Polio and *Haemophilus influenzae* type b

Pink Book Webinar Series

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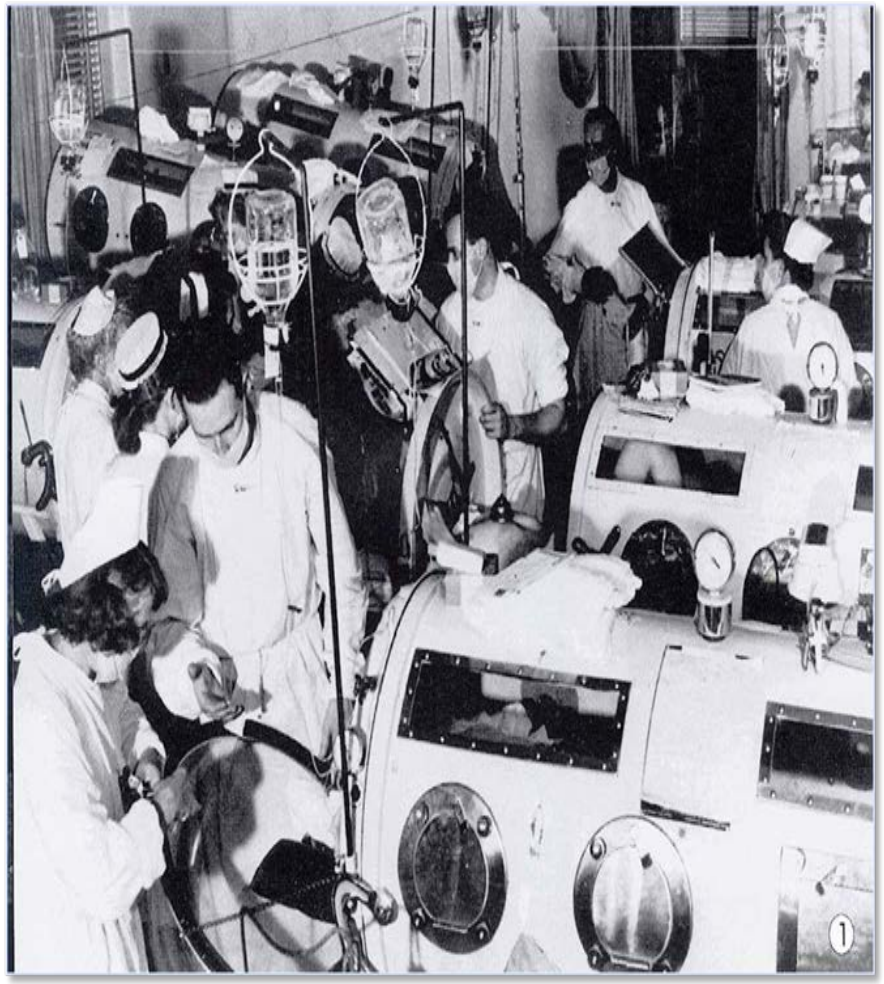
ACIP Recommendations: Polio and Polio Vaccines

Poliomyelitis Disease

- First outbreak described in the U.S. in 1843
- Polio epidemics were reported each summer and fall
- More than 21,000 paralytic cases reported in the U.S. in 1952

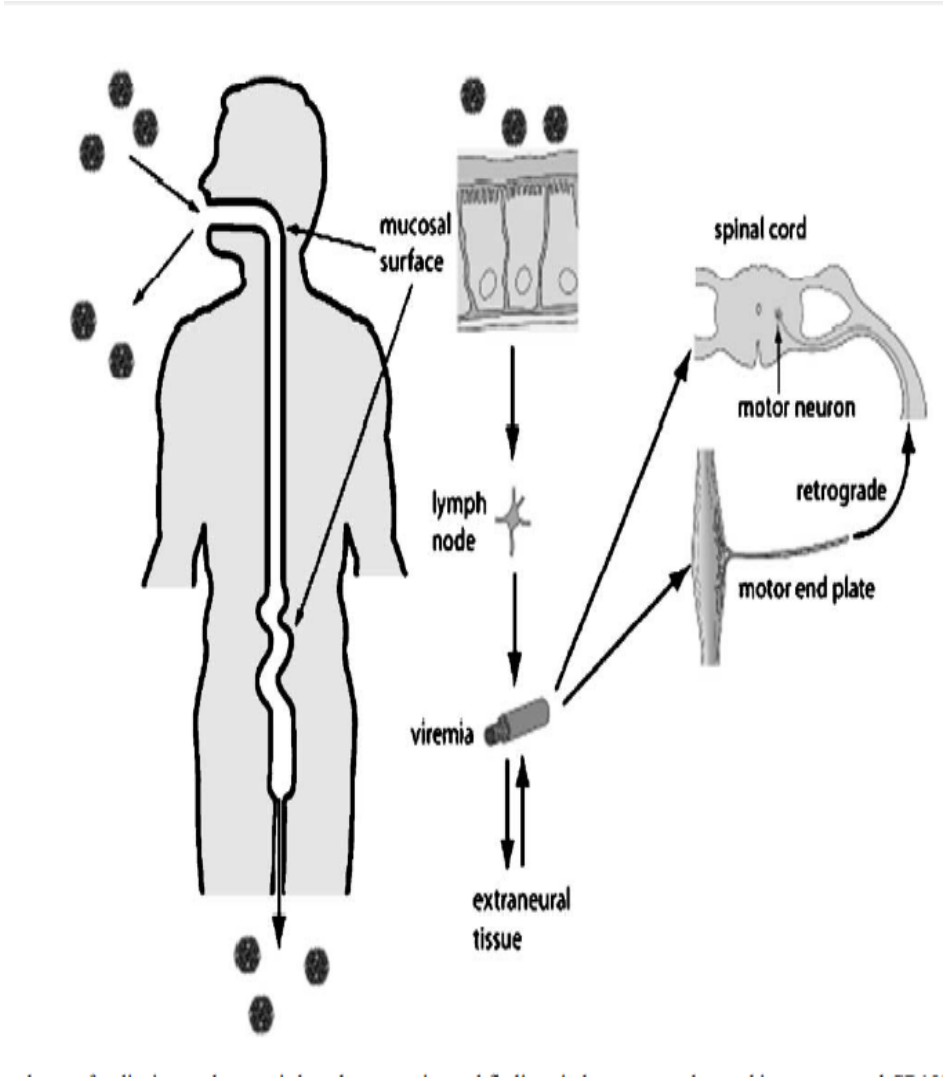


Poliovirus

- **Three serotypes of wild poliovirus:**
  - WPV1
  - WPV2
  - WPV3
- **Minimal heterotypic immunity between serotypes**
- **Rapidly inactivated by heat, chlorine, formaldehyde, and ultraviolet light**

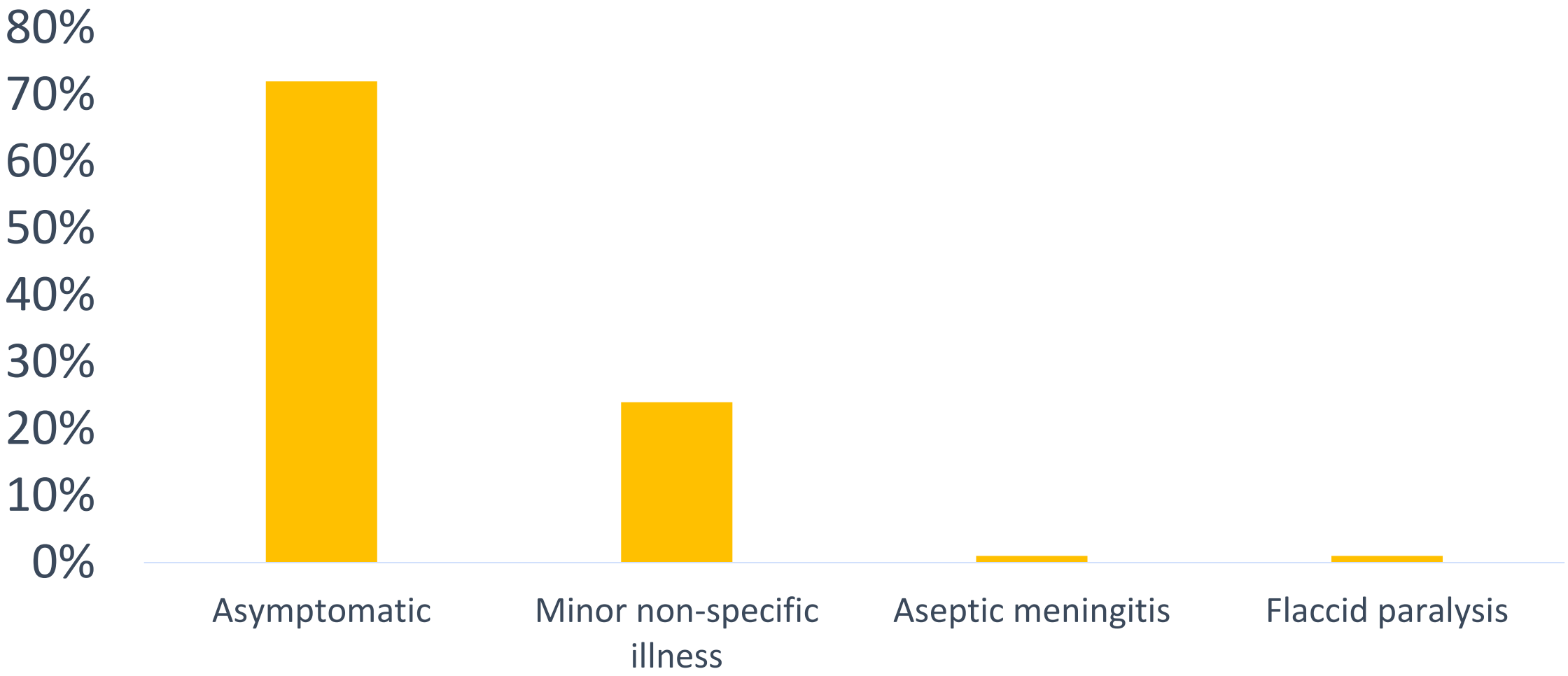
Poliomyelitis Pathogenesis

- Enters into mouth
- Replicates 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

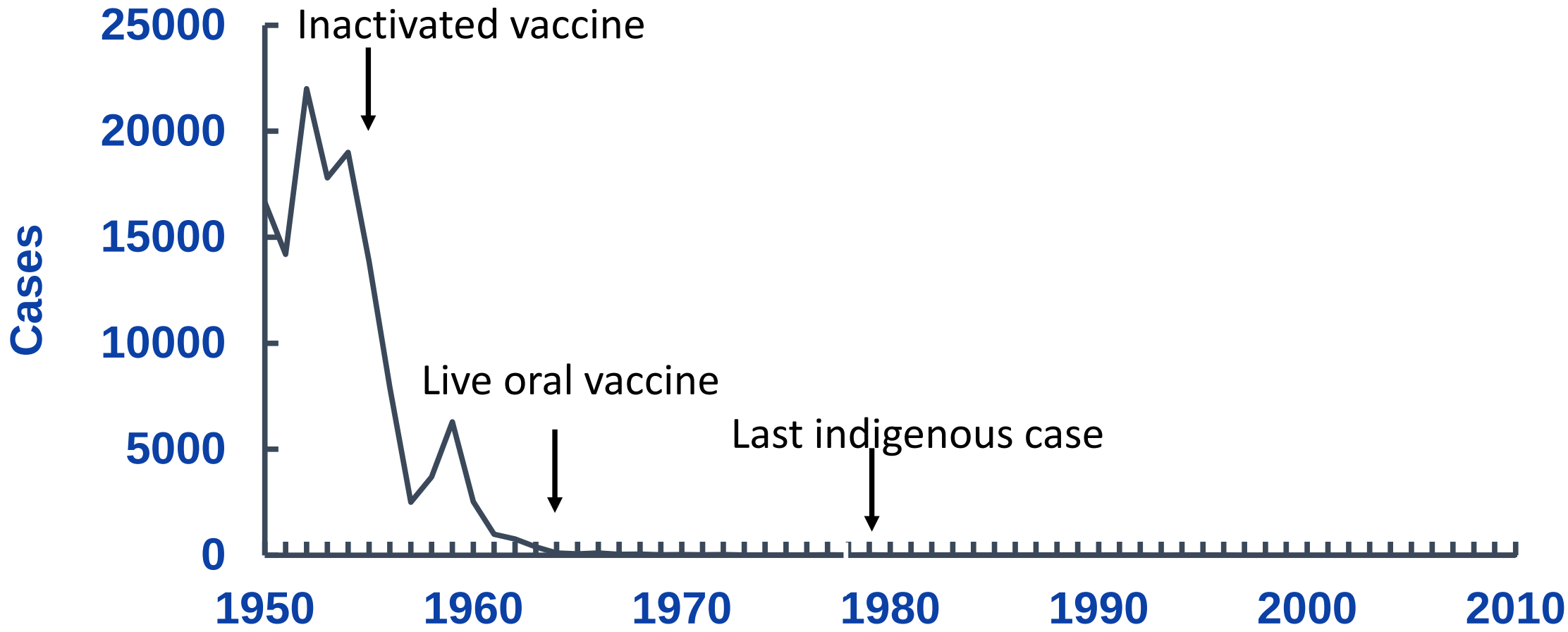


Asymmetric paralysis

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

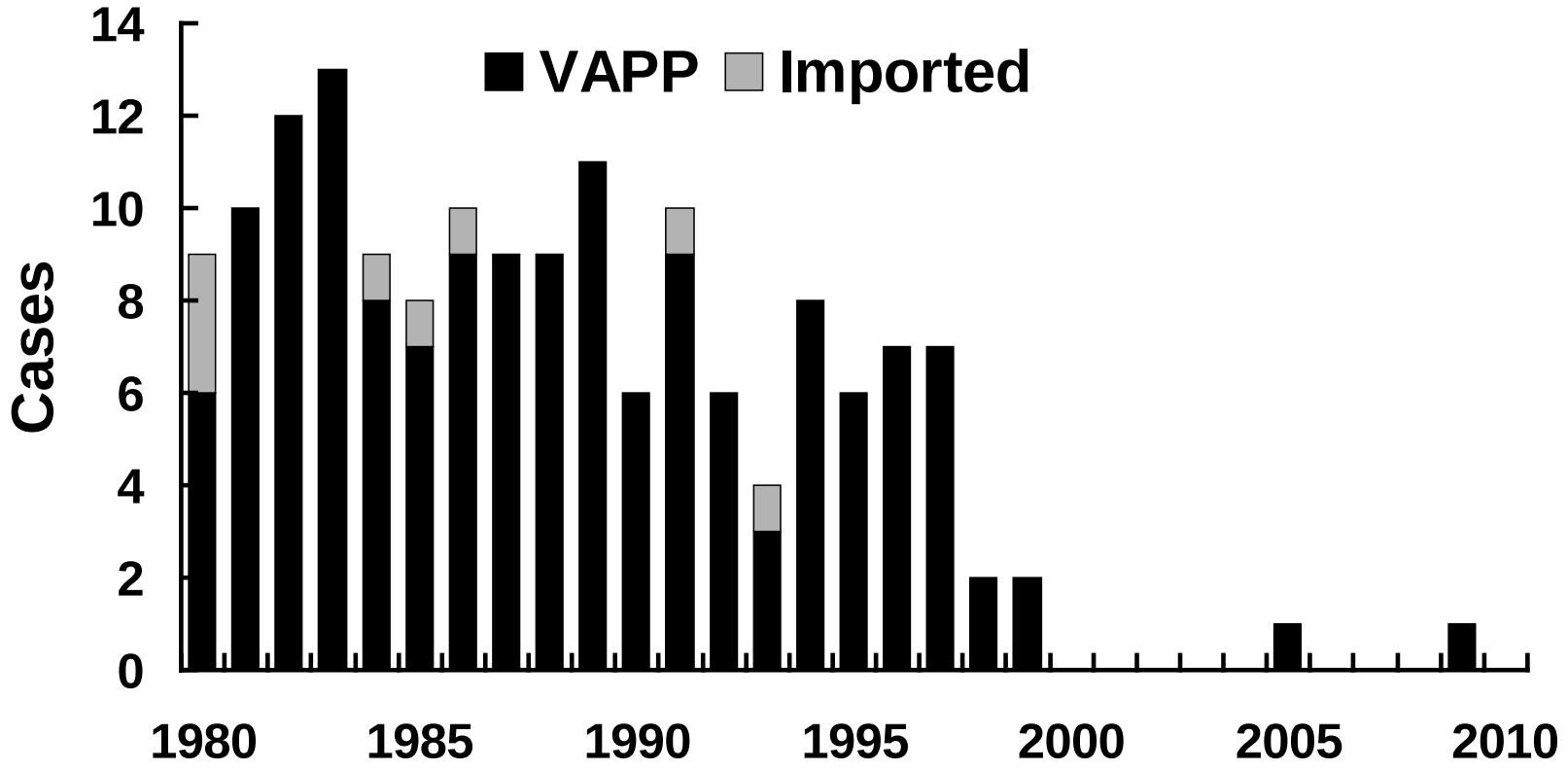
Poliomyelitis—United States, 1950–2011



Source: National Notifiable Disease Surveillance System, CDC

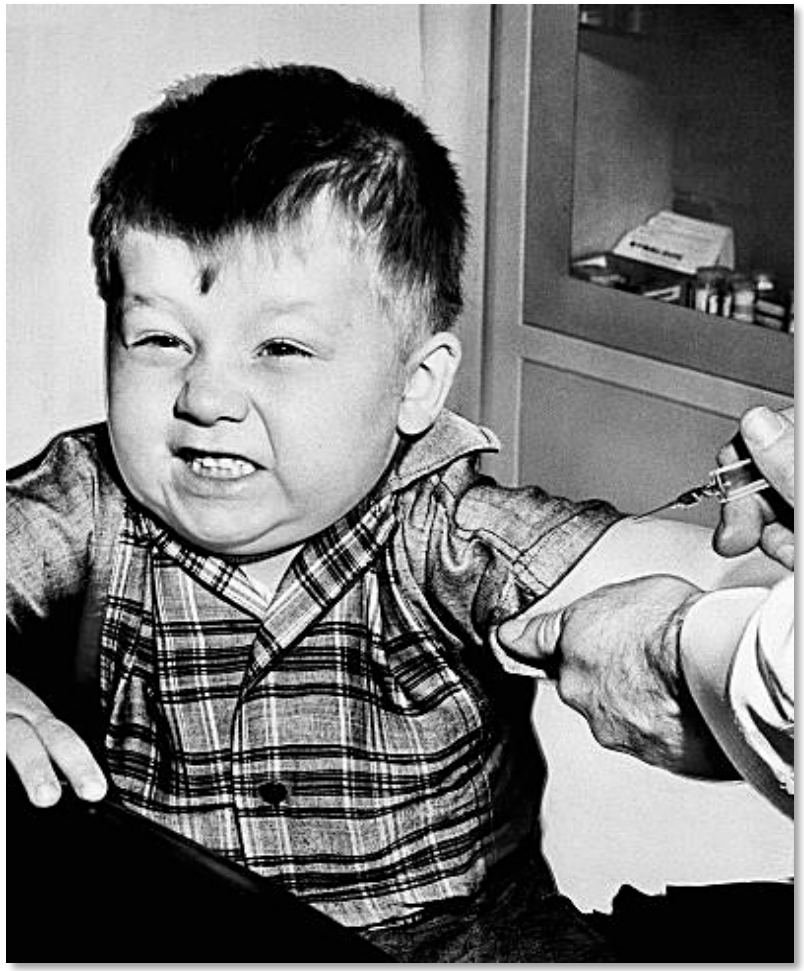
Poliomyelitis—United States, 1980–2010

Vaccine–associated paralytic polio = VAPP



Poliovirus Vaccines

- 1955–Inactivated vaccine
- 1963–Live, attenuated vaccine (OPV)
- 1987–Enhanced-potency, inactivated vaccine (IPV)



Enhanced 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**

Polio-Containing Vaccine Products

Product ACIP Abbreviation	Age Indications	IPV Series
IPOL **IPV**	6 weeks and older	Any dose in the series
Pediarix **DTaP-IPV-HepB**	6 weeks through 6 years	Doses 1 through 3
Pentacel **DTaP-IPV/Hib**	6 weeks through 4 years	Doses 1 through 4
Kinrix **DTaP-IPV**	4 through 6 years	Dose 4
Quadracel **DTaP-IPV**	4 through 6 years	Dose 4 or 5

ACIP Polio Immunization Recommendations
Routine Childhood Schedule

IPV Dose	Routinely Recommended Age
1	2 months
2	4 months
3	6–18 months
4	4–6 years

ACIP Polio Immunization Recommendations
Catch-Up Schedule

- **Infants 6 months of age and younger, follow the recommended schedule intervals**
- **If accelerated protection is needed (e.g., travel to polio-endemic area), minimum age and intervals may be followed**

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	----------

ACIP Polio Immunization Recommendations
4th Dose and the Catch-Up Schedule

- **A 4th dose is not necessary if the 3rd dose was administered:**
  - At age 4 years or older AND
  - At least 6 months after the previous dose

- **Children who have received 4 doses (or more) before 4 years of age need an additional dose**
  - There should be at least 6 months between last and next-to-last dose

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 OPV
  - Ensure doses met minimum ages and intervals
- **Administer 1 dose of IPV to children who received 4 doses of OPV (or more) before 4 years of age**
  - There should be at least 6 months the last dose of OPV and the IPV dose

OPV Administered Outside the U.S.

- 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 2016
- Persons 18 years of age and younger with doses of OPV that do not count towards the U.S. vaccination requirements should receive IPV

ACIP Polio Immunization Recommendations Adolescents and Adults

- 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

ACIP Polio Immunization Recommendations

Unvaccinated Adults

- **Use routine IPV schedule if possible**
  - 0, 1–2 months, 6–12 months intervals
- **If accelerated protection is needed (e.g., travel to polio-endemic area), use the minimum intervals**

	Minimum Intervals to the Next Dose
Dose 1	4 weeks
Dose 2	6 months
Dose 3	----------

ACIP Polio Immunization Recommendations
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

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

- **Precaution**
  - Moderate to severe acute illness

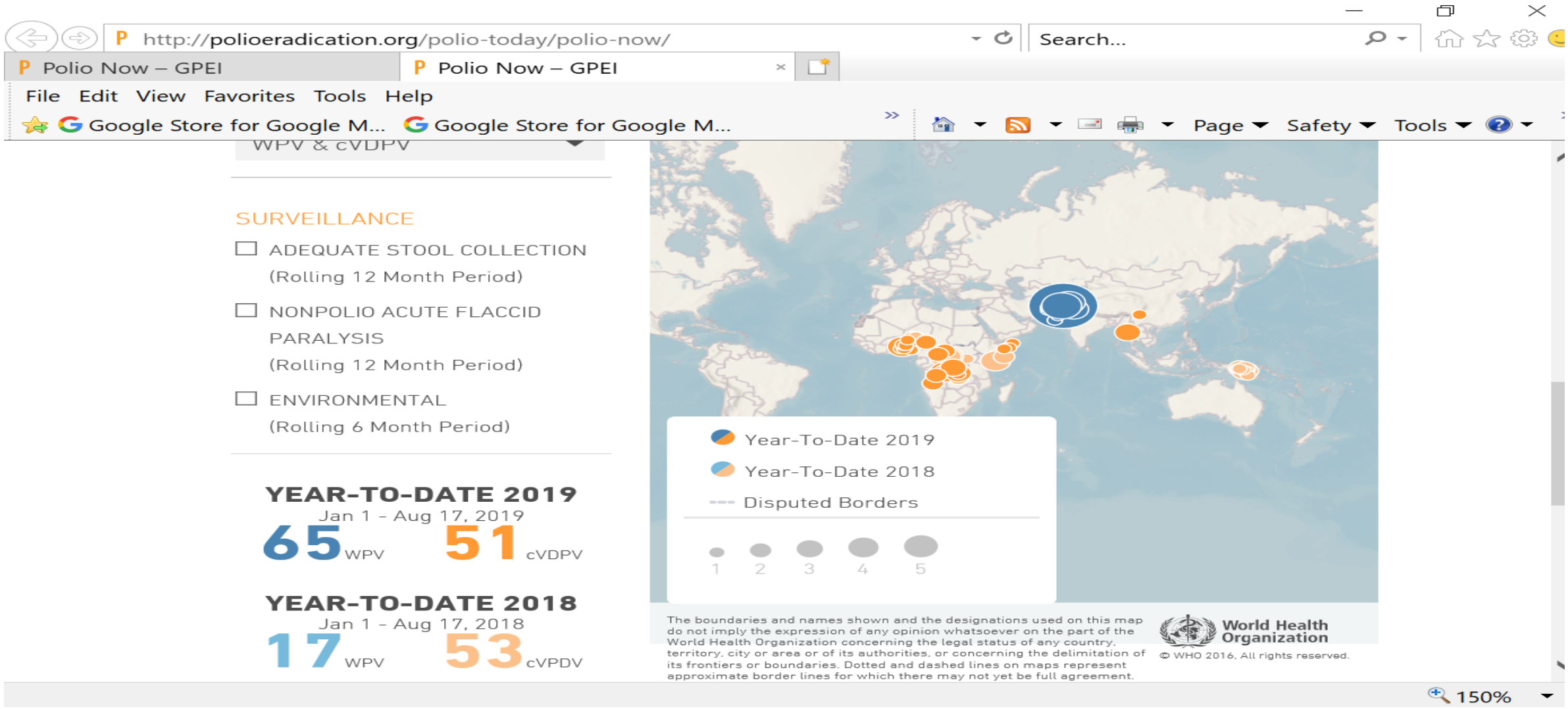
IPV Adverse Reactions

- **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

Global Polio Eradication Initiative



Clinical Considerations for IPV-Containing Vaccines

- **Storage: Refrigerate between 2°C and 8°C (36°F and 46°F)**
- **Preparation: Prepare the vaccine just prior to administration**
  - Pentacel requires reconstitution
  - Reconstitute the lyophilized vaccine with the DTaP-IPV liquid diluent supplied by the manufacturer. Do NOT use Kinrix or Quadracel
- **Route: IM injection***
- **Site:**
  - 11 months and younger: Anterolateral thigh muscle
  - 12 months and older: Anterolateral thigh muscle or deltoid muscle of arm
- **Needle:**
  - Children: 22–25 gauge, 1-inch needle
  - Adults: 22–25 gauge, length varies by weight

*iPV may be administered by subcutaneous injection using a 5/8-inch needle given in the fatty tissue over the upper, outter triceps or anterolateral thigh

Polio: Vaccine Administration Errors

- **Schedule errors: Dose 4 administered too soon**
  - 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
  - Minimum age/interval: At/after age 4 AND 6 months after dose 3
- **Age/dose errors: Kinrix or Quadracel for doses 1 through 3**
  - If the minimum age and interval from the last dose of polio vaccine has been met, the dose can count and does not need to be repeated
- **Preparation errors: Wrong diluent to reconstitute DTaP-IPV/Hib (Pentacel)**
  - Do not use Kinrix or Quadracel to reconstitute Pentacel

ACIP Recommendations: *Haemophilus influenzae* type b and Hib Vaccine

National Center for Immunization & Respiratory Diseases
Immunization Services Division

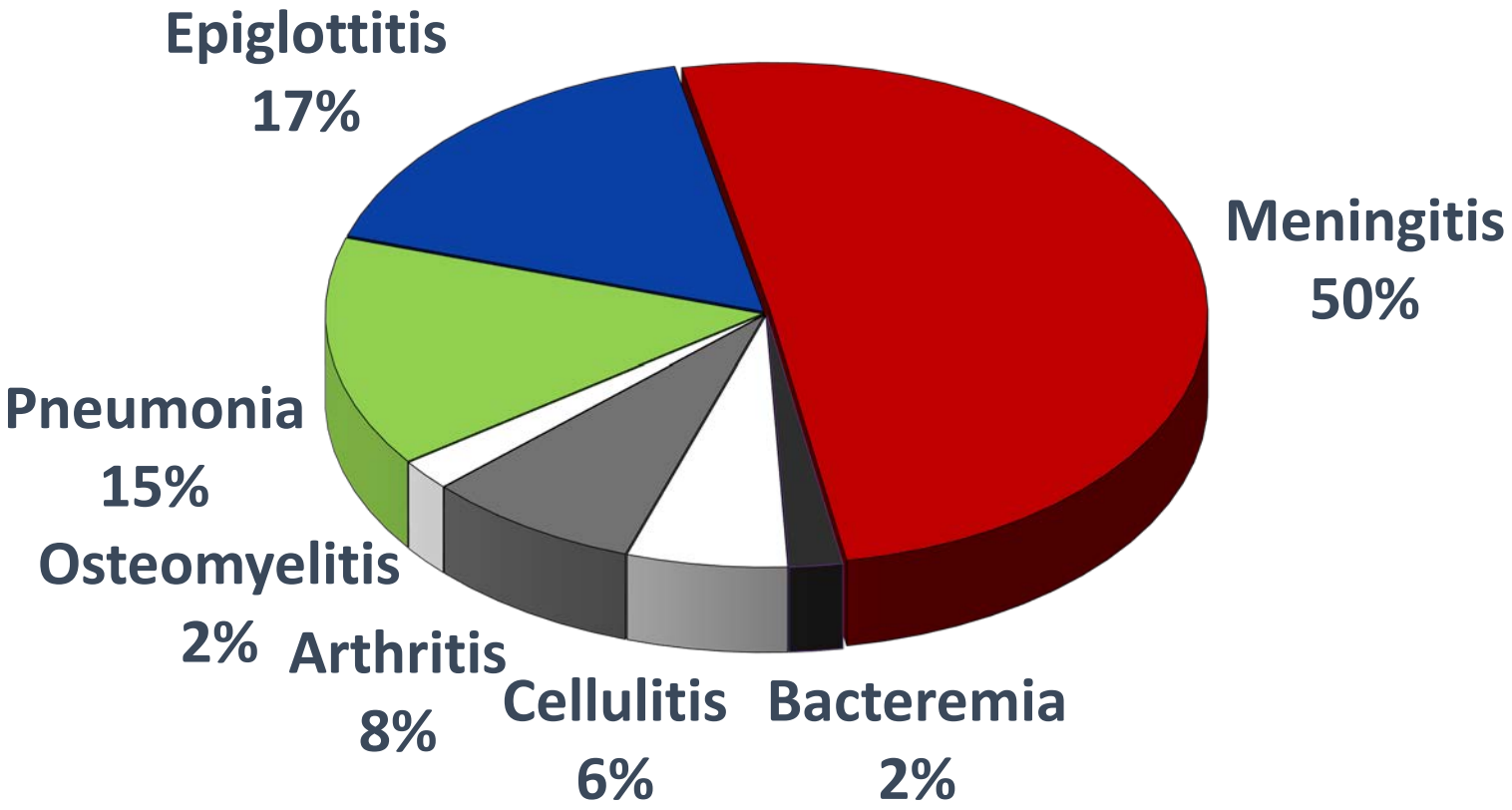
Haemophilus influenzae type b

- 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*



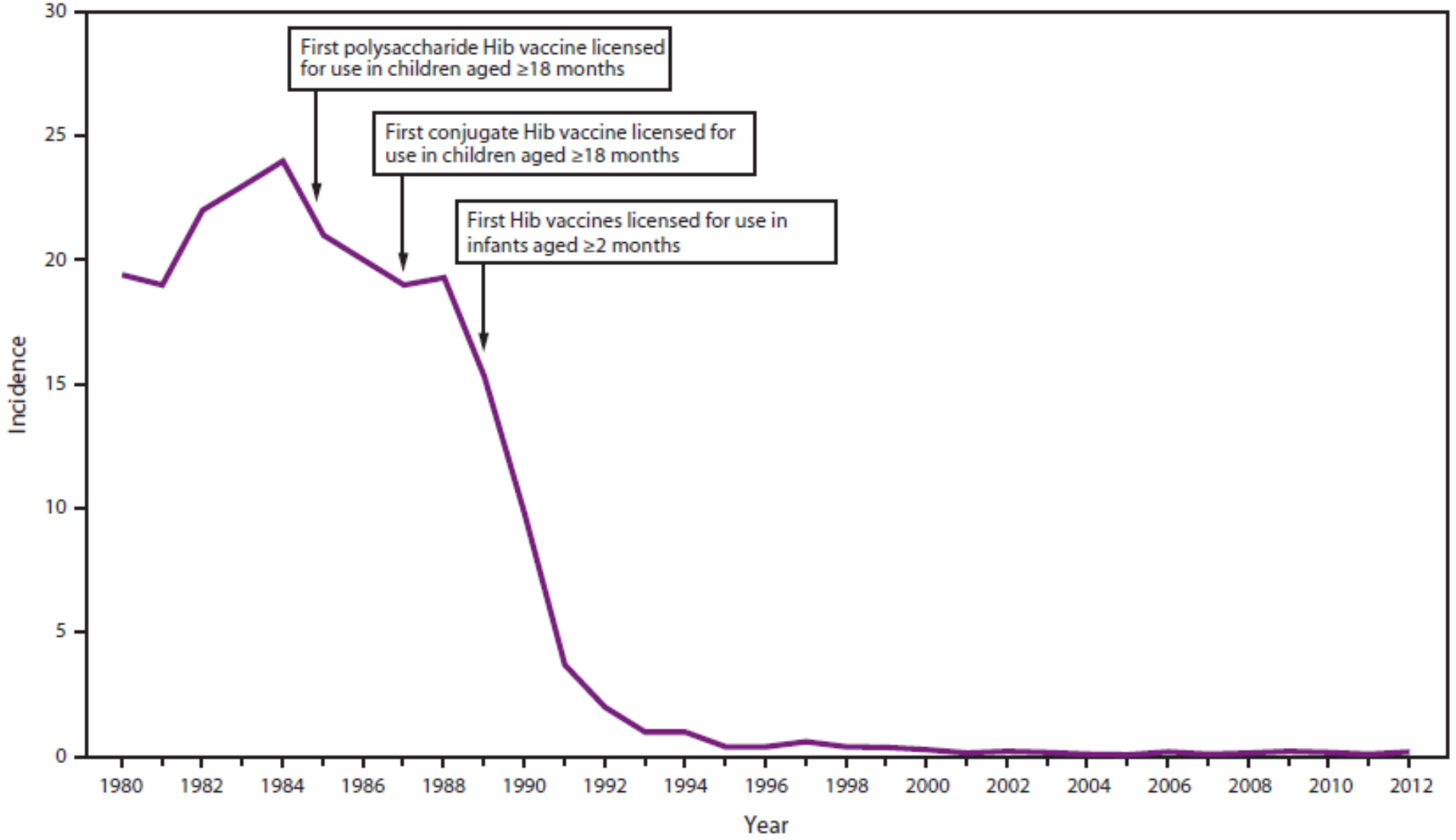
*Prevaccine era

Facial cellulitis or infection of the soft tissues of the face, caused by Hib

Haemophilus influenzae type b Epidemiology

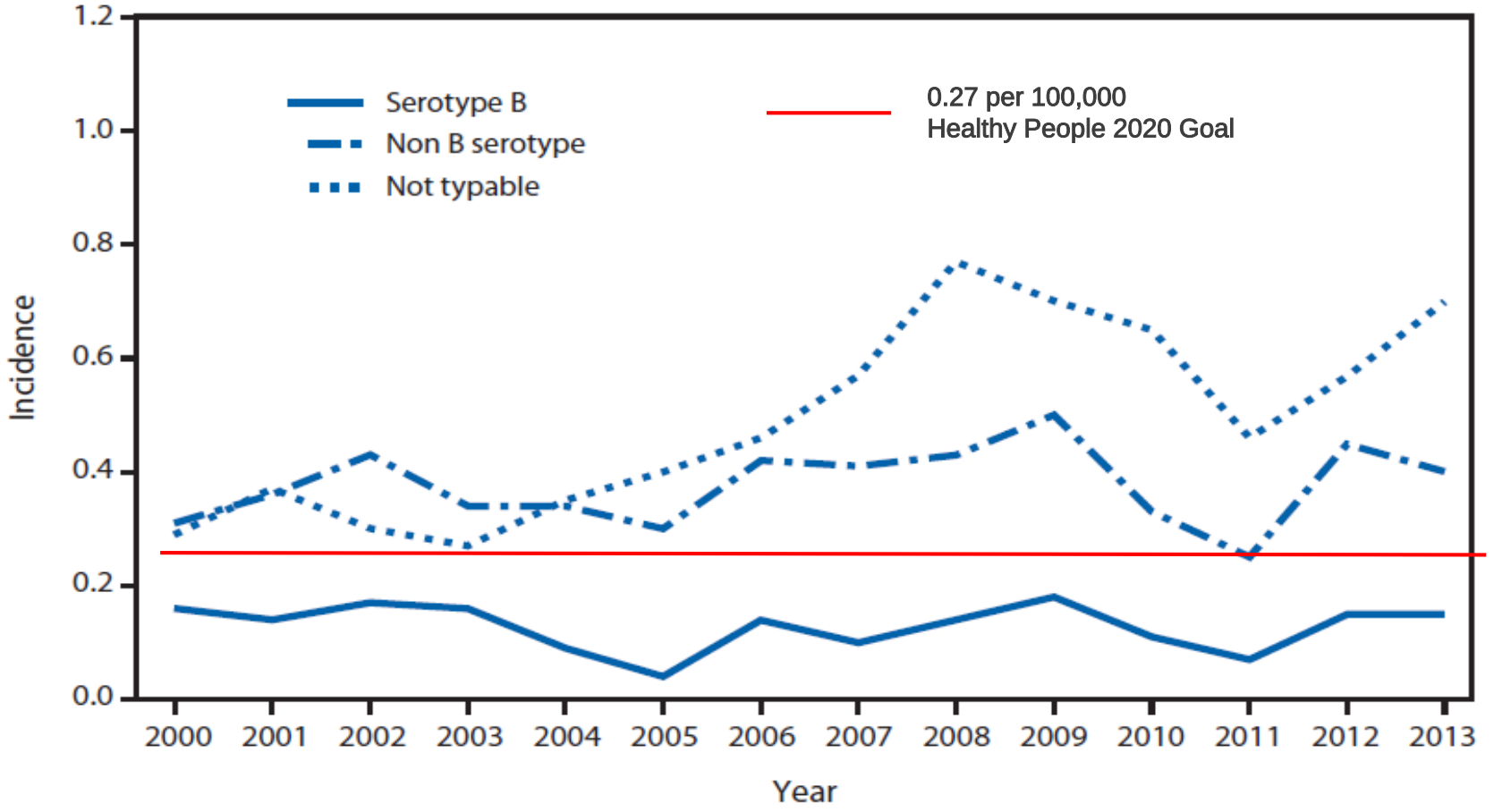
Reservoir	Human asymptomatic carriers
Transmission	Respiratory droplets presumed
Temporal pattern	Peaks in Sept. through Dec. and March through May
Communicability	Generally limited but higher in some circumstances (e.g., household, child care)

Estimated Annual Incidence (per 100,000) of Invasive *Haemophilus influenzae* type b (Hib) Disease in Children Aged <5 Years—U.S., 1980–2012



MMWR 2014;63(RR1):1–14

Haemophilus influenzae, Invasive Disease Incidence of Reported Cases (per 100,000), by serotype Among Children aged <5 years—U.S., 2000–2013



MMWR 2015;62(53):1–119

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 single-component conjugate Hib vaccine products**
- **1 combination vaccine products available that contain Hib conjugate vaccine**

Hib-Containing Vaccine Products

Vaccine product	Age indications
PRP-T (polysaccharide, tetanus toxoid)	
ActHIB	All doses of primary schedule and booster dose 2 months through 5 years
Hiberix	All doses of primary schedule and booster dose 6 weeks through 4 years
Pentacel (DTaP, IPV, Hib)	For doses 1 through 4 6 weeks through 4 years of age
PRP-OMP (polysaccharide, outer membrane protein)	
PedvaxHIB	All doses of primary schedule and booster dose 2 to 71 months of age
Vaxelis (DTaP, IPV, Hib, HepB)	All doses of primary schedule (2) and booster dose 6 weeks-4 years

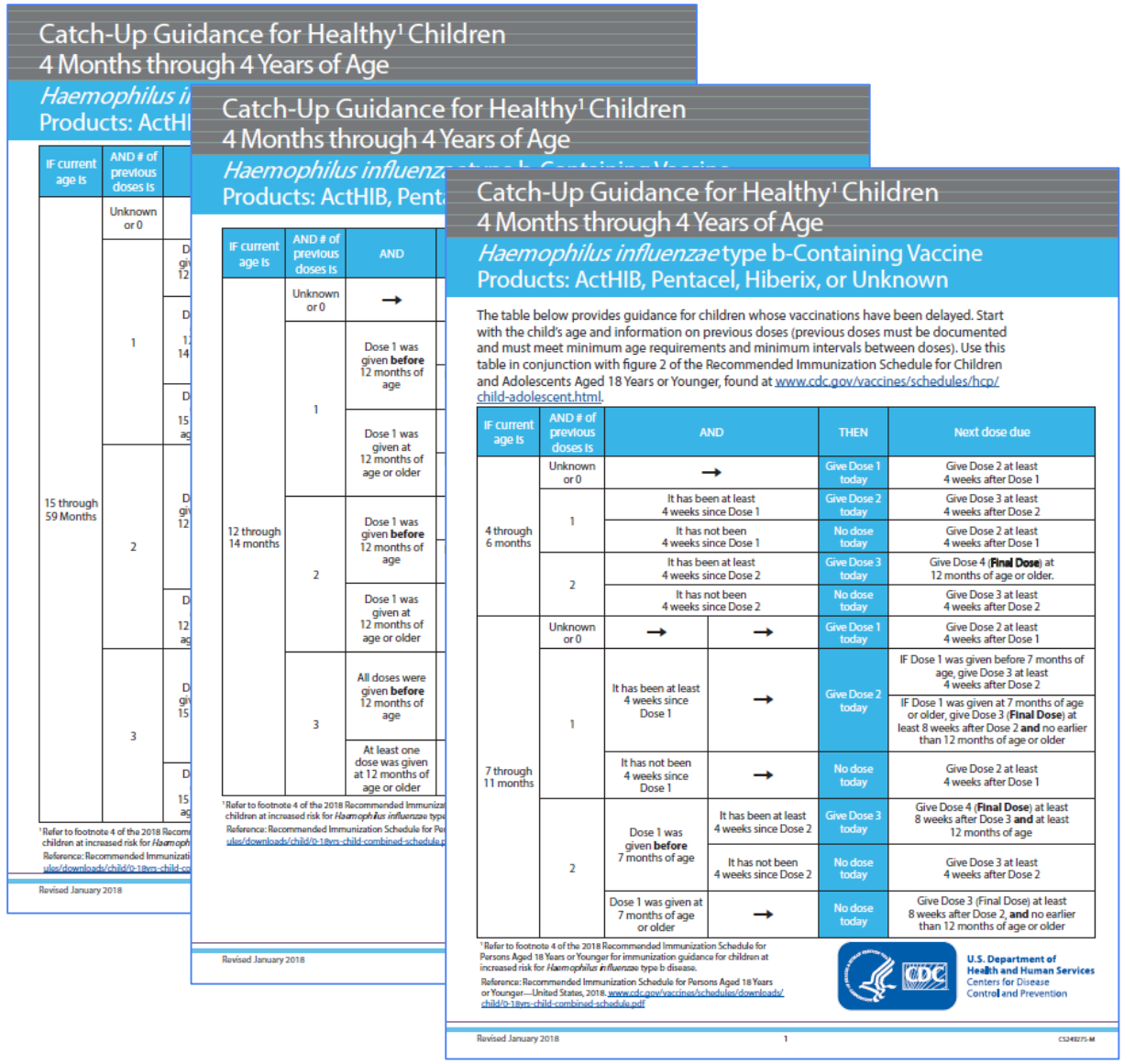
ACIP Hib Immunization Recommendations
Routine Schedule

- **Routinely recommended for all infants beginning at 2 months of age***
- **Schedule varies based on the product used**
  - ActHib, Pentacel, Hiberix: Follow the 4-dose schedule at 2, 4, 6, and 12–15 months of age
  - PedvaxHIB: Follow the 3-dose schedule at 2, 4, and 12–15 months of age
- **If any dose in the series is ActHIB, Pentacel, Hiberix or the product is not known, follow the 4-dose schedule**

*Minimum age for the 1st dose is 6 weeks

Unvaccinated Healthy 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**
- **Resources:**
  - 2018 catch-up schedule
  - Catch-up guidance for healthy children
  - Detailed schedule p. 128 of Pink Book



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

Haemophilus influenzae type b-Containing Vaccine
Products: ActHIB, Pentacel, Hiberix, or Unknown

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 figure 2 of the Recommended Immunization Schedule for Children and Adolescents Aged 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
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 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.
		It has not been 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 or older
		It has not been 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** at least 12 months of age
			It has not been 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 or older

[1]Refer to footnote 4 of the 2018 Recommended Immunization Schedule for Persons Aged 18 Years or Younger for immunization guidance for children at increased risk for *Haemophilus influenzae* type b disease.

Reference: Recommended Immunization Schedule for Persons Aged 18 Years or Younger—United States, 2018. 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

Revised January 2018 1

Catch-Up Guidance for Healthy Children 4 Months through 4 Years of Age www.cdc.gov/vaccines/schedules/downloads/child/job-aids/hib-actHib.pdf

ACIP Hib Immunization Recommendations
Older Children and Adults

- **Generally not recommended for healthy persons older than 59 months of age**
- **Vaccinate high-risk older children and adolescents if incompletely or previously unvaccinated**
  - Asplenia
  - Immunodeficiency
  - HIV infection
  - Receipt of chemotherapy or radiation therapy

ACIP Hib Immunization Recommendations
High-Risk Children and Adults

High-Risk Children and Adults	Hib Vaccine Guidance
Elective splenectomy	If unvaccinated: 1 dose prior to procedure
Asplenic patient	If unvaccinated: 1 dose
HIV-infected children	If unvaccinated: 1 dose
Hematopoietic cell transplant	3 doses (at least 4 weeks apart) beginning 6–12 months after transplant
HIV-infected adults	Hib vaccination is not recommended

“Unvaccinated” and High-Risk Catch-Up

- “Unvaccinated” means someone who meets both criteria:

  Less than the routine series through 14 months;

  AND

  No doses after 14 months of age

Special Populations

- **Children less 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
- **American Indian/Alaska natives**
  - Hib disease peaks earlier in infancy
  - PedVaxHIB vaccine produces protective antibody after first dose/early protection
  - PedVaxHIB vaccine is specifically recommended for primary series doses

Hib Vaccine Interchangeability

- All single-component 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

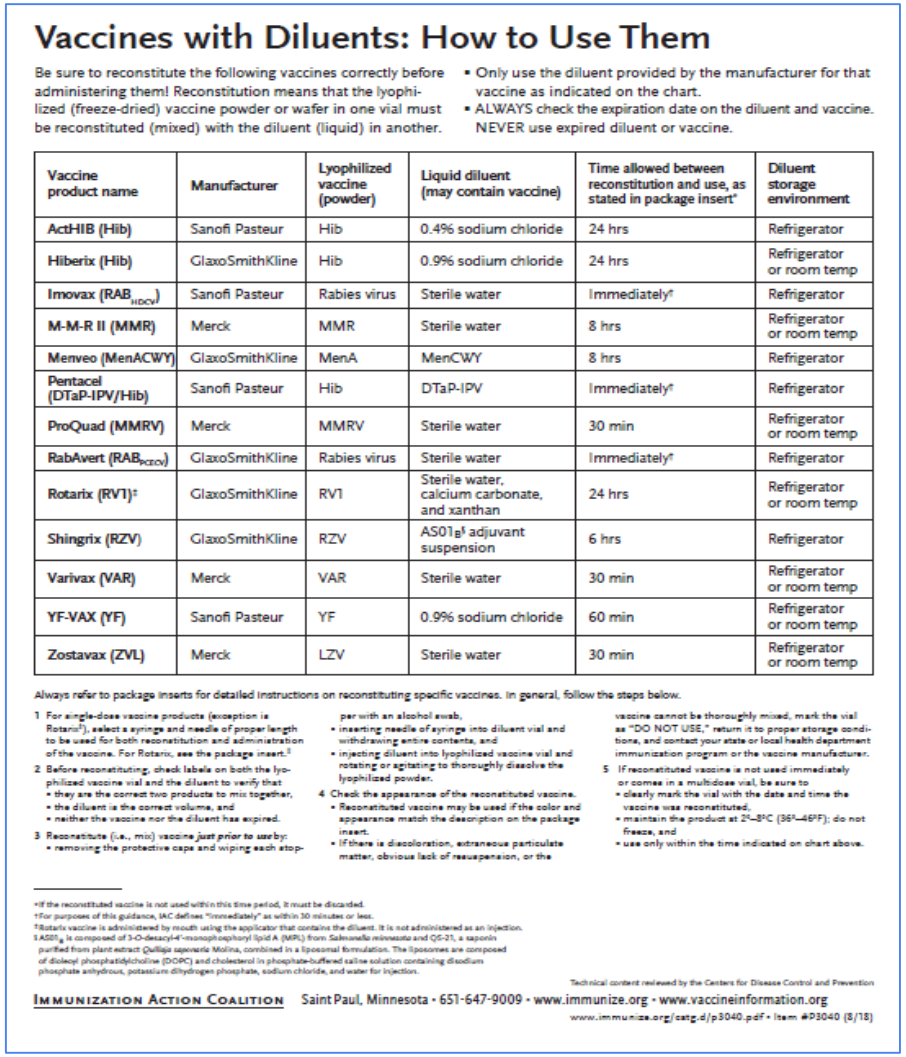
- Severe allergic reaction to vaccine component or following previous dose
- Moderate to severe acute illness
- Age younger than 6 weeks

Hib Vaccine Adverse Reactions

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

Clinical Considerations for Hib-Containing Vaccine

- **Storage: Refrigerate between 2°C and 8°C (36°F and 46°F)**
- **Preparation: Prepare vaccine just prior to administration**
  - ActHIB, Pentacel, and Hiberix require reconstitution
  - Reconstitute the lyophilized vaccine with the diluent supplied by the manufacturer
- **Route: IM injection**
- **Site:**
  - 11 months and younger: Anterolateral thigh muscle
  - 12 months and older: Anterolateral thigh muscle or deltoid muscle of arm
- **Needle: 22–25 gauge, 1-inch needle**



Vaccines with Diluents: How to Use Them

Be sure to reconstitute the following vaccines correctly before administering them! Reconstitution means that the lyophilized (freeze-dried) vaccine powder or wafer in one vial must be reconstituted (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.

Vaccine product name	Manufacturer	Lyophilized vaccine (powder)	Liquid diluent (may contain vaccine)	Time allowed between reconstitution and use, as stated in package insert*	Diluent storage environment
ActHIB (Hib)	Sanofi Pasteur	Hib	0.4% sodium chloride	24 hrs	Refrigerator
Hiberix (Hib)	GlaxoSmithKline	Hib	0.9% sodium chloride	24 hrs	Refrigerator or room temp
Imovax (RAB_{HDCV})	Sanofi Pasteur	Rabies virus	Sterile water	Immediately†	Refrigerator
M-M-R II (MMR)	Merck	MMR	Sterile water	8 hrs	Refrigerator or room temp
Menveo (MenACWY)	GlaxoSmithKline	MenA	MenCWY	8 hrs	Refrigerator
Pentacel (DTaP-IPV/Hib)	Sanofi Pasteur	Hib	DTaP-IPV	Immediately†	Refrigerator
ProQuad (MMRV)	Merck	MMRV	Sterile water	30 min	Refrigerator or room temp
RabAvert (RAB_{PCEC})	GlaxoSmithKline	Rabies virus	Sterile water	Immediately†	Refrigerator
Rotarix (RV1)‡	GlaxoSmithKline	RV1	Sterile water, calcium carbonate, and xanthan	24 hrs	Refrigerator or room temp
Shingrix (RZV)	GlaxoSmithKline	RZV	AS01B§ adjuvant suspension	6 hrs	Refrigerator
Varivax (VAR)	Merck	VAR	Sterile water	30 min	Refrigerator or room temp
YF-VAX (YF)	Sanofi Pasteur	YF	0.9% sodium chloride	60 min	Refrigerator or room temp
Zostavax (ZVL)	Merck	LZV	Sterile water	30 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 (exception is Rotarix‡), select a syringe and needle of proper length to be used for both reconstitution and administration of the vaccine. For Rotarix, 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 *just prior to use* by:
- removing the protective caps and wiping each stopper with an alcohol swab,
- inserting needle of syringe into diluent vial and withdrawing entire contents, and
- injecting diluent into lyophilized vaccine vial and rotating or agitating 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, extraneous 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.

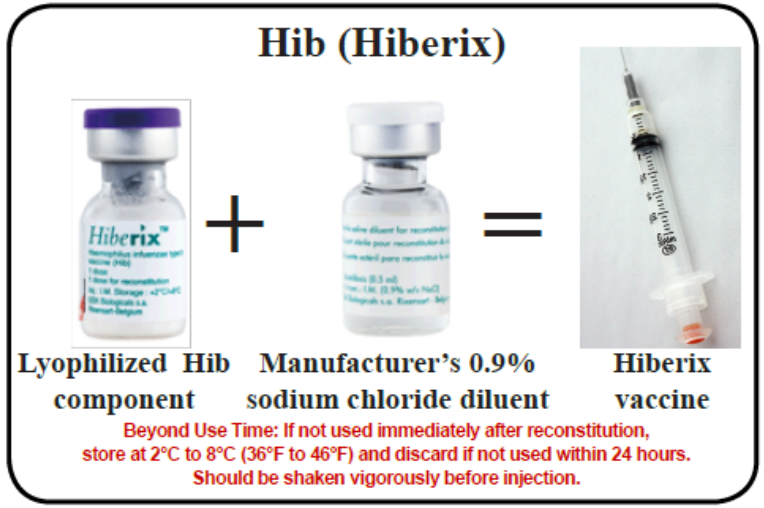
*If the reconstituted vaccine is not used within this time period, it must be discarded.
†For purposes of this guidance, IAC defines "immediately" as within 30 minutes or less.
‡Rotarix vaccine is administered by mouth using the applicator that contains the diluent. It is not administered as an injection.
§$AS01_B$ is composed of 3-O-desacyl-4′-monophosphoryl lipid A (MPL) from *Salmonella minnesota* and QS-21, a saponin purified from plant extract *Quillaja saponaria* Molina, combined in a liposomal formulation. The liposomes are composed of dioleoyl phosphatidylcholine (DOPC) and cholesterol in phosphate-buffered saline solution containing disodium phosphate anhydrous, potassium dihydrogen phosphate, sodium chloride, and water for injection.

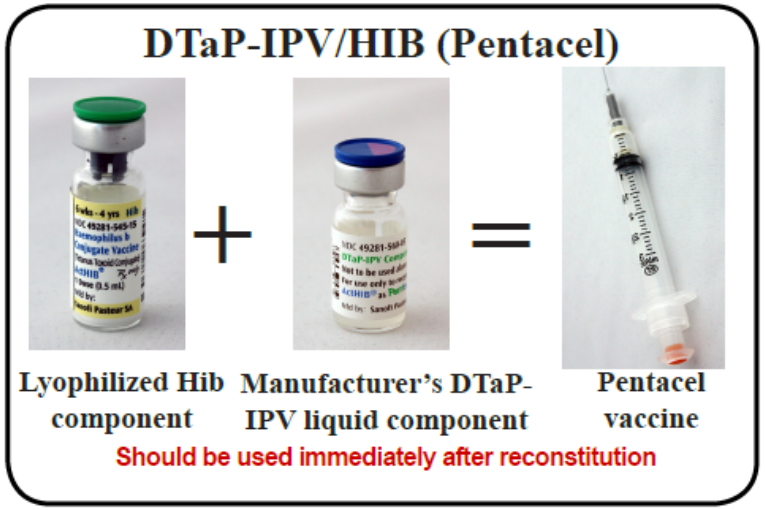
Technical content reviewed by the Centers for Disease Control and Prevention

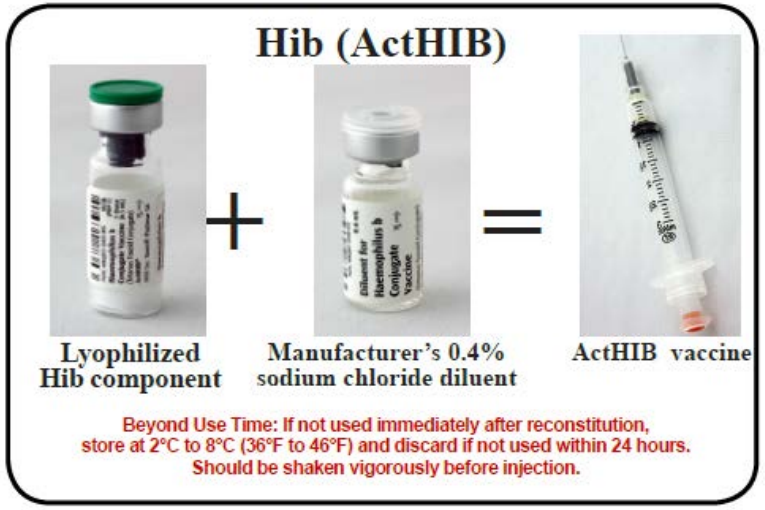
IMMUNIZATION ACTION COALITION Saint Paul, Minnesota • 651-647-9009 • www.immunize.org • www.vaccineinformation.org
www.immunize.org/catg.d/p3040.pdf • Item #P3040 (8/18)

Hib: Vaccine Administration Errors

- **Preparation errors: Using the wrong diluent to reconstitute the lyophilized component**



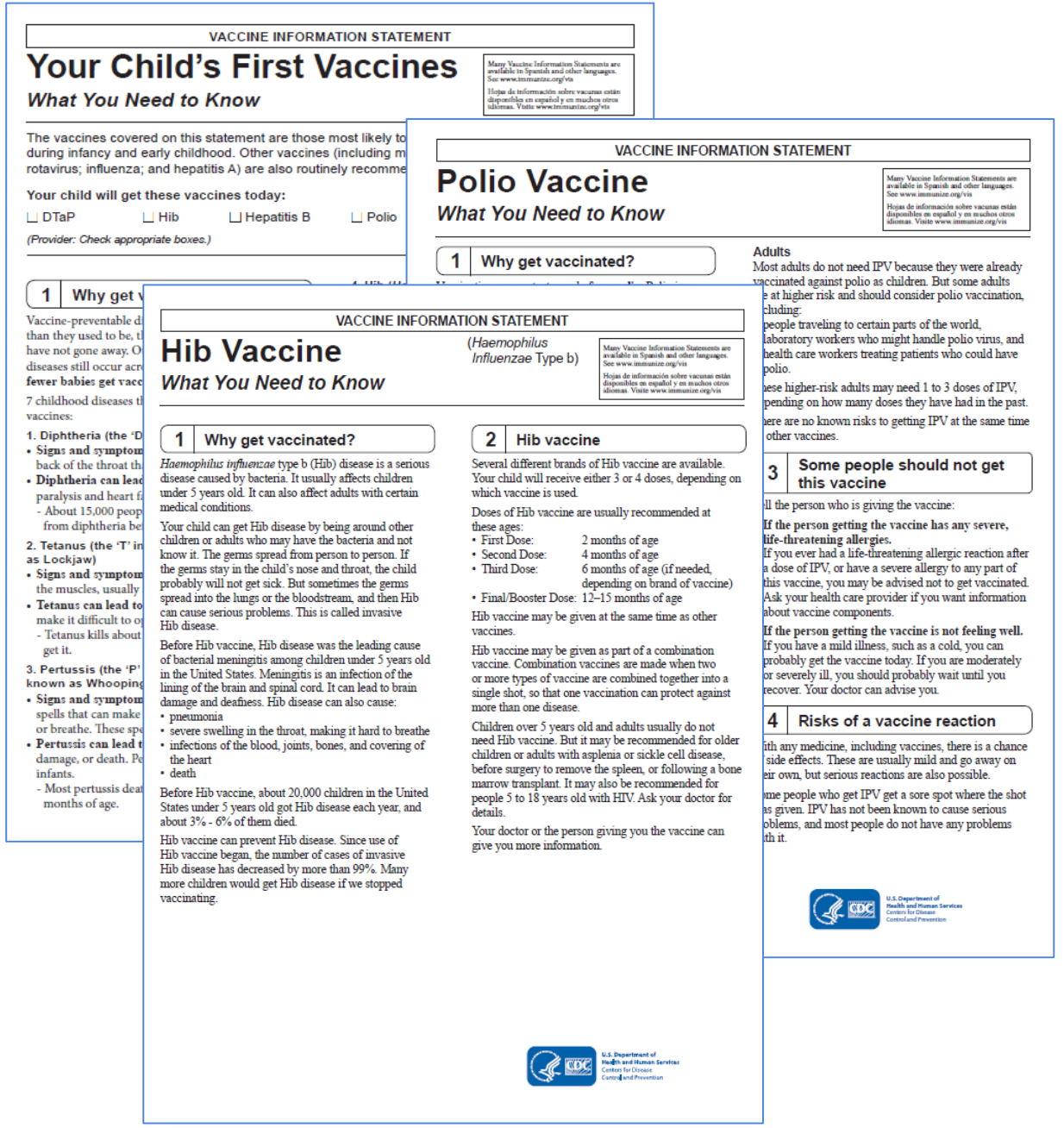




CDC vaccine storage label examples https://www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf

Additional Clinical Considerations

- **Provide the polio and Hib vaccine information statement (VIS) when a combination vaccine is administered**
  - There are no VISs specific for Kinrix, Pediarix, Pentacel, or Quadracel
- **Other option: multiple vaccines VIS**
  - May be used in place of the individual VISs for DTaP, Hib, hepatitis B, polio, and PCV13 when two or more of these vaccines are administered during the same visit
  - It 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

Polio Vaccine

What You Need to Know

VACCINE INFORMATION STATEMENT

Hib Vaccine (Haemophilus Influenzae Type b)

What You Need to Know

1 Why get vaccinated?

2 Hib vaccine

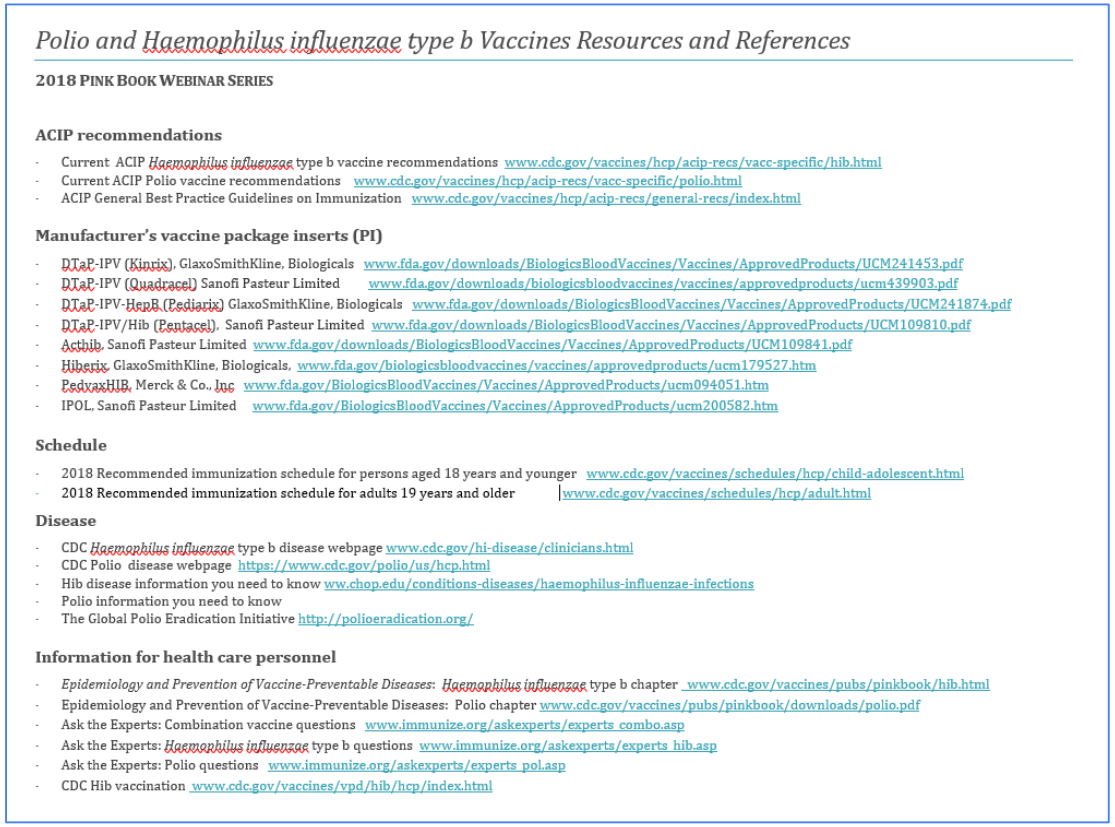
3 Some people should not get this vaccine

4 Risks of a vaccine reaction

CDC vaccine information statements www.cdc.gov/vaccines/hcp/vis/vis-statements/multi.html

Polio and Vaccine Resources and References

- Resources and references are available on the webinar web page



Polio and Haemophilus influenzae type b Vaccines Resources and References

2018 PINK BOOK WEBINAR SERIES

ACIP recommendations

- Current ACIP *Haemophilus influenzae* type b vaccine recommendations www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hib.html
- Current ACIP Polio vaccine recommendations www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/polio.html
- ACIP General Best Practice Guidelines on Immunization www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html

Manufacturer's vaccine package inserts (PI)

- DTaP-IPV (Kinrix), GlaxoSmithKline, Biologicals www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM241453.pdf
- DTaP-IPV (Quadracel) Sanofi Pasteur Limited www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm439903.pdf
- DTaP-IPV-HepB (Pediarix) GlaxoSmithKline, Biologicals www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM241874.pdf
- DTaP-IPV/Hib (Pentacel), Sanofi Pasteur Limited www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM109810.pdf
- Actihib, Sanofi Pasteur Limited www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM109841.pdf
- Hiberix, GlaxoSmithKline, Biologicals, www.fda.gov/biologicsbloodvaccines/vaccines/approvedproducts/ucm179527.htm
- PedvaxHIB, Merck & Co., Inc www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/ucm094051.htm
- IPOL, Sanofi Pasteur Limited www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/ucm200582.htm

Schedule

- 2018 Recommended immunization schedule for persons aged 18 years and younger www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html
- 2018 Recommended immunization schedule for adults 19 years and older www.cdc.gov/vaccines/schedules/hcp/adult.html

Disease

- CDC *Haemophilus influenzae* type b disease webpage www.cdc.gov/hi-disease/clinicians.html
- CDC Polio disease webpage https://www.cdc.gov/polio/us/hcp.html
- Hib disease information you need to know ww.chop.edu/conditions-diseases/haemophilus-influenzae-infections
- Polio information you need to know
- The Global Polio Eradication Initiative http://polioeradication.org/

Information for health care personnel

- *Epidemiology and Prevention of Vaccine-Preventable Diseases*: *Haemophilus influenzae* type b chapter www.cdc.gov/vaccines/pubs/pinkbook/hib.html
- Epidemiology and Prevention of Vaccine-Preventable Diseases: Polio chapter www.cdc.gov/vaccines/pubs/pinkbook/downloads/polio.pdf
- Ask the Experts: Combination vaccine questions www.immunize.org/askexperts/experts_combo.asp
- Ask the Experts: *Haemophilus influenzae* type b questions www.immunize.org/askexperts/experts_hib.asp
- Ask the Experts: Polio questions www.immunize.org/askexperts/experts_pol.asp
- CDC Hib vaccination www.cdc.gov/vaccines/vpd/hib/hcp/index.html