

# Immunizations

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# Objectives

- To understand the timing of immunization administration for all infants
- To understand the role of RSV Immune Globulin--Synagis
- To understand the current (2007) vaccination schedule

- The timing of immunizations should be based on the infant's chronologic age, not the gestational age. The only exception is Hepatitis B vaccination. The American Academy of Pediatrics Committee on Infectious Diseases has issued a statement indicating that it may be advisable to delay administration of Hepatitis B vaccine until the infant weighs 2,000 g (4 lb, 6 oz).<sup>30</sup> –This is our NICU policy as well.
- The full dose of all immunizations should be given.
- As with term infants, premature infants should be given the acellular pertussis vaccine when it is available. Synagis should be given if applicable. Administration of the pneumococcal vaccine at two years of age may be beneficial in infants with chronic problems such as lung disease.
- MMR and Varivax administration should be delayed by 6 months after the administration of PRBC or whole blood and by 7 months after the administration of plasma/platelets.

- After discharge, the patient should receive a copy of their immunization record and documentation of immunizations received should be forwarded to their primary care physician.

# Synagis (RSV-IGIV)

## ■ **RSV Immune Globulin—RSV-IGIV (Synagis)**

Synagis prevents severe RSV infection when it is administered monthly during the RSV season. In two clinical trials, infants who received RSV-IGIV had a 41 percent reduction and a 65 percent reduction in the rate of hospitalization compared with the rate of hospitalization in infants who did not receive the agent. Once an RSV infection has developed, Synagis will not help. Because antibodies from Synagis block immunity to measles vaccine, measles-containing vaccines should not be administered for nine months after the last dose of Synagis. No changes are necessary for other routine immunizations.

■ Synagis should be considered for use in infants under 24 months of age with bronchopulmonary dysplasia who required medical intervention (oxygen therapy in the preceding six months, frequent bronchodilators, steroid use, or diuretic therapy) in the six months prior to the onset of RSV season.

■ Synagis should be considered for infants born at 28 weeks EGA (28 weeks 0 days) or less, without chronic lung disease and less than 12 months old at the start of RSV season.

■ Infants born at or after 28 weeks 1 day and before 32 weeks and 0 days, without chronic lung disease and less than 6 months old at the start of RSV season should also receive Synagis.

- The physician may consider infants without chronic lung disease born at or after 32 weeks 1 day to 35 weeks 0 days who are less than 6 months old at the start of RSV season if the infant has **2 or more** risk factors for RSV infection. These include:
- Congenital airway anomalies, severe neuromuscular disease, passive smoke exposure (may not meet criteria for some insurance companies), daycare attendance, or school age siblings

- Infants and children less than 24 months of age with **hemodynamically significant cyanotic or acyanotic** congenital heart disease will benefit from prophylaxis. Those most likely to benefit include:
  - Infants receiving medication to control CHF, infants with moderate to severe pulmonary hypertension, and infants with cyanotic heart disease.
- The following infants are not at increased risk from RSV and **should not** receive Synagis:
  - Infants and children with hemodynamically insignificant heart disease (ASD secundum, small VSD, PS, uncomplicated AS, mild coarctation of the aorta, and PDA), infants with lesions adequately corrected by surgery unless they continue to require medication for CHF, and infants with mild cardiomyopathy who are not receiving medical therapy.

- The following section is a review and an update of the current (2007) immunization schedule.

# Immunization schedule for 2007

## Recommended Immunization Schedule for Persons Aged 0–6 Years—UNITED STATES • 2007

Vaccine ▼	Age ▶	Birth	1 month	2 months	4 months	6 months	12 months	15 months	18 months	19–23 months	2–3 years	4–6 years
Hepatitis B <sup>1</sup>	HepB		HepB		<sup>see footnote 1</sup>	HepB			HepB Series			
Rotavirus <sup>2</sup>				Rota	Rota	Rota						
Diphtheria, Tetanus, Pertussis <sup>3</sup>				DTaP	DTaP	DTaP		DTaP				DTaP
<i>Haemophilus influenzae</i> type b <sup>4</sup>				Hib	Hib	Hib <sup>5</sup>	Hib		Hib			
Pneumococcal <sup>6</sup>				PCV	PCV	PCV	PCV			PCV PPV		
Inactivated Poliovirus				IPV	IPV	IPV					IPV	
Influenza <sup>4</sup>						Influenza (Yearly)						
Measles, Mumps, Rubella <sup>7</sup>							MMR					MMR
Varicella <sup>8</sup>							Varicella					Varicella
Hepatitis A <sup>9</sup>							HepA (2 doses)			HepA Series		
Meningococcal <sup>10</sup>											MenPV4	

 Range of recommended ages

 Catch-up immunization

 Certain high-risk groups

# Hepatitis B vaccine (HepB).

## Minimum age: birth

- **At birth:**
- Administer monovalent HepB to all newborns before hospital discharge.
- If the mother is HBsAg+, administer HepB and 0.5ml of HBIG within 12 hours of birth.
- If mother's HBsAg status is unknown, administer HepB within 12 hours of birth. Determine the HBsAg status as soon as possible and if HBsAg +, administer HBIG (no later than age 1 week).
- If mother is HBsAg--, the birth dose can only be delayed with physician's order and mother's negative HBsAg laboratory report documented in the infant's medical record.
- **After the birth dose:**
- The HepB series should be completed with either monovalent HepB or a combination vaccine containing HepB. The second dose should be administered at age 1-2 months. The final dose should be administered at age >/ 24 weeks. Infants born to HBsAg+ mothers should be tested for HBsAg and antibody to HBsAg after completion of >/ 3 doses of a licensed HepB series, at age 9-18 months (generally at the next well child visit).
- **4-month dose:**
- It is permissible to administer 4 doses of HepB when combination vaccines are administered after the birth dose. If monovalent HepB is used for doses after the birth dose, a dose at age 4 months is not needed.

# Rotavirus vaccine (Rota).

## Minimum age: 6 weeks

- Administer the first dose at age 6-12 weeks. Do not start the series later than 12 weeks.
- Administer the final dose in the series by age 32 weeks. Do not administer a dose later than age 32 weeks.
- Data on safety and efficiency outside of the age ranges are insufficient.

# Haemophilus influenzae type b conjugate vaccine (Hib).

Minimum age age: 6 weeks

- If PRP-OMP (PedvaxHIB or ComVax) is administered at ages 2 and 4 months, a dose at age 6 months is not required.
- TriHiBit (DTaP/Hib) combination products should not be used for primary immunization but can be used as boosters following any Hib vaccine in children 12 months

## Pneumococcal vaccine.

Minimum age: 6 weeks for pneumococcal conjugate vaccine (PCV); 2 years for pneumococcal polysachride vaccine (PPV).

- Administer PCV at ages 24-59 months in certain high-risk groups. Administer PPV to children  $\geq 2$  years in certain high risk groups.

## Influenza vaccine.

Minimum age 6 months for trivalent inactivated influenza vaccine (TIV); 5 years for live, attenuated influenza vaccine (LAIV).

- All children aged 6-59 months and close contacts of all children aged 0-59 months are recommended to receive influenza vaccine.
- Influenza vaccine is recommended annually for children > 59 months with certain risk factors, health-care workers, and other person (including household members) in close contact with persons in groups at high-risk.
- For healthy persons aged 5-59 years, LAIV may be used as an alternative to TIV
- Children receiving TIV should receive 0.25mL if aged 6-35 months or 0.5mL if aged > 3 years.
- Children aged < 9 years who are receiving influenza vaccine for the first time should receive 3 doses (separated by > 4 weeks for TIV and > 6 weeks for LAIV).

# Measles, mumps, and rubella (MMR).

## Minimum age: 12 months

- Administer the second dose of varicella vaccine at age 4-6 years.
- Varicella vaccine may be administered before aged 4-6 years, provided that  $\geq 3$  months have elapsed since the first dose and both doses are administered at age  $\geq 12$  months. If the second dose was administered at  $\geq 28$  days following the first dose, the second dose does not need to be repeated.

# Hepatitis A vaccine (HepA).

## Minimum age: 12 months

- HepA is recommended for all children aged 1 year (12-23 months). The 2 doses in the series should be administered at least 6 months apart.
- Children not fully immunized by age 2 years can be vaccinated at subsequent visits.
- HepA is recommended for certain other groups of children, including in areas where vaccination programs target older children.

Meningococcal polysaccharide vaccine (MPSV4). Minimum age: 2 years.

- Administer MPSV4 to children aged 2-10 years with terminal complement deficiencies or anatomic or functional asplenia and certain other high-risk groups.

- The following is a review and update of the current immunization schedule (2007) for older children.

## Recommended Immunization Schedule for Persons Aged 7–18 Years—UNITED STATES • 2007

Vaccine ▼	Age ▶	7–10 years	11–12 YEARS	13–14 years	15 years	16–18 years
Tetanus, Diphtheria, Pertussis <sup>1</sup>	see footnote 1		<b>Tdap</b>		<b>Tdap</b>	
Human Papillomavirus <sup>2</sup>	see footnote 2		<b>HPV (3 doses)</b>		<b>HPV Series</b>	
Meningococcal <sup>3</sup>		<b>MPSV4</b>	<b>MCV4</b>		<b>MCV4<sup>1</sup></b>	<b>MCV4</b>
Pneumococcal <sup>4</sup>		<b>PPV</b>				
Influenza <sup>5</sup>		<b>Influenza (Yearly)</b>				
Hepatitis A <sup>6</sup>		<b>HepA Series</b>				
Hepatitis B <sup>7</sup>		<b>HepB Series</b>				
Inactivated Poliovirus <sup>8</sup>		<b>IPV Series</b>				
Measles, Mumps, Rubella <sup>9</sup>		<b>MMR Series</b>				
Varicella <sup>10</sup>		<b>Varicella Series</b>				



Range of recommended ages



Catch-up immunization



Certain high-risk groups

# Tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap). Minimum age: 10 years for BOOSTRIX and 11 years for ADACEL

- Administered at age 11-12 years for those who have completed the recommended childhood DTP/DTaP vaccination series and have not received a tetanus and diphtheria toxoid vaccine (Td) booster dose.
- Adolescents aged 13-18 years who missed the 11-12 year Td/Tdap booster dose should also receive a single dose of Tdap if they have completed the recommended childhood DTP/DTaP vaccination series.

# Human papillomavirus vaccine (HPV).

## Minimum age: 9 years

- Administer the first dose of the HPV vaccine series to females at age 1-12 years.
- Administer the second dose 2 months after the first dose and the third dose 6 months after the first dose.
- Administer the HPV vaccine series to females at age 13-18 years if not previously vaccinated.

## Meningococcal vaccine.

Minimum age: 11 years for meningococcal conjugate vaccine (MCV4); 2 years for meningococcal polysachride vaccine (MPSV4).

- Administer MCV4 at age 11-12 years and to previously unvaccinated adolescents at high school entry (15 years)
- Administer MCV4 to previously unvaccinated college freshmen living in dorms; MPSV4 is an acceptable alternative.
- Vaccination against invasive meningococcal disease is recommended for children and adolescents aged  $\geq$  2 years with terminal complement deficiencies or anatomic or functional asplenia and certain other high-risk groups.

# Pneumococcal polysachride vaccine (PPV). Minimum age: 2 years

- Administer for certain high-risk groups.

Influenza vaccine. Minimum age: 6 months for trivalent inactivated vaccine (TIV) and 5 years for live, attenuated influenza vaccine (LAIV).

- Influenza vaccine is recommended annually for persons with certain risk factors, health-care workers, and other persons (including household members) in close contact with persons in high-risk groups.
- For healthy persons aged 5-49 year, LAIV may be used as an alternative to TIV
- Children aged < 9 years who are receiving influenza vaccine for the first time should receive 2 dose (separated by >4 weeks for TIV and >4 weeks for LAIV).

# Hepatitis A vaccine (HepA).

Minimum age: 12 months

- The 2 doses in the series should be administered at least 6 months apart
- HepA is recommended for certain other groups of children, including areas where vaccination programs target older children.

# Hepatitis B vaccine (HepB).

Minimum age: birth

- Administer the 3-dose series to those who were not previously vaccinated.
- A 2-dose series of Recombivax HB is licensed for children aged 11-15 years.

# Inactivated poliovirus vaccine (IPV). Minimum age: 6 weeks

- For children who received an all-IPV or all-oral poliovirus (OPV) series, a fourth dose is not necessary if the third dose was administered at age  $>4$  years.
- If both OPV and IPV were administered as part of a series, a total of 4 doses should be administered, regardless of the child's current age.

# Measles, mumps, and rubella vaccine (MMR).

Minimum age: 12 months)

- If not previously vaccinated, administer 2 doses of MMR during any visit, with  $>/4$  weeks between the doses.

# Varicella vaccine.

## Minimum age: 12 months

- Administer 3 doses of varicella vaccine to persons without evidence of immunity.
- Administer 2 doses of varicella vaccine to persons aged <13 years at least 3 months apart. Do not repeat the second dose, if administered >/28 days after the first dose.
- Administer 2 doses of varicella vaccine to persons aged >/13 years at least 4 weeks apart.

- The following is a copy of the catch-up immunization schedule provided for your reference.

## Catch-up Immunization Schedule

### for Persons Aged 4 Months–18 Years Who Start Late or Who Are More Than 1 Month Behind

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.

<b>CATCH-UP SCHEDULE FOR PERSONS AGED 4 MONTHS–6 YEARS</b>					
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
Hepatitis B <sup>1</sup>	<b>Birth</b>	<b>4 weeks</b>	<b>8 weeks</b> (and 16 weeks after first dose)		
Rotavirus <sup>2</sup>	<b>6 wks</b>	<b>4 weeks</b>	<b>4 weeks</b>		
Diphtheria, Tetanus, Pertussis <sup>3</sup>	<b>6 wks</b>	<b>4 weeks</b>	<b>4 weeks</b>	<b>6 months</b>	<b>6 months<sup>4</sup></b>
<i>Haemophilus influenzae</i> type b <sup>4</sup>	<b>6 wks</b>	<b>4 weeks</b> If first dose administered at age <12 months <b>8 weeks (as final dose)</b> If first dose administered at age 12–14 months <b>No further doses needed</b> If first dose administered at age ≥15 months	<b>4 weeks<sup>4</sup></b> If current age <12 months <b>8 weeks (as final dose)<sup>4</sup></b> If current age ≥12 months and second dose administered at age <15 months <b>No further doses needed</b> If previous dose administered at age ≥15 months	<b>8 weeks (as final dose)</b> This dose only necessary for children aged 12 months–5 years who received 3 doses before age 12 months	
Pneumococcal <sup>5</sup>	<b>6 wks</b>	<b>4 weeks</b> If first dose administered at age <12 months and current age <24 months <b>8 weeks (as final dose)</b> If first dose administered at age ≥12 months or current age 24–59 months <b>No further doses needed</b> for healthy children if first dose administered at age ≥24 months	<b>4 weeks</b> If current age <12 months <b>8 weeks (as final dose)</b> If current age ≥12 months <b>No further doses needed</b> for healthy children if previous dose administered at age ≥24 months	<b>8 weeks (as final dose)</b> This dose only necessary for children aged 12 months–5 years who received 3 doses before age 12 months	
Inactivated Poliovirus <sup>6</sup>	<b>6 wks</b>	<b>4 weeks</b>	<b>4 weeks</b>	<b>4 weeks<sup>4</sup></b>	
Measles, Mumps, Rubella <sup>7</sup>	<b>12 mos</b>	<b>4 weeks</b>			
Varicella <sup>8</sup>	<b>12 mos</b>	<b>3 months</b>			
Hepatitis A <sup>9</sup>	<b>12 mos</b>	<b>6 months</b>			
<b>CATCH-UP SCHEDULE FOR PERSONS AGED 7–18 YEARS</b>					
Tetanus, Diphtheria/ Tetanus, Diphtheria, Pertussis <sup>10</sup>	<b>7 yrs<sup>4</sup></b>	<b>4 weeks</b>	<b>8 weeks</b> If first dose administered at age <12 months <b>6 months</b> If first dose administered at age ≥12 months	<b>6 months</b> If first dose administered at age <12 months	
Human Papillomavirus <sup>11</sup>	<b>9 yrs</b>	<b>4 weeks</b>	<b>12 weeks</b>		
Hepatitis A <sup>9</sup>	<b>12 mos</b>	<b>6 months</b>			
Hepatitis B <sup>1</sup>	<b>Birth</b>	<b>4 weeks</b>	<b>8 weeks</b> (and 16 weeks after first dose)		
Inactivated Poliovirus <sup>6</sup>	<b>6 wks</b>	<b>4 weeks</b>	<b>4 weeks</b>	<b>4 weeks<sup>4</sup></b>	
Measles, Mumps, Rubella <sup>7</sup>	<b>12 mos</b>	<b>4 weeks</b>			
Varicella <sup>8</sup>	<b>12 mos</b>	<b>4 weeks</b> If first dose administered at age ≥13 years <b>3 months</b> If first dose administered at age <13 years			

# Lecture Questions

- How does the timing of vaccinations differ for premature versus term infants?
- What is Synagis and who qualifies for it?
- Who does not qualify for Synagis?
- What implications, if any, does Synagis have in regards to the administration of the standard infant vaccines.
- How does the administration of blood products affect the administration of immunizations?
- When should HepBIG be given after birth?
- List some of the newly recommended vaccines on the current vaccination schedule.