPOL

Precautions to IPV

- **Pregnancy: can vaccinate if at increased risk of polio infection**
- **Moderate or severe acute illness with or without fever**

Package Insert - IPOL
Contraindications and Precautions for Polio Vaccination | CDC

IPV Adverse Reactions

- Transient local reactions at the site of injection
- Erythema (redness), induration or swelling, and pain
- Elevated temperature, irritability, sleepiness, fussiness, crying
- Serious adverse reactions rarely occur

Package Insert - IPOL

Polio Vaccine Administration Errors (1)

- **Schedule errors:**
  - Doses administered 5 or more days before the minimum age and/or interval do not count and should be repeated when age-appropriate.
  - Wait the minimum interval from the invalid dose before giving the repeat dose.

Timing and Spacing of Immunobiologics | Vaccines & Immunizations | CDC

Polio Vaccine Administration Errors (2)

- **Age and dose errors: Kinrix or Quadracel for doses 1–3**
  - If the minimum age and minimum interval from the last dose of polio vaccine have been met, the dose can count and does not need to be repeated.

Timing and Spacing of Immunobiologics | Vaccines & Immunizations | CDC

5 Storage and Handling

Polio Vaccine Storage and Handling

- **For all IPV-containing vaccines:**
  - Store in the refrigerator between 2°C and 8°C (36°F and 46°F)
  - Should not be frozen
  - Refrigerate on arrival
  - Protect from light (Vaxelis and Ipol)
- **For Pentacel:**
  - Use immediately after reconstitution.

Package Insert – IPOL, Package Insert – VAXELIS, Pentacel | FDA

Knowledge Check

When DTaP-IPV/Hib (Pentacel) is used, 4 doses of IPV are given at ages 2, 4, 6, and 15–18 months. This results in 4 doses of IPV by the age of 18 months. The series is complete at 18 months.

A. True

B. False

Answer

When DTaP-IPV/Hib (Pentacel) is used, 4 doses of IPV are given at ages 2, 4, 6, and 15–18 months. This results in 4 doses of IPV by the age of 18 months. The series is complete at 18 months.

A. True

B. False 

Knowledge Check

The vaccination record of a 14-year-old from Uzbekistan shows receipt of four OPV vaccines between 6/2/2011 and 2/20/2016. All were given using U.S. minimum age and intervals. This series is considered valid and complete for the U.S. vaccination schedule.

A. True

B. False

Answer

The vaccination record of a 14-year-old from Uzbekistan shows receipt of four OPV vaccines between 6/2/11 and 2/20/2016. All were given using U.S. minimum age and intervals. This series is considered valid and complete for the U.S. vaccination schedule.

A. True 

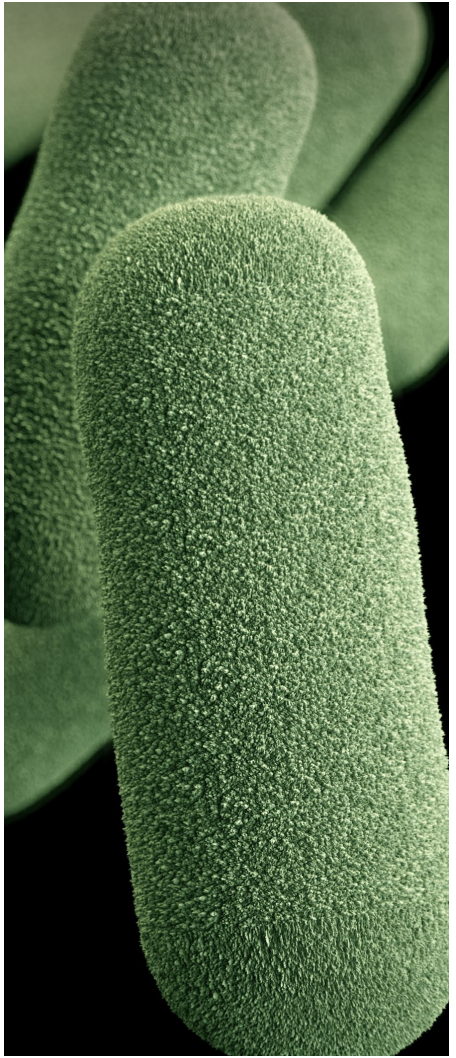
B. False

6

Haemophilus influenzae
Disease

Haemophilus influenzae

- **Gram-negative bacilli**
- **Originally thought to be the cause of influenza**
- **Abbreviated "*H. flu*" or Hi**
- **Infections range from mild to severe invasive disease**

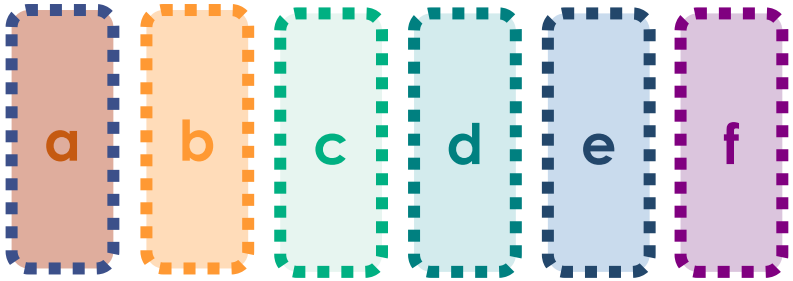


Clinical Overview of Haemophilus influenzae Disease | H. influenzae | CDC

Classification of *H. influenzae*

Encapsulated

(6 serotypes based on polysaccharide antigens)



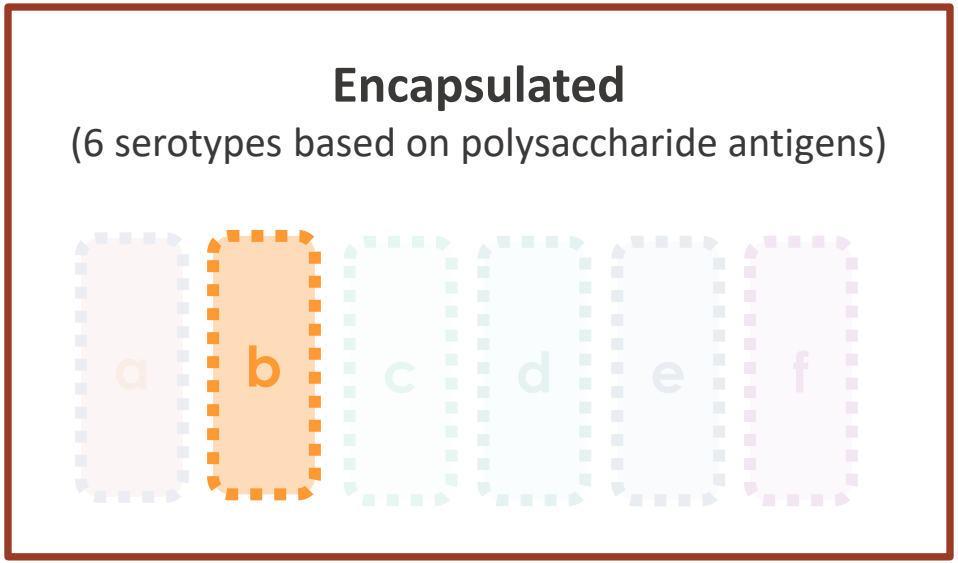
Unencapsulated

(Non-typeable)

Clinical Overview of Haemophilus influenzae Disease | H. influenzae | CDC

H. influenzae serotype b (Hib)

- **The most virulent serotype**
- **The only Hi serotype preventable through vaccination**
- **Before the introduction of effective vaccines, the leading cause of bacterial meningitis and other invasive bacterial disease among children aged less than 5 years in the United States**



Clinical Overview of Haemophilus influenzae Disease | H. influenzae | CDC

H. influenzae serotype b (Hib) pathogenesis

- **Enters body through nasopharynx**
- **Can colonize the nasopharynx**
- **Invasive infection: Bacteria spread in bloodstream to distant sites in the body**

Chapter 8: Haemophilus influenzae | Pink Book | CDC, Clinical Overview of Haemophilus influenzae Disease | H. influenzae | CDC

Hib Epidemiology

Reservoir	Human asymptomatic carriers
Transmission	Airborne respiratory droplets or direct contact with respiratory secretions
Temporal pattern	Pre-vaccine era: Peaks in Sept. through Dec. and March through May
Communicability	Generally limited but higher in some circumstances (e.g., household, childcare)

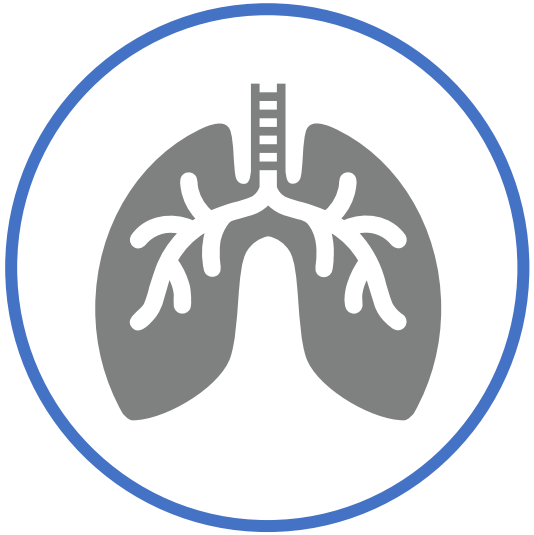
Chapter 8: Haemophilus influenzae | Pink Book | CDC, Clinical Overview of Haemophilus influenzae Disease | H. influenzae | CDC

Risk Factors for Invasive Hib Disease in the Pre-vaccine Era

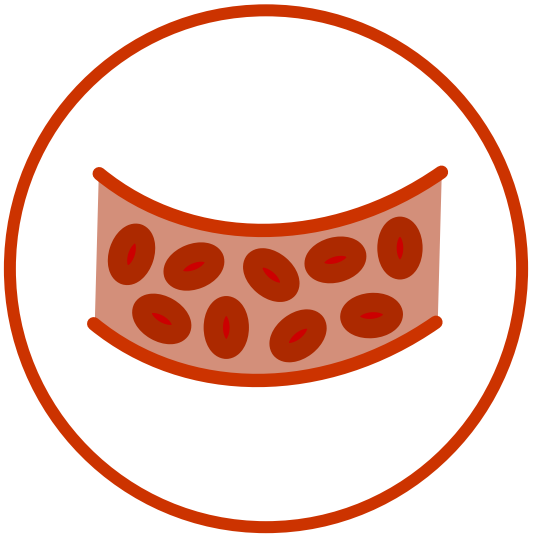
- **Demographic factors**
  - Male sex
  - Race/Ethnicity
    - American Indian
    - Alaska Native
    - Black
- **Social factors**
  - Household crowding
  - Large household size
  - Low socioeconomic status
  - School-aged siblings
  - Daycare attendance
- **Immunocompromising conditions**
  - HIV infection
  - Asplenia or Sickle cell disease
  - IgG deficiency
  - Early component complement deficiency
  - Hematopoietic stem cell transplantation
  - Chemotherapy

, Clinical Overview of Haemophilus influenzae Disease | H. influenzae | CDC, Background on Hib disease and vaccination among American Indian/Alaska Native populations (ACIP, February 2024)

Common Clinical Syndromes of Invasive Hib Disease



Bacteremic pneumonia



Bacteremia without a focus

Meningitis

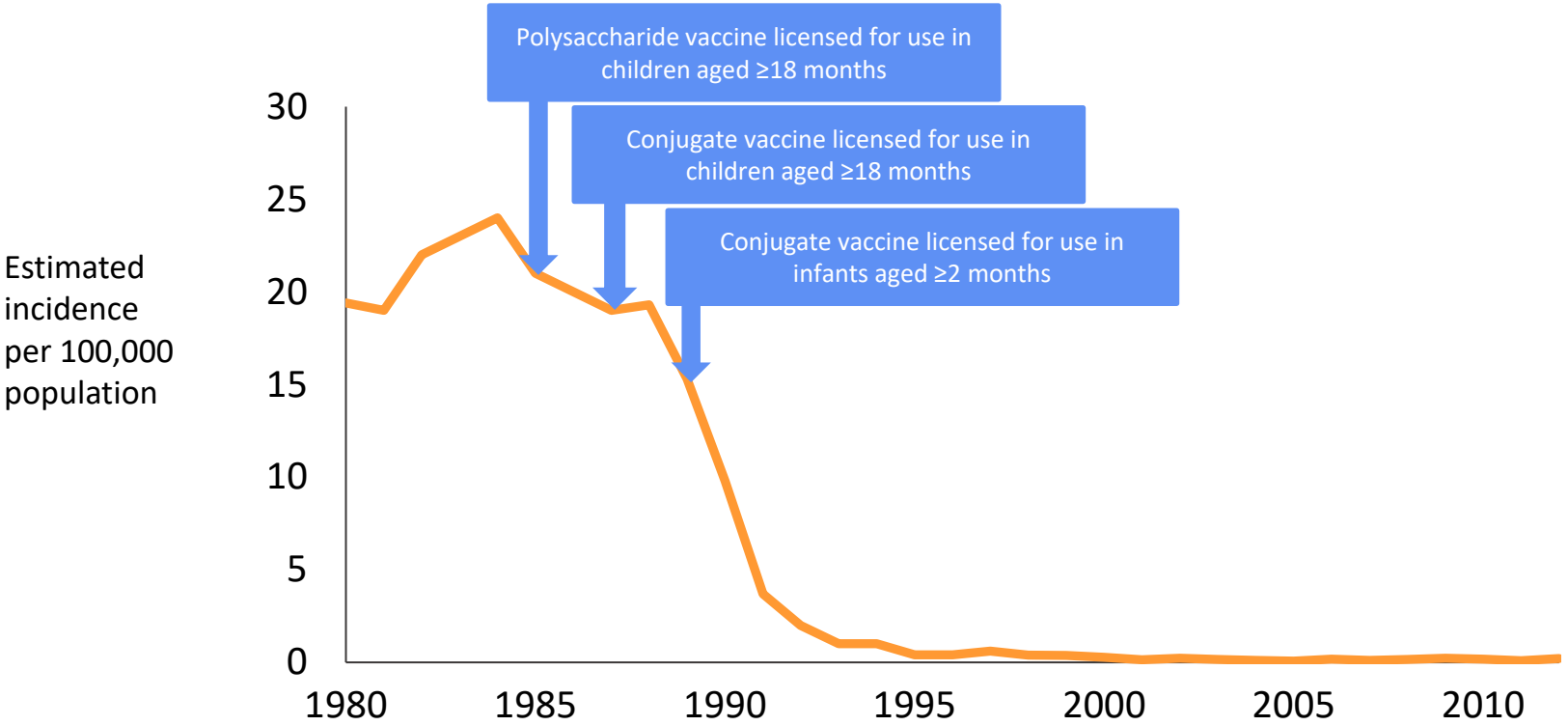
Clinical Overview of Haemophilus influenzae Disease | H. influenzae | CDC, Active Bacterial Core Surveillance (ABCs) Report - Emerging Infections Program Network - Haemophilus influenzae, 2022, Background on Hib disease and vaccination among American Indian/Alaska Native populations (ACIP, February 2024)

Other Clinical Syndromes of Hib Disease

- **Invasive disease:**
  - Epiglottitis
  - Septic arthritis
  - Cellulitis
  - Purulent pericarditis
  - Endocarditis
  - Osteomyelitis
- **Non-invasive disease:**
  - Otitis media
  - Sinusitis
  - Bronchitis

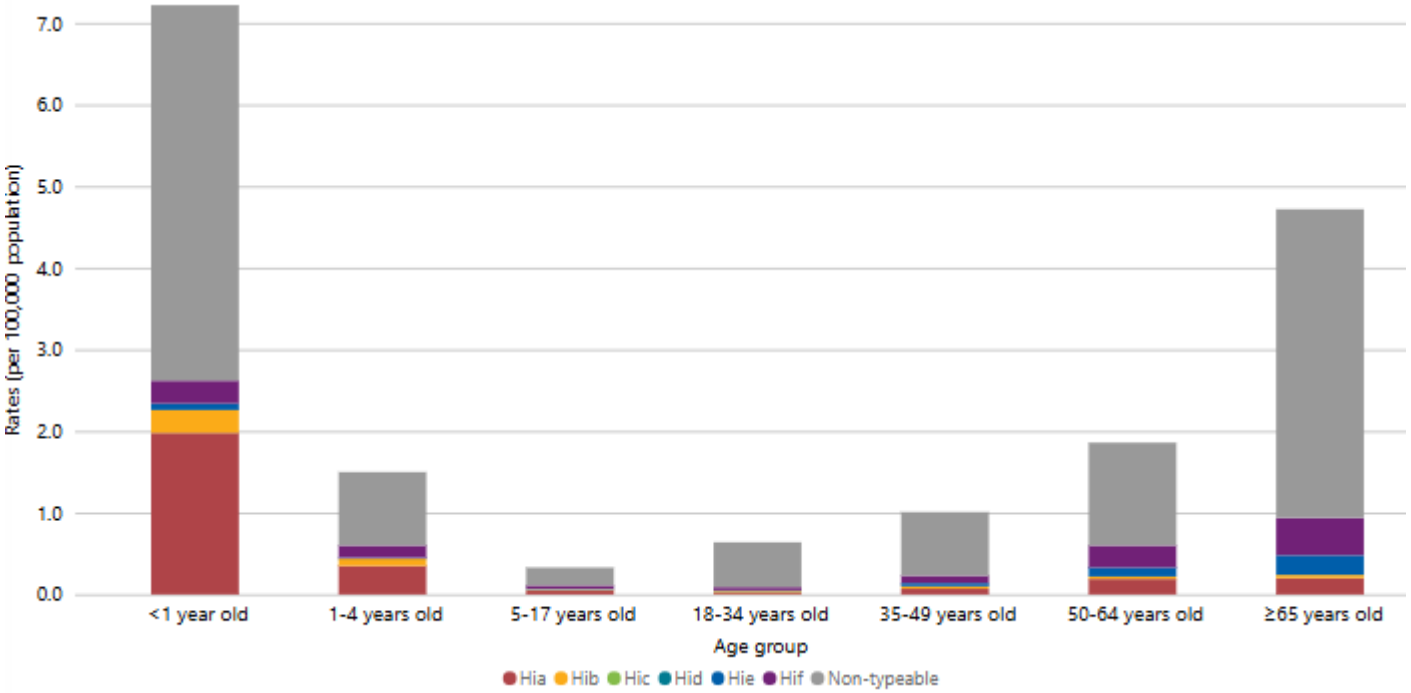
Chapter 8: Haemophilus influenzae | Pink Book | CDC, Clinical Overview of Haemophilus influenzae Disease | H. influenzae | CDC, Active Bacterial Core Surveillance (ABCs) Report - Emerging Infections Program Network - Haemophilus influenzae, 2022

Invasive Hib Disease in Children Decreased Dramatically After Hib Vaccine Introduction



Background on Hib disease and vaccination among American Indian/Alaska Native populations (ACIP, February 2024)

Estimated U.S. Incidence of Invasive H. influenzae Disease by Age Group and Serotype



Active Bacterial Core Surveillance (ABCs) cases from 2018-2023 and estimated to the U.S. population. 2023 data are preliminary.

ABCs Bact Facts Interactive Data Dashboard | ABCs | CDC

7

Hib Vaccine

Hib Polysaccharide Conjugate Vaccines

- **Capsular polysaccharide (PRP) conjugated to carrier proteins**
  - Tetanus toxoid (PRP-T)
  - Outer membrane protein of meningococcal serogroup B (PRP-OMP)
- **Highly immunogenic via activation of T-cell dependent immunity**
  - 95% of infants develop protective antibody levels after a primary series.
  - No cross protection against non-b/non-typeable serotypes
- **Estimated clinical efficacy 95%–100%**
- **Invasive Hib disease is uncommon in children who are fully vaccinated.**

Background on Hib disease and vaccination among American Indian/Alaska Native populations (ACIP, February 2024)

Hib-containing Vaccine Products

Vaccine Product	Age Indications	Dose in Series
PRP-T (polysaccharide, tetanus toxoid)		
ActHIB	2 months–5 years	1, 2, 3, booster
Pentacel (SP)	6 weeks–4 years	1, 2, 3, booster
Hiberix (GSK)	6 weeks–4 years	1, 2, 3, booster
PRP-OMP (polysaccharide, meningococcal outer membrane protein)		
PedvaxHIB	2–71 months	1, 2, booster
Vaxelis (Merck)	6 weeks–4 years	1, 2, 3*

Chapter 8: Haemophilus influenzae | Pink Book | CDC

* Vaxelis should not be used as a booster dose, but a booster dose is still recommended.

Hib-containing Vaccine Products: Single Antigen Vaccines

Vaccine Product	Age Indications	Dose in Series
PRP-T (polysaccharide, tetanus toxoid)		
ActHIB	2, 4, and 6 months	1, 2, 3, booster
Pentacel (SP)	6 weeks–4 years	1, 2, 3, booster
Hiberix (GSK)	2, 4, and 6 months	1, 2, 3, booster
PRP-OMP (polysaccharide, meningococcal outer membrane protein)		
PedvaxHIB	2 and 4 months	1, 2, booster
Vaxelis (Merck)	6 weeks–4 years	1, 2, 3

Chapter 8: Haemophilus influenzae | Pink Book | CDC

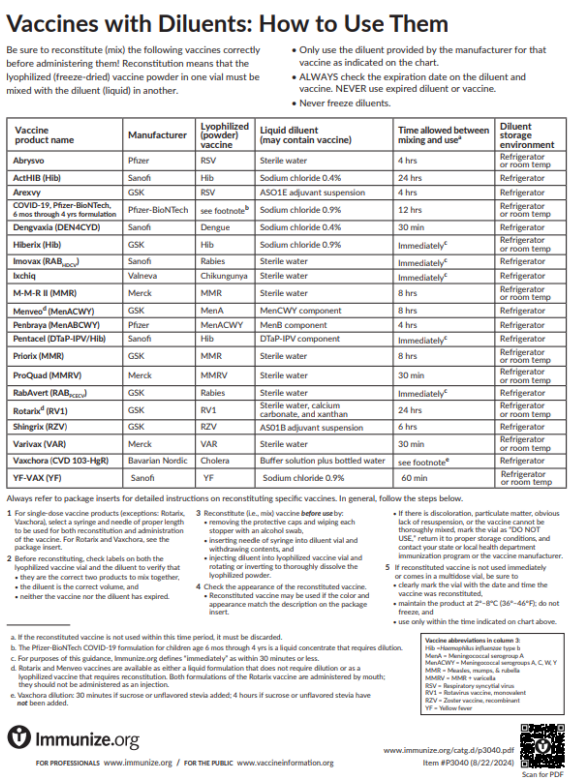
Hib-containing Vaccine Products: Combination Vaccines

Vaccine Product	Age Indications	Dose in Series
PRP-T (polysaccharide, tetanus toxoid)		
ActHIB	2, 4, and 6 months	1, 2, 3, booster
Pentacel (SP)	6 weeks–4 years	1, 2, 3, booster
Hiberix (GSK)	2, 4, and 6 months	1, 2, 3, booster
PRP-OMP (polysaccharide, meningococcal outer membrane protein)		
PedvaxHIB	2 and 4 months	1, 2, booster
Vaxelis (Merck)	6 weeks–4 years	1, 2, 3

Chapter 8: Haemophilus influenzae | Pink Book | CDC

Preparation and Administration of Hib-containing Vaccines

- **Preparation: just prior to administration**
  - ActHIB, Hiberix, and Pentacel require reconstitution.
  - Reconstitute the lyophilized vaccine with manufacturer-supplied diluent.
- **Route: intramuscular injection**



Vaccines with Diluents: How to Use Them

Be sure to reconstitute (mix) the following vaccines correctly before administering them! Reconstitution means that the lyophilized (freeze-dried) vaccine powder in one vial must be mixed with the diluent (liquid) in another.

- Only use the diluent provided by the manufacturer for that vaccine as indicated on the chart.
- ALWAYS check the expiration date on the diluent and vaccine. NEVER use expired diluent or vaccine.
- Never freeze diluents.

Vaccine product name	Manufacturer	Lyophilized (powder) vaccine	Liquid diluent (may contain vaccine)	Time allowed between mixing and use[a]	Diluent storage environment
Abrysvo	Pfizer	RSV	Sterile water	4 hrs	Refrigerator or room temp
ActHIB (Hib)	Sanofi	Hib	Sodium chloride 0.4%	24 hrs	Refrigerator
Arexvy	GSK	RSV	AS01E adjuvant suspension	4 hrs	Refrigerator
COVID-19, Pfizer-BioNTech, 6 mos through 4 yrs formulation	Pfizer-BioNTech	see footnote[b]	Sodium chloride 0.9%	12 hrs	Refrigerator or room temp
Dengvaxia (DEN4CYD)	Sanofi	Dengue	Sodium chloride 0.4%	30 min	Refrigerator
Hiberix (Hib)	GSK	Hib	Sodium chloride 0.9%	Immediately[c]	Refrigerator or room temp
Imovax (RAB$_{HDCV}$)	Sanofi	Rabies	Sterile water	Immediately[c]	Refrigerator
Ixchiq	Valneva	Chikungunya	Sterile water	Immediately[c]	Refrigerator
M-M-R II (MMR)	Merck	MMR	Sterile water	8 hrs	Refrigerator or room temp
Menveo[d] (MenACWY)	GSK	MenA	MenCWY component	8 hrs	Refrigerator
Penbraya (MenABCWY)	Pfizer	MenACWY	MenB component	4 hrs	Refrigerator
Pentacel (DTaP-IPV/Hib)	Sanofi	Hib	DTaP-IPV component	Immediately[c]	Refrigerator
Priorix (MMR)	GSK	MMR	Sterile water	8 hrs	Refrigerator or room temp
ProQuad (MMRV)	Merck	MMRV	Sterile water	30 min	Refrigerator or room temp
RabAvert (RAB$_{PCEC}$)	GSK	Rabies	Sterile water	Immediately[c]	Refrigerator
Rotarix[d] (RV1)	GSK	RV1	Sterile water, calcium carbonate, and xanthan	24 hrs	Refrigerator or room temp
Shingrix (RZV)	GSK	RZV	AS01B adjuvant suspension	6 hrs	Refrigerator
Varivax (VAR)	Merck	VAR	Sterile water	30 min	Refrigerator or room temp
Vaxchora (CVD 103-HgR)	Bavarian Nordic	Cholera	Buffer solution plus bottled water	see footnote[e]	Refrigerator
YF-VAX (YF)	Sanofi	YF	Sodium chloride 0.9%	60 min	Refrigerator or room temp

Always refer to package inserts for detailed instructions on reconstituting specific vaccines. In general, follow the steps below.

1 For single-dose vaccine products (exceptions: Rotarix, Vaxchora), select a syringe and needle of proper length to be used for both reconstitution and administration of the vaccine. For Rotarix and Vaxchora, see the package insert.

2 Before reconstituting, check labels on both the lyophilized vaccine vial and the diluent to verify that
- they are the correct two products to mix together,
- the diluent is the correct volume, and
- neither the vaccine nor the diluent has expired.

3 Reconstitute (i.e., mix) vaccine ***before use*** by:
- removing the protective caps and wiping each stopper with an alcohol swab,
- inserting needle of syringe into diluent vial and withdrawing contents, and
- injecting diluent into lyophilized vaccine vial and rotating or inverting to thoroughly dissolve the lyophilized powder.

4 Check the appearance of the reconstituted vaccine.
- Reconstituted vaccine may be used if the color and appearance match the description on the package insert.
- If there is discoloration, particulate matter, obvious lack of resuspension, or the vaccine cannot be thoroughly mixed, mark the vial as "DO NOT USE," return it to proper storage conditions, and contact your state or local health department immunization program or the vaccine manufacturer.

5 If reconstituted vaccine is not used immediately or comes in a multidose vial, be sure to
- clearly mark the vial with the date and time the vaccine was reconstituted,
- maintain the product at 2°–8°C (36°–46°F); do not freeze, and
- use only within the time indicated on chart above.

a. If the reconstituted vaccine is not used within this time period, it must be discarded.
b. The Pfizer-BioNTech COVID-19 formulation for children age 6 mos through 4 yrs is a liquid concentrate that requires dilution.
c. For purposes of this guidance, Immunize.org defines "immediately" as within 30 minutes or less.
d. Rotarix and Menveo vaccines are available as either a liquid formulation that does not require dilution or as a lyophilized vaccine that requires reconstitution. Both formulations of the Rotarix vaccine are administered by mouth; they should not be administered as an injection.
e. Vaxchora dilution: 30 minutes if sucrose or unflavored stevia added; 4 hours if sucrose or unflavored stevia have **not** been added.

Vaccine abbreviations in column 3:
Hib =Haemophilus influenzae type b
MenA = Meningococcal serogroup A
MenACWY = Meningococcal serogroups A, C, W, Y
MMR = Measles, mumps, & rubella
MMRV = MMR + varicella
RSV = Respiratory syncytial virus
RV1 = Rotavirus vaccine, monovalent
RZV = Zoster vaccine, recombinant
YF = Yellow fever

Immunize.org
FOR PROFESSIONALS www.immunize.org / FOR THE PUBLIC www.vaccineinformation.org

www.immunize.org/catg.d/p3040.pdf
Item #P3040 (8/22/2024)

Scan for PDF

Administering Hib Vaccine | CDC, Vaccines with Diluents: How to Use Them

8

Clinical Considerations

Recommended Hib Vaccination Schedule for Children and Adolescents

Table 1 Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

These recommendations must be read with the notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars.
To determine minimum intervals between doses, see the catch-up schedule (Table 2).

Vaccine and other immunizing agents	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2–3 yrs	4–6 yrs	7–10 yrs	11–12 yrs	13–15 yrs	16 yrs	17–18 yrs
Haemophilus influenzae type b (Hib)			1st dose	2nd dose	See Notes		← 3rd or 4th dose (See Notes) →										

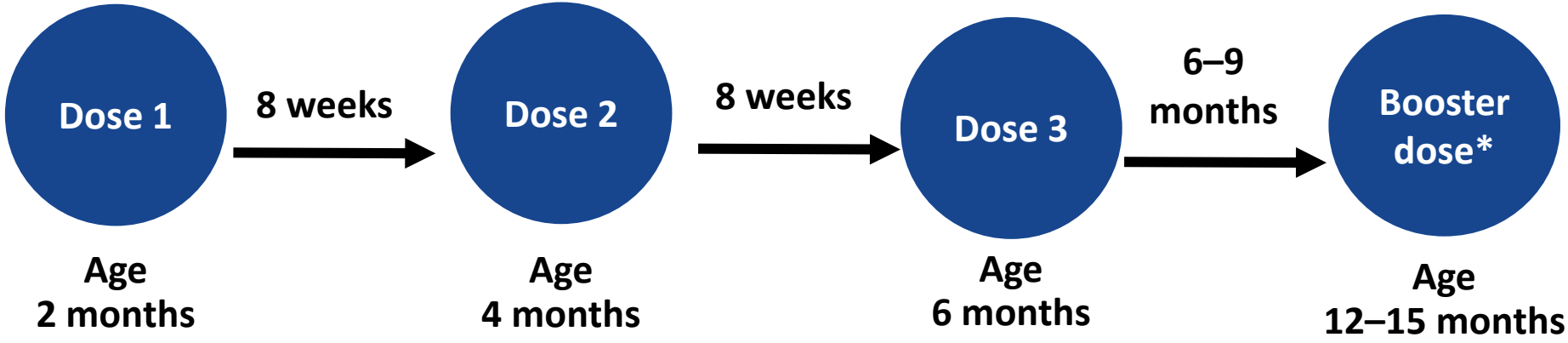
Range of recommended ages for all children

Range of recommended ages for catch-up vaccination

Range of recommended ages for certain high-risk groups or populations

Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger; 2025 U.S. .

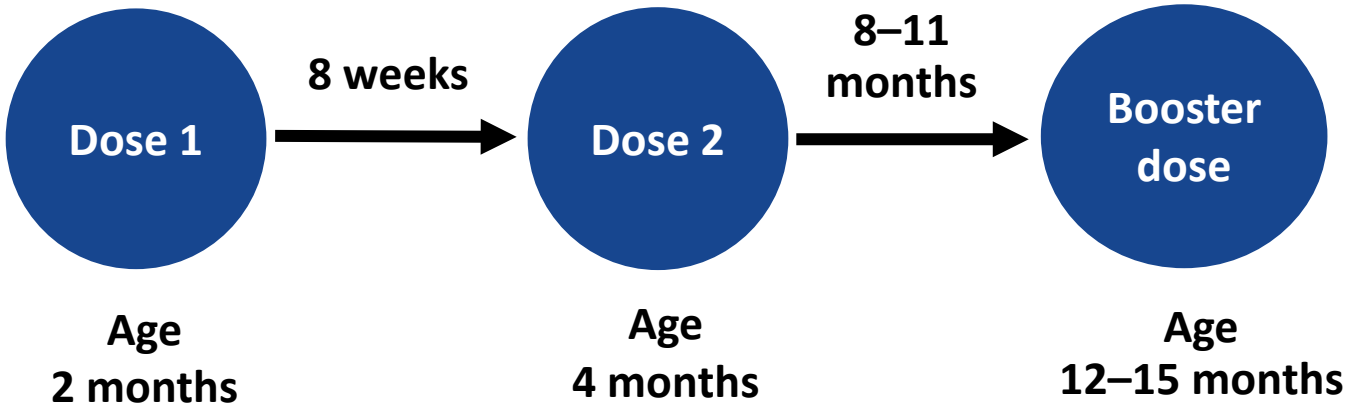
Hib Vaccine Recommendations: Routine Schedule for ActHib, Pentacel, Hiberix, and Vaxelis*



*Vaxelis is not recommended for use as a booster dose. A different Hib-containing vaccine should be used for the booster dose.

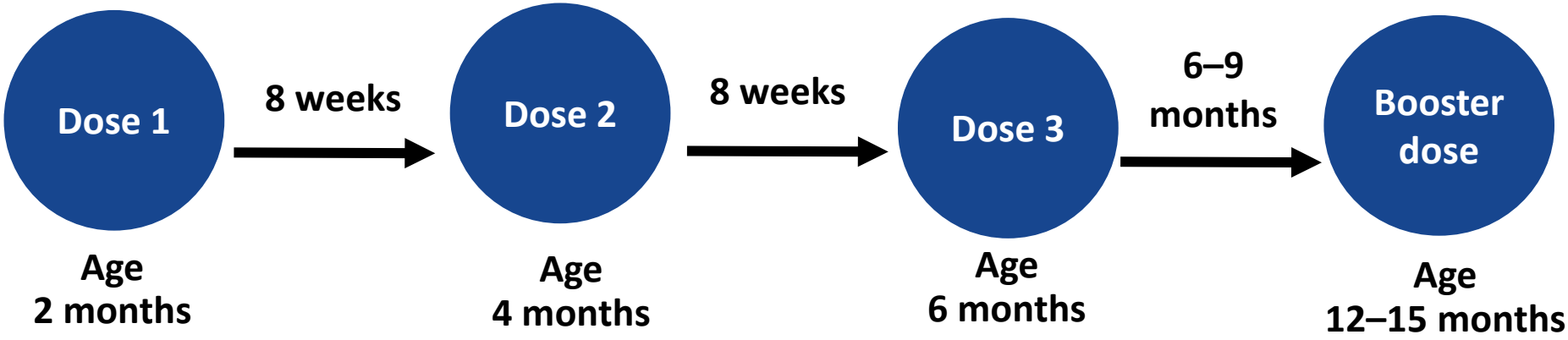
Child and Adolescent Immunization Schedule by Age | Vaccines & Immunizations | CDC

Hib Vaccine Recommendations: Routine Schedule for PedvaxHIB



Child and Adolescent Immunization Schedule by Age | Vaccines & Immunizations | CDC

Hib Vaccine Recommendations: Routine Schedule for Mixed or Unknown Products*



*If any dose in the series is ActHIB, Pentacel, Hiberix, Vaxelis or the product is not known, follow the 4-dose schedule.

Child Immunization Schedule Notes | Vaccines & Immunizations | CDC

Hib Vaccine Recommendations: Catch-up Schedule

Table 2 Recommended Catch-up Immunization Schedule for Children and Adolescents Who Start Late or Who Are More than 1 Month Behind, United States, 2025

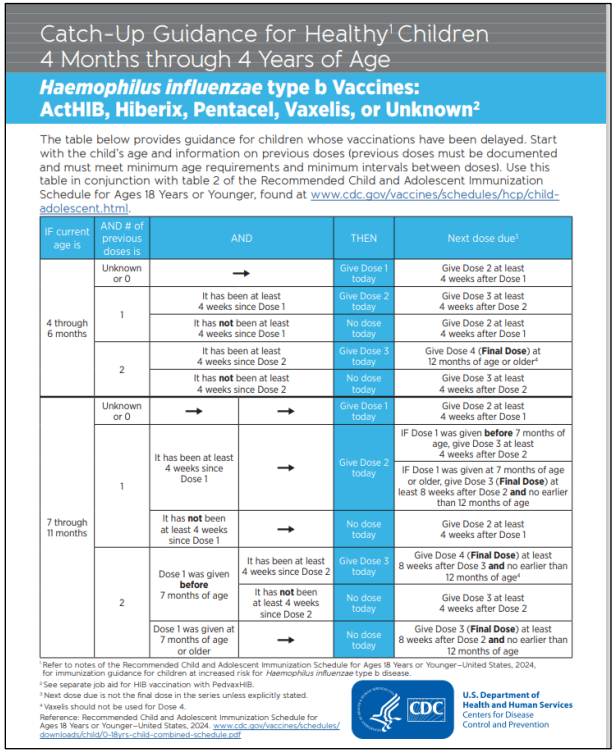
The table below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. **Always use this table in conjunction with Table 1 and the Notes that follow.**

Children age 4 months through 6 years					
Vaccine	**Minimum Age for Dose 1**	**Minimum Interval Between Doses**			
		Dose 1 to Dose 2	**Dose 2 to Dose 3**	**Dose 3 to Dose 4**	**Dose 4 to Dose 5**
Haemophilus influenzae type b	6 weeks	**No further doses needed** if first dose was administered at age 15 months or older. **4 weeks** if first dose was administered before the 1st birthday. **8 weeks (as final dose)** if first dose was administered at age 12 through 14 months.	**No further doses needed** if previous dose was administered at age 15 months or older **4 weeks** if current age is younger than 12 months ***and*** first dose was administered at younger than age 7 months ***and*** at least 1 previous dose was PRP-T (ActHib, Pentacel, Hiberix), Vaxelis or unknown **8 weeks *and* age 12 through 59 months (as final dose)** if current age is younger than 12 months ***and*** first dose was administered at age 7 through 11 months; **OR** if current age is 12 through 59 months ***and*** first dose was administered before the 1st birthday ***and*** second dose was administered at younger than 15 months; **OR** if both doses were PedvaxHIB and were administered before the 1st birthday	**8 weeks (as final dose)** This dose only necessary for children age 12 through 59 months who received 3 doses before the 1st birthday.	

Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger; 2025 U.S.

Hib Immunization Recommendations: Catch-up Schedule Resources

- **Children starting late might not need entire 3- or 4-dose series.**
  - Number of doses child requires depends on current age
- **Resources**
  - Catch-up guidance for healthy children



Catch-Up Guidance for Healthy[1] Children 4 Months through 4 Years of Age

***Haemophilus influenzae* type b Vaccines: ActHIB, Hiberix, Pentacel, Vaxelis, or Unknown[2]**

The table below provides guidance for children whose vaccinations have been delayed. Start with the child's age and information on previous doses (previous doses must be documented and must meet minimum age requirements and minimum intervals between doses). Use this table in conjunction with table 2 of the Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, found at www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html.

IF current age is	AND # of previous doses is	AND		THEN	Next dose due[3]
4 through 6 months	Unknown or 0	→		Give Dose 1 today	Give Dose 2 at least 4 weeks after Dose 1
	1	It has been at least 4 weeks since Dose 1		Give Dose 2 today	Give Dose 3 at least 4 weeks after Dose 2
		It has **not** been at least 4 weeks since Dose 1		No dose today	Give Dose 2 at least 4 weeks after Dose 1
	2	It has been at least 4 weeks since Dose 2		Give Dose 3 today	Give Dose 4 (**Final Dose**) at 12 months of age or older[4]
		It has **not** been at least 4 weeks since Dose 2		No dose today	Give Dose 3 at least 4 weeks after Dose 2
7 through 11 months	Unknown or 0	→	→	Give Dose 1 today	Give Dose 2 at least 4 weeks after Dose 1
	1	It has been at least 4 weeks since Dose 1	→	Give Dose 2 today	IF Dose 1 was given **before** 7 months of age, give Dose 3 at least 4 weeks after Dose 2
					IF Dose 1 was given at 7 months of age or older, give Dose 3 (**Final Dose**) at least 8 weeks after Dose 2 **and** no earlier than 12 months of age
		It has **not** been at least 4 weeks since Dose 1	→	No dose today	Give Dose 2 at least 4 weeks after Dose 1
	2	Dose 1 was given **before** 7 months of age	It has been at least 4 weeks since Dose 2	Give Dose 3 today	Give Dose 4 (**Final Dose**) at least 8 weeks after Dose 3 **and** no earlier than 12 months of age[4]
			It has **not** been at least 4 weeks since Dose 2	No dose today	Give Dose 3 at least 4 weeks after Dose 2
		Dose 1 was given at 7 months of age or older	→	No dose today	Give Dose 3 (**Final Dose**) at least 8 weeks after Dose 2 **and** no earlier than 12 months of age

[1] Refer to notes of the Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger–United States, 2024, for immunization guidance for children at increased risk for *Haemophilus influenzae* type b disease.
[2] See separate job aid for HIB vaccination with PedvaxHIB.
[3] Next dose due is not the final dose in the series unless explicitly stated.
[4] Vaxelis should not be used for Dose 4.

Reference: Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger–United States, 2024. www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Catch-Up Guidance for Healthy1 Children 4 Months 4 years of age-Haemophilus influenzae type b Vaccines: ActHIB, Hiberix, Pentacel, Vaxelis, or Unknown2- Revised December 2023

Catch-up Guidance for Children 4 months through 4 years of age-Haemophilus Influenzae type b-PedvaxHIB - December 2023

Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger; 2025 U.S.

Hib Vaccine Recommendations: American Indian/Alaska Native Children

Vaccine Product	Age Indications	Dose in Series
PRP-T (polysaccharide, tetanus toxoid)		
ActHIB	2 months–5 years	1, 2, 3, booster
Pentacel (SP)	6 weeks–4 years	1, 2, 3, booster
Hiberix (GSK)	6 weeks–4 years	1, 2, 3, booster
PRP-OMP (polysaccharide, meningococcal outer membrane protein)		
PedvaxHIB	2–71 months	1, 2, booster
Vaxelis (Merck)	6 weeks–4 years	1, 2, 3

Use of Haemophilus influenzae Type b–Containing Vaccines Among American Indian and Alaska Native Infants: Updated Recommendations of the Advisory Committee on Immunization Practices — United States, 2024 | MMWR

Hib Vaccine Recommendations: Special Populations (1)

- **Recommendations for children and adolescents with conditions that increase the risk of invasive Hib are based on age, vaccination history, and condition.**
  - Functional or anatomic asplenia (including sickle cell disease)
  - Immunoglobulin deficiency or early complement component deficiency
  - HIV infection
  - Receipt of chemotherapy or radiation therapy
  - Hematopoietic stem cell transplant

Chapter 8: Haemophilus influenzae | Pink Book | CDC

Hib Vaccine Recommendations: Special Populations (2)

- **Chemotherapy or radiation treatment:**
  Age 12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Doses administered within 14 days of starting therapy or during therapy should be repeated at least 3 months after therapy completion.
- **Hematopoietic stem cell transplant (HSCT):**
  - 3-dose series 4 weeks apart starting 6 to 12 months after successful transplant regardless of Hib vaccination history
- **Anatomic or functional asplenia (including sickle cell disease):**
  Age 12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Unvaccinated* persons age 5 years or older
  - 1 dose
- **Elective splenectomy:**
  Unvaccinated* persons age 15 months or older
  - 1 dose (preferably at least 14 days before procedure)
- **HIV infection:**
  Age 12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Unvaccinated* persons age 5–18 years
  - 1 dose
- **Immunoglobulin deficiency, early component complement deficiency:**
  Age 12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

Unvaccinated* = Less than routine series (through age 14 months) **OR no doses (age 15 months or older)

Child and Adolescent Immunization Schedule by Medical Indication | Vaccines & Immunizations | CDC

Hib Vaccine Recommendations: Special Populations (3)

- **Children 12–59 months of age at increased risk of invasive Hib disease***
  - 0 or 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

*Chemotherapy, radiation therapy, anatomic or functional asplenia, HIV infection, immunoglobulin deficiency, or early component complement deficiency

Prevention and Control of Haemophilus influenzae Type b Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Hib Vaccine Recommendations: Special Populations (4)

- **Unvaccinated persons ages 15 months or older undergoing elective splenectomy**:
  - 1 dose, preferably at least 14 days before procedure
- **Unvaccinated persons ages 5 years or older with anatomic or functional asplenia**:
  - 1 dose
- **Unvaccinated persons ages 5–18 years with HIV infection**:
  - 1 dose
- **Hematopoietic stem cell transplant recipients** (**any age**):
  - 3 doses, 4 or more weeks apart, beginning 6–12 months post-transplant
- **Note**: **“Unvaccinated” includes partially vaccinated.**

Prevention and Control of Haemophilus influenzae Type b Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Hib Vaccine Recommendations: Special Populations (5)

- **Children younger than 24 months of age with invasive Hib disease:**
  - Administer complete series as recommended for child's age.
  - Vaccinate during the convalescent phase of the illness.

Prevention and Control of Haemophilus influenzae Type b Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Recommended Hib Vaccination Schedule for Adults

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2025

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
***Haemophilus influenzae* type b** (Hib)	1 or 3 doses depending on indication			

Recommended vaccination for adults with an additional risk factor or another indication

Recommended Adult Immunization Schedule for ages 19 years or older; 2025 U.S. .

Recommended Hib Vaccination Schedule for Adults Based on Indication

- **Anatomical or functional asplenia (including sickle cell disease)**:
  - 1 dose if previously did not receive Hib vaccine
  - For elective splenectomy: 1 dose preferably at least 14 days before splenectomy
- **Hematopoietic stem cell transplant**:
  - 3-dose series 4 weeks apart starting 6–12 months after successful transplant; regardless of Hib vaccination history

Adult Immunization Schedule Notes | Vaccines & Immunizations | CDC

Use of Hib-containing Vaccine Products is Off-label in Older Children and Adults

Vaccine Product	Age Indications
ActHIB	2 months–5 years
Pentacel (SP)	6 weeks–4 years
Hiberix (GSK)	6 weeks–4 years
PedvaxHIB	2–71 months
Vaxelis (Merck)	6 weeks–4 years

Adult Immunization Schedule Notes | Vaccines & Immunizations | CDC, Child Immunization Schedule Notes | Vaccines & Immunizations | CDC

Hib Vaccine Interchangeability

- **Single-component conjugate Hib vaccines are interchangeable.**
  - 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 the vaccine used for earlier doses is unknown or not available, use any brand to complete the primary series.

Chapter 8: Haemophilus influenzae | Pink Book | CDC

Knowledge Check

Vaxelis can be used for all 4 recommended doses in the Hib series.

A. True

B. False

Answer

Vaxelis can be used for all 4 recommended doses in the Hib series.

A. True

B. False 

Knowledge Check

PedvaxHIB can be administered to a 26-year-old who has sickle cell disease and no history of previous Hib vaccination.

A. True

B. False

Answer

PedvaxHIB can be administered to a 26-year-old who has sickle cell disease and no history of previous Hib vaccination.

A. **True** 

B. False

9

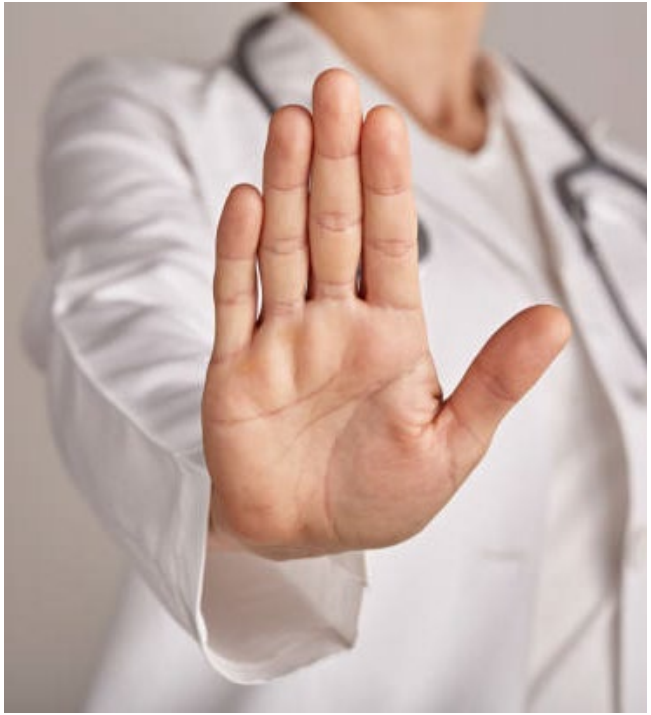
Safety

Hib Vaccine Contraindications

- **Severe allergic reaction (e.g. anaphylaxis)**
  - After a previous dose

  or

  - To a vaccine component
- **Age younger than 6 weeks**
  - Potential for development of immunologic tolerance



Child Immunization Schedule Appendix | Vaccines & Immunizations | CDC

Hib Vaccine Precautions

- **Moderate or severe acute illness with or without fever**

Child Immunization Schedule Appendix | Vaccines & Immunizations | CDC

Hib Vaccine Adverse Reactions

Injection site pain, redness, swelling

Fever

Crying

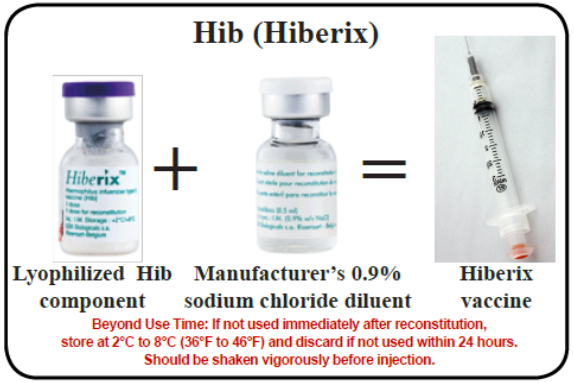
Irritability

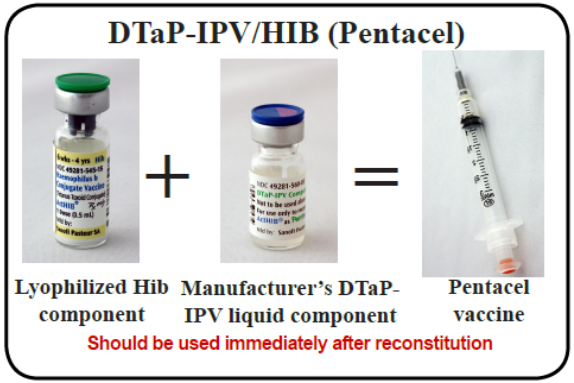
Rash

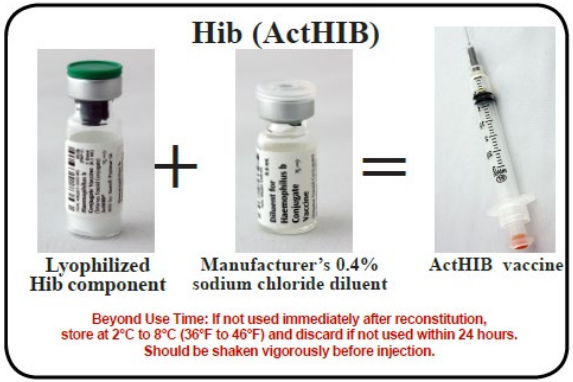
Haemophilus influenzae type b (Hib) Vaccine Safety | Vaccine Safety | CDC, Chapter 8: Haemophilus influenzae | Pink Book | CDC

Hib Vaccine Administration Errors (1)

- **Using wrong diluent to reconstitute the lyophilized component**
  - Doses using the wrong diluent are not valid.
  - Dose should be repeated after reconstitution with correct diluent.
  - The repeat dose may be given as soon as possible; there is no waiting period.







Vaccine Labels: Storage and Beyond-Use Date Tracking

Hib Vaccine Administration Errors (2)

- **Schedule errors:**
  - Doses administered 5 or more days before the minimum age and/or interval do not count and should be repeated when age-appropriate.
  - Wait the minimum interval from the invalid dose before giving the repeat dose.

Timing and Spacing of Immunobiologics | Vaccines & Immunizations | CDC

Hib Vaccine Administration Errors

- **For all Hib vaccine administration errors:**
  - Inform the recipient of the vaccine administration error.
  - Determine how the error occurred and implement strategies to prevent it from happening again.
  - Providers are encouraged to report the error to Vaccine Adverse Event Reporting System (VAERS), even for errors not associated with an adverse event.

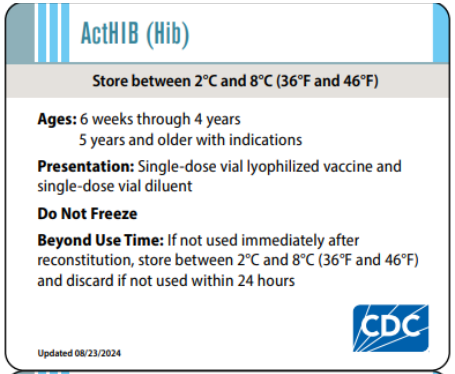
VAERS - Report an Adverse Event

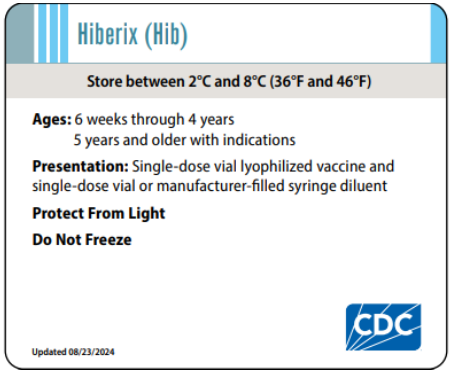
10

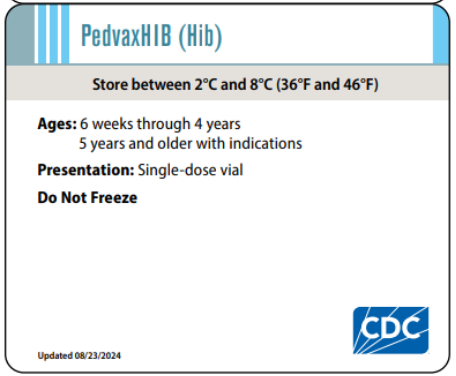
Storage and Handling

Hib Vaccine Storage and Handling (1)

- **All Hib-containing vaccines: store refrigerated between 2°C and 8°C (36°F and 46°F).**
- **Store in the original packaging.**
  - Hib vaccines requiring reconstitution (Pentacel, ActHIB, Hiberix) should be stored together with their diluent in the refrigerator.



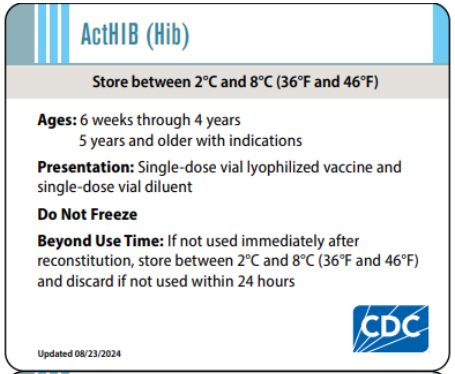


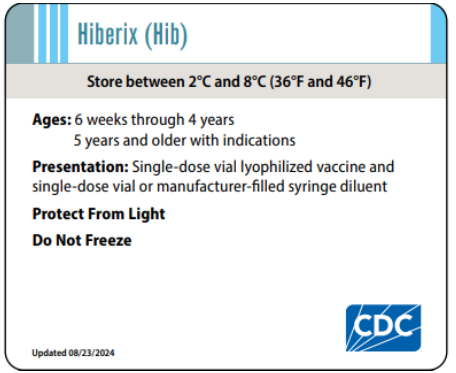


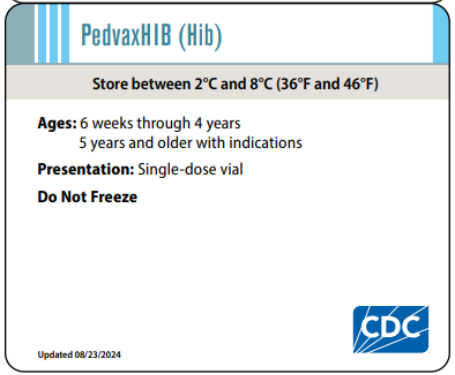
Vaccine Labels: Storage and Beyond-Use Date Tracking

Hib Vaccine Storage and Handling (2)

- **Do not freeze vaccine or diluents; do not expose to freezing temperatures.**
- **If vaccines are exposed to inappropriate temperatures or handled improperly:**
  - Store at the appropriate temperature.
  - Isolate from other vaccines.
  - Mark “Do NOT Use.”
  - Consult the vaccine manufacturer and/or state or local immunization program for guidance.





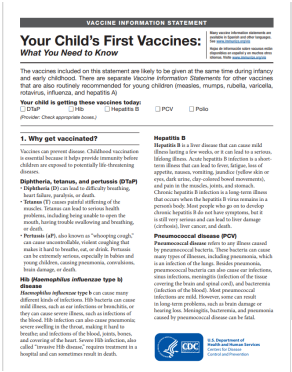


Vaccine Storage and Handling Toolkit - January 2023

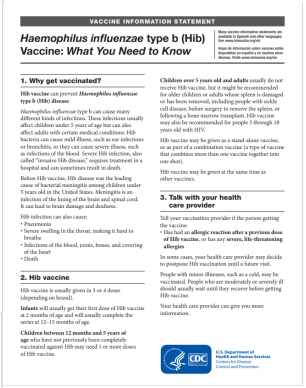
11 Resources

Vaccine Information Statements

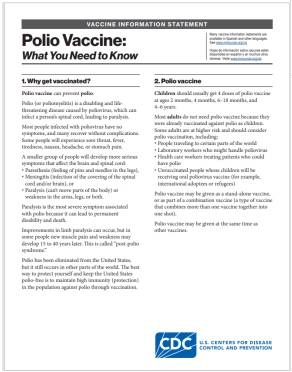
- **Provide the polio and Hib vaccine information statement (VIS) when a combination vaccine is administered.**
  - There are no VISs specific for Kinrix, Pediarix, Pentacel, Vaxelis, or Quadracel.
- **Other option: Multiple Vaccines VIS**
  - May be used in place of the individual VISs for DTaP, Hib, hepatitis B, polio, and PCV when two or more of these vaccines are administered during the same visit
  - May be used for infants through children receiving their routine 4- to 6-year vaccines


VACCINE INFORMATION STATEMENT

Your Child's First Vaccines:
What You Need to Know


VACCINE INFORMATION STATEMENT

Haemophilus influenzae type b (Hib) Vaccine: What You Need to Know


VACCINE INFORMATION STATEMENT

Polio Vaccine:
What You Need to Know

[Current VISs | Vaccines & Immunizations | CDC]

CDC Clinical Resources

- **www.cdc.gov/vaccines/**
  - Advisory Committee on Immunization Practices (ACIP) Vaccine Recommendations and Guidelines
  - Recommended Immunization Schedules
  - Vaccine Storage and Handling Toolkit
  - Vaccine Information Statements

Pink Book Training Materials

Continuing Education Information

- To claim continuing education (CE) for this course, please follow the steps below by July 1, 2026.
- Search and register for course **WD4810-080824** in **CDC TRAIN**.
- Pass the post-assessment at 80%.
- Complete the evaluation.
- Visit “Your Learning” to access your certificates and transcript.
- If you have any questions, contact **CDC TRAIN** at train@cdc.gov or CE Coordinator, Melissa Barnett, at MBarnett2@cdc.gov

Home - CDC TRAIN - an affiliate of the TRAIN Learning Network powered by the Public Health Foundation

Email Us Your Immunization Questions

nipinfo@cdc.gov

Thank You From Atlanta!

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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.