

General Recommendations on Immunization

Part One

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June 8, 2016

Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Recommendations and Reports / Vol. 60 / No. 2

January 28, 2011

General Recommendations on Immunization

Recommendations of the Advisory Committee
on Immunization Practices (ACIP)



Continuing Education Examination available at <http://www.cdc.gov/mmwr/cme/conted.html>



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

General Recommendations on Immunization

□ ACIP MMWR Table of Contents

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- Contraindications and precautions
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- Vaccine administration
- Storage and handling
- Altered immunocompetence
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- Vaccination records
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- Vaccine information sources

General Recommendations on Immunization

- **Pink Book chapter**
 - Timing and spacing
 - Contraindications and precautions

Timing and Spacing Issues

- ❑ Interval between receipt of antibody-containing blood products and live vaccines.
- ❑ Interval between doses of different vaccines not administered simultaneously.
- ❑ Interval between subsequent doses of the same vaccine.

Antibody-containing Blood Products

- ❑ **Used to restore a needed component of blood or provide a passive immune response following disease exposure.**
- ❑ **Sometimes circumstance dictates the use of antibody-containing blood products along with a vaccine.**

Antibody and Live Vaccines

General Rule

- ❑ Inactivated vaccines are generally not affected by circulating antibody to the antigen
- ❑ Live, attenuated vaccines might be affected by circulating antibody to the antigen – an effectiveness concern

Antibody Products and Measles- and Varicella-containing Vaccines

Product given first

Action

Vaccine

Wait 2 weeks
before giving antibody

Antibody

Wait at least 3 months
before giving vaccine

Appendix A24: Interval Between Antibody-containing Products and Measles- and Varicella-containing Vaccines

Recommended intervals between administration of immune globulin preparations and measles- or varicella-containing vaccine

Product / Indication	Dose, including mg Immunoglobulin G (IgG)/kg body weight	Recommended interval before measles or varicella-containing vaccine administration ¹
Blood transfusion		
- Red blood cells (RBCs), washed	10 mL/kg (negligible IgG/kg) IV	None
- RBCs, adenine-saline added	10 mL/kg (10 mg IgG/kg) IV	3 months
- Packed RBCs (hematocrit 65%) ²	10 mL/kg (60 mg IgG/kg) IV	6 months
- Whole blood (hematocrit 35%-50%) ²	10 mL/kg (80-100 mg IgG/kg) IV	6 months
- Plasma/platelet products	10 mL/kg (160 mg IgG/kg) IV	7 months
Botulinum Immune Globulin Intravenous (Human)	1.5 mL/kg (75 mg IgG/kg) IV	6 months
Cytomegalovirus IGIV	150 mg/kg maximum	6 months
Hepatitis A IG		
- Contact prophylaxis	0.02 mL/kg (3.3 mg IgG/kg) IM	3 months
- International travel	0.06 mL/kg (10 mg IgG/kg) IM	3 months
Hepatitis B IG (HBIG)		
IGIV	0.06 mL/kg (10 mg IgG/kg) IM	3 months
- Replacement therapy for immune deficiencies ³	300-400 mg/kg IV	8 months
- Immune thrombocytopenic purpura treatment	400 mg/kg IV	8 months
- Measles IG, contact prophylaxis (immunocompromised contact)	400 mg/kg IV	8 months
- Postexposure varicella prophylaxis	400 mg/kg IV	8 months
- Immune thrombocytopenic purpura treatment	1,000 mg/kg IV	10 months
Measles IG, contact prophylaxis	0.5 mL/kg (80 mg IgG/kg) IM	6 months
- Standard (i.e., nonimmunocompromised) contact		
Monoclonal antibody to respiratory syncytial virus F protein (Synagis™) ⁴	15 mg/kg (IM)	None
Rabies IG (RIG)	20 IU/kg (22 mg IgG/kg) IM	4 months
Tetanus IG (TIG)	250 units (10 mg IgG/kg) IM	3 months
Varicella IG ⁵	125 units/10 kg (60-200 mg IgG/kg) IM, maximum 625 units	5 months

Spacing of Antibody-containing Products and MMR and Varicella Vaccines

<u>Product</u>	<u>Interval</u>
Washed red blood cells	0 months
Hepatitis A (IG)	3 months
Measles prophylaxis (IG) (immunocompetent recipient)	6 months
Plasma/platelet products	7 months
Intravenous immune globulin (IGIV)	7-11 months

Exceptions to the General Rule

- ❑ Antibody-vaccine spacing recommendations apply specifically to MMR and varicella-containing vaccines.
- ❑ Do NOT apply to:
 - Zoster vaccine (large amount of virus in the vaccine)
 - Yellow fever, oral typhoid (negligible antibody in the U.S. blood supply)
 - LAIV (viruses change annually)
 - Rotavirus (replication in GI tract)

Interval Between Doses of Different Vaccines

- ❑ Simultaneous administration
- ❑ Non-simultaneous administration

Simultaneous Administration

General Rule

- All vaccines can be administered at the same visit as all other vaccines.
- Exceptions:
 - PCV13 and PPSV23: Give PCV13 first
 - MCV4-D (**Menactra only**) and PCV13 in asplenic persons: Give PCV13 first

Non-simultaneous Administration: Live-vaccine Effectiveness

Combination

2 live injected OR
1 live injected and 1
intranasal influenza
vaccine

All other vaccines

Minimum interval

4 weeks

None

Spacing of Live Vaccines Not Given Simultaneously

- ❑ If 2 live parenteral or intranasal vaccines are given less than 28 days apart, the vaccine given second should be repeated.
- ❑ Antibody response from first vaccine interferes with replication of second vaccine.

Intervals Between Doses

General Rule

- ❑ **Increasing** the interval between doses of a multidose vaccine does not diminish the effectiveness of the vaccine.

Extended Interval Between Doses

- ❑ Not all variations among all schedules for all vaccines have been studied
- ❑ Available studies of extended intervals have shown no significant difference in final titer
- ❑ It is not necessary to restart the series or add doses because of an extended interval between doses

Intervals Between Doses

General Rule

- ❑ Increasing the interval between doses of a multidose vaccine does not diminish the effectiveness of the vaccine.
- ❑ Decreasing the interval between doses of a multidose vaccine may interfere with antibody response and protection.

Recommended and Minimum Ages and Intervals Between Doses of Routinely Recommended Vaccines ^{1,2,3,4}				
Vaccine and dose number	Recommended age for this dose	Minimum age for this dose	Recommended interval to next dose	Minimum interval to next dose
Diphtheria-tetanus-acellular pertussis (DTaP)-1 ⁵	2 months	6 weeks	8 weeks	4 weeks
DTaP-2	4 months	10 weeks	8 weeks	4 weeks
DTaP-3	6 months	14 weeks	6-12 months	6 months ⁹
DTaP-4	15-18 months	15 months ⁷	3 years	6 months
DTaP-5	4-6 years	4 years	—	—
<i>Haemophilus influenzae</i> type b (Hib)-1 ^{6,8}	2 months	6 weeks	8 weeks	4 weeks
Hib-2	4 months	10 weeks	8 weeks	4 weeks
Hib-3 ⁹	6 months	14 weeks	6-9 months	8 weeks
Hib-4	12-15 months	12 months	—	—
Hepatitis A (HepA)-1	12-23 months	12 months	6-18 months	6 months
HepA-2	≥18 months	18 months	—	—
Hepatitis B (HepB)-1 ⁵	Birth	Birth	4 weeks-4 months	4 weeks
HepB-2	1-2 months	4 weeks	8 weeks-17 months	8 weeks
HepB-3 ¹⁰	6-18 months	24 weeks	—	—
Herpes zoster (HZV) ¹¹	≥60 years	60 years	—	—
Human papillomavirus (HPV)-1 ¹²	11-12 years	9 years	8 weeks	4 weeks
HPV-2	11-12 years (+ 2 months)	9 years (+ 4 weeks)	4 months	12 weeks ¹³
HPV-3 ¹³	11-12 years (+ 6 months)	9 years (+24 weeks)	—	—
Influenza, inactivated (IIV) ¹⁴	≥6 months	6 months ¹⁵	4 weeks	4 weeks
Influenza, live attenuated (LAIV) ¹⁴	2-49 years	2 years	4 weeks	4 weeks
Measles-mumps-rubella (MMR)-1 ¹⁶	12-15 months	12 months	3-5 years	4 weeks
MMR-2 ¹⁶	4-6 years	13 months	—	—
Meningococcal conjugate (MCV)-1 ¹⁷	11-12 years	6 weeks ¹⁹	4-5 years	8 weeks
MCV-2	16 years	11 years (+ 8 weeks)	—	—
Meningococcal polysaccharide (MPSV4)-1 ¹⁷	—	2 years	5 years	5 years
MPSV4-2	—	7 years	—	—
Pneumococcal conjugate (PCV)-1 ⁹	2 months	6 weeks	8 weeks	4 weeks
PCV-2	4 months	10 weeks	8 weeks	4 weeks
PCV-3	6 months	14 weeks	6 months	8 weeks
PCV-4	12-15 months	12 months	—	—
Pneumococcal polysaccharide (PPSV)-1	—	2 years	5 years	5 years
PPSV-2 ¹⁸	—	7 years	—	—
Poliovirus, Inactivated (IPV)-1 ⁵	2 months	6 weeks	8 weeks	4 weeks
IPV-2	4 months	10 weeks	8 weeks-14 months	4 weeks
IPV-3	6-18 months	14 weeks	3-5 years	6 months
IPV-4 ²⁰	4-6 years	4 years	—	—
Rotavirus (RV)-1 ²¹	2 months	6 weeks	8 weeks	4 weeks
RV-2	4 months	10 weeks	8 weeks	4 weeks
RV-3 ²²	6 months	14 weeks	—	—
Tetanus-diphtheria (Td)	11-12 years	7 years	10 years	5 years
Tetanus-diphtheria-acellular pertussis (Tdap) ²³	≥11 years	7 years	—	—
Varicella (Var)-1 ¹⁸	12-15 months	12 months	3-5 years	12 weeks ²⁴
Var-2 ¹⁶	4-6 years	15 months ²⁵	—	—

Appendix A

Recommended and Minimum Ages and Intervals Between Doses of Routinely Recommended Vaccines^{1,2,3,4}

Vaccine and dose number	Recommended age for this dose	Minimum age for this dose	Recommended interval to next dose	Minimum interval to next dose
Diphtheria-tetanus-acellular pertussis (DTaP)-1 ⁵	2 months	6 weeks	8 weeks	4 weeks
DTaP-2	4 months	10 weeks	8 weeks	4 weeks
DTaP-3	6 months	14 weeks	6-12 months	6 months ⁶
DTaP-4	15-18 months	15 months ⁷	3 years	6 months
DTaP-5	4-6 years	4 years	—	—
<i>Haemophilus influenzae</i> type b (Hib)-1 ^{6,8}	2 months	6 weeks	8 weeks	4 weeks
Hib-2	4 months	10 weeks	8 weeks	4 weeks
Hib-3 ⁹	6 months	14 weeks	6-9 months	8 weeks
Hib-4	12-15 months	12 months	—	—
Hepatitis A (HepA)-1	12-23 months	12 months	6-18 months	6 months

Minimum Intervals and Ages

- ❑ Vaccine doses should not be administered at intervals less than the minimum intervals or earlier than the minimum age.

When Can Minimum Intervals Be Used?

- ❑ Catch-up for a lapsed vaccination schedule
- ❑ Impending international travel
- ❑ NOT to be used routinely

Contraindications and Precautions

Vaccine Adverse Reaction

□ Adverse reaction

- Extraneous effect caused by vaccine
- “Side effect”

Vaccine Adverse Reaction

❑ Adverse reaction

❑ Adverse event

- Any medical event following vaccination
- May be true adverse reaction
- May be only coincidental

Vaccine Adverse Reactions

□ Local

- Pain, swelling, redness at site of injection
- Common with inactivated vaccines
- Usually mild and self-limited

Vaccine Adverse Reactions

□ Local

□ Systemic

- Fever, malaise, headache
- Nonspecific
- May be unrelated to vaccine

Live, Attenuated Vaccines

- ❑ Must replicate to produce immunity
- ❑ Symptoms usually mild
- ❑ Occur after an incubation period (usually 3-21 days)

Vaccine Adverse Reactions

- Local

- Systemic

- Allergic

- Due to vaccine or vaccine component
- Rare
- Risk minimized by screening

Contraindication

- ❑ A condition in a recipient that greatly increases the chance of a serious adverse event

Precaution

- ❑ A condition in a recipient that may increase the chance or severity of an adverse event

OR

- ❑ May compromise the ability of the vaccine to produce immunity

Permanent Contraindications

- ❑ Severe allergic reaction to a prior dose of vaccine or to a vaccine component

Permanent Contraindications

❑ Rotavirus vaccines only

- Severe Combined Immunodeficiency disease (SCID)
- History of intussusception

❑ Pertussis vaccines only

- Encephalopathy not due to another identifiable cause occurring within 7 days of pertussis vaccination

Contraindications and Precautions

<u>Condition</u>	<u>Live</u>	<u>Inactivated</u>
Allergy to component	C	C
Encephalopathy	---	C
Pregnancy	C	V*
Immunosuppression	C	V
Moderate/severe illness	P	P
Recent blood product	P**	V

C=contraindication

P=precaution

V=vaccinate if indicated

*Except HPV

**MMR and varicella-containing (except zoster vaccine and LAIV)

Appendix A

Guide to Contraindications and Precautions to Commonly Used Vaccines^{1,*†} (page 1 of 2)

Vaccine	Contraindications	Precautions
Hepatitis B (HepB)	<ul style="list-style-type: none"> Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component 	<ul style="list-style-type: none"> Moderate or severe acute illness with or without fever Infant weighing less than 2000 grams (4 lbs, 6.4 oz)²
Rotavirus (RV5 [RotaTeq], RV1 [Rotarix])	<ul style="list-style-type: none"> Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Severe combined immunodeficiency (SCID) History of intussusception 	<ul style="list-style-type: none"> Moderate or severe acute illness with or without fever Altered immunocompetence other than SCID Chronic gastrointestinal disease¹ Spina bifida or bladder exstrophy¹
Diphtheria, tetanus, pertussis (DTaP) Tetanus, diphtheria, pertussis (Tdap) Tetanus, diphtheria (DT, Td)	<ul style="list-style-type: none"> Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component For pertussis-containing vaccines: encephalopathy (e.g., coma, decreased level of consciousness, prolonged seizures) not attributable to another identifiable cause within 7 days of administration of a previous dose of DTP or DTaP (for DTaP²), or of previous dose of DTP, DTaP, or Tdap (for Tdap) 	<ul style="list-style-type: none"> Moderate or severe acute illness with or without fever Guillain-Barré syndrome (GBS) within 6 weeks after a previous dose of tetanus toxoid-containing vaccine History of Arthus-type hypersensitivity reactions after a previous dose of tetanus or diphtheria toxoid-containing vaccine; defer vaccination until at least 10 years have elapsed since the last tetanus-toxoid containing vaccine For pertussis-containing vaccines: progressive or unstable neurologic disorder (including infantile spasms for DTaP), uncontrolled seizures, or progressive encephalopathy until a treatment regimen has been established and the condition has stabilized <p>For DTaP only:</p> <ul style="list-style-type: none"> Temperature of 105° F or higher (40.5° C or higher) within 48 hours after vaccination with a previous dose of DTP/DTaP Collapse or shock-like state (i.e., hypotonic hyporesponsive episode) within 48 hours after receiving a previous dose of DTP/DTaP Seizure within 3 days after receiving a previous dose of DTP/DTaP Persistent, inconsolable crying lasting 3 or more hours within 48 hours after receiving a previous dose of DTP/DTaP
<i>Haemophilus influenzae</i> type b (Hib)	<ul style="list-style-type: none"> Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Age younger than 6 weeks 	<ul style="list-style-type: none"> Moderate or severe acute illness with or without fever
Inactivated poliovirus vaccine (IPV)	<ul style="list-style-type: none"> Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component 	<ul style="list-style-type: none"> Moderate or severe acute illness with or without fever Pregnancy
Pneumococcal (PCV13 or PPSV23)	<ul style="list-style-type: none"> Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component (including, for PCV13, to any diphtheria toxoid-containing vaccine) 	<ul style="list-style-type: none"> Moderate or severe acute illness with or without fever
Measles, mumps, rubella (MMR) ¹	<ul style="list-style-type: none"> Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy¹ or patients with human immunodeficiency virus [HIV] infection who are severely immunocompromised¹) Pregnancy 	<ul style="list-style-type: none"> Moderate or severe acute illness with or without fever Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product)¹ History of thrombocytopenia or thrombocytopenic purpura Need for tuberculin skin testing¹
Varicella (Var) ⁴	<ul style="list-style-type: none"> Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy¹ or patients with HIV infection who are severely immunocompromised¹) Pregnancy 	<ul style="list-style-type: none"> Moderate or severe acute illness with or without fever Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product)¹ Receipt of specific antivirals (i.e., acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination; avoid use of these antiviral drugs for 14 days after vaccination.
Hepatitis A (HepA)	<ul style="list-style-type: none"> Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component 	<ul style="list-style-type: none"> Moderate or severe acute illness with or without fever

(continued on page 2)

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

Appendix A-28

www.immunize.org/catg.d/p3072a.pdf • Item #P3072a (3/15)

Centers for Disease Control and Prevention
Epidemiology and Prevention of Vaccine-Preventable Diseases, 13th Edition

April, 2015

Included in Pink Book Appendix A-28-30

Vaccination During Pregnancy

- ❑ Live vaccines should not be administered to women known to be pregnant.
- ❑ In general, inactivated vaccines may be administered to pregnant women for whom they are indicated.
- ❑ HPV vaccine should be deferred during pregnancy.

Vaccination During Pregnancy

□ Inactivated vaccines

- Routine
 - Influenza – any trimester
 - Tdap – 27 to 36 weeks
- Vaccinate if indicated (HepA, HepB, MenACWY)
- Withhold (HPV)
- Vaccinate if increased risk (all others except PCV13, Hib, MenB)

Vaccination of Immunosuppressed Persons

- ❑ Live vaccines should not be administered to severely immunosuppressed persons.
- ❑ Persons with isolated B-cell deficiency may receive varicella vaccine.
- ❑ Inactivated vaccines are safe to use in immunosuppressed persons, but the response to the vaccine may be decreased.

Immunosuppression

□ Disease

- Congenital immunodeficiency
- Leukemia or lymphoma
- Generalized malignancy

□ Cancer Therapy

- Alkylating agents
- Antimetabolites
- Radiation

Immunosuppressive Drugs

- ❑ Immune mediators
- ❑ Immune modulators
- ❑ Iso-antibodies (therapeutic monoclonal antibodies)
 - Antitumor necrosis factor agents

Corticosteroids and Immunosuppression

- ❑ The amount or duration of corticosteroid therapy needed to increase adverse event risk is not well-defined.
- ❑ Dose generally believed to be a concern:
 - 20 mg or more/day of prednisone for 2 weeks or longer
 - 2 mg/kg per day or more of prednisone for 2 weeks or longer

Corticosteroids and Immunosuppression

- ❑ Does NOT apply to aerosols, topical, alternate-day, short courses (less than 2 weeks), physiologic replacement schedules
- ❑ Delay live vaccines for at least 1-3 months after discontinuation of high-dose therapy

Vaccination of Immunosuppressed Persons

□ Safety:

- Immunocompromised persons are at increased risk of adverse events following live vaccines.
- Live vaccines may be administered at least 3 months following termination of chemotherapy (at least 1 month after high-dose steroid use of 2 weeks or more).
- LAIV, MMR, varicella, and rotavirus vaccines may be administered to susceptible household and other close contacts.

Vaccination of Immunosuppressed Persons

- ❑ Safety and efficacy
- ❑ Anti-tumor necrosis factor inhibitors
 - Generally can treat like steroids
 - Some experts recommend waiting longer than 1 month after vaccination with live or inactivated vaccines
- ❑ Other iso-antibodies (e.g., lymphocyte depleting agents)
 - Some experts recommend up to 6 months

Persons with HIV Infection

- Persons with HIV/AIDS are at increased risk for complications of measles, varicella, influenza, and pneumococcal disease.

Live, Attenuated Vaccines for Persons with HIV/AIDS*

<u>Vaccine</u>	<u>Asymptomatic</u>	<u>Symptomatic*</u>
Varicella	Yes	No
Zoster	No	No
MMR	Yes	No
MMRV	No	No
LAIV	No	No
Rotavirus	Consider	Consider
Yellow Fever	Consider	No

Yes=vaccinate No=do not vaccinate

*See specific ACIP recommendations for details.