



Principles of Vaccination

Pink Book Web-on-Demand Series July 5, 2022

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Learning Objectives

- Describe the Advisory Committee on Immunization Practices General Best Practice Guidelines on Immunization.
- 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.
- Implement disease detection and prevention health care services (e.g., smoking cessation, weight reduction, diabetes screening, blood pressure screening, immunization services) to prevent health problems and maintain health.

Continuing Education Information

- CE credit, go to: <https://tceols.cdc.gov/>
- Search course number: WD4564-070522
- CE credit expires: July 1, 2024
- CE instructions are available on the Pink Book Web-on-Demand Series web page
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1

Immunity

Human Immune System

- **Complex network of interacting cells and proteins whose purpose is to identify, and eliminate, foreign substances**

Immunity

- **The ability of the human body to:**
 - Tolerate the presence of material indigenous to the body, and
 - To eliminate foreign substances

- **Self vs. “non-self”**

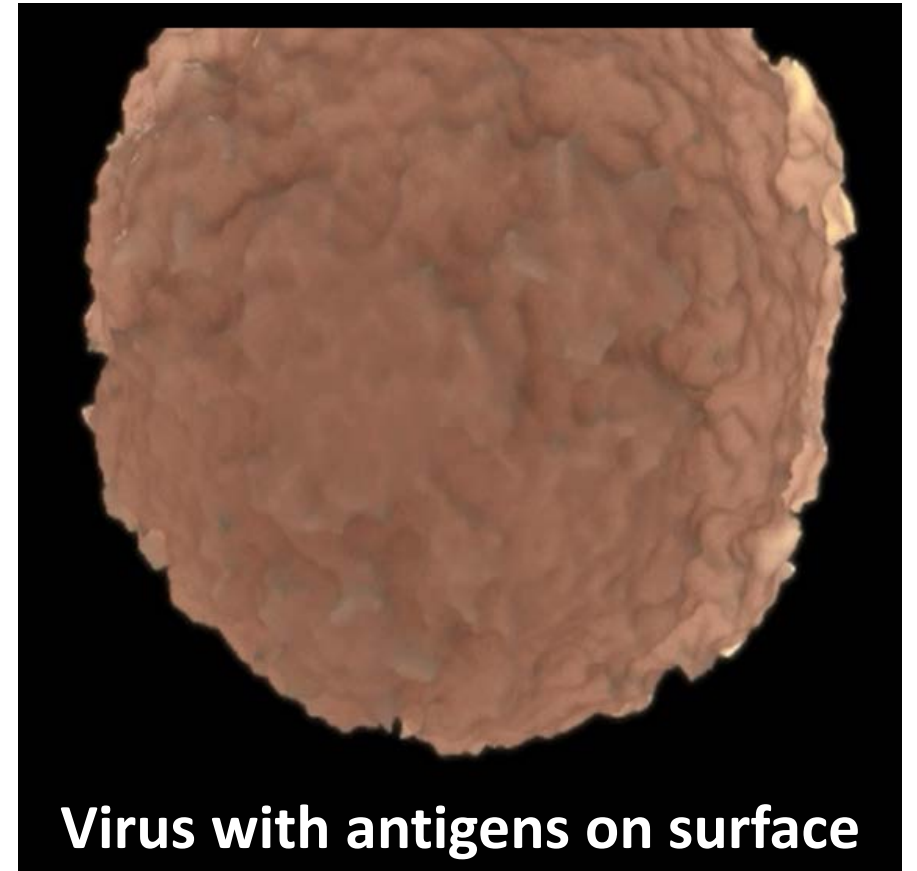
Immunity, cont.

- **Most organisms recognized as foreign**
 - Virus, bacteria, fungi
 - Immune system provides protection from infectious diseases

- **Immunity is generally specific to a single organism**
 - Or a group of closely related organisms

Antigen

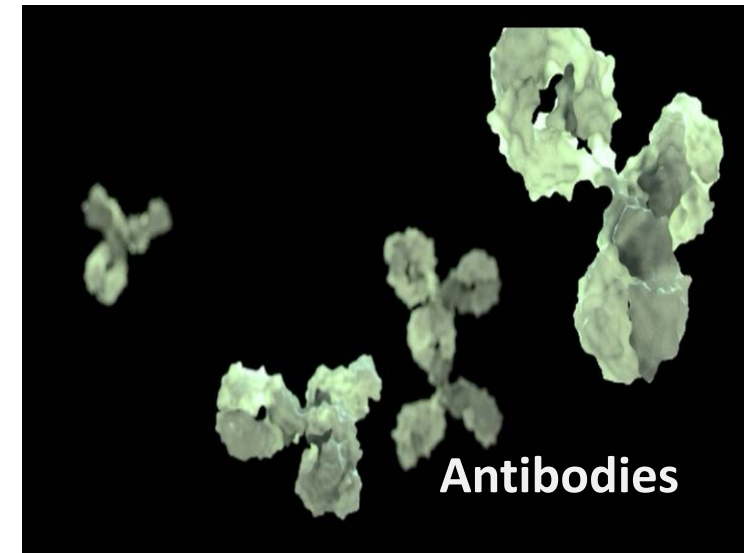
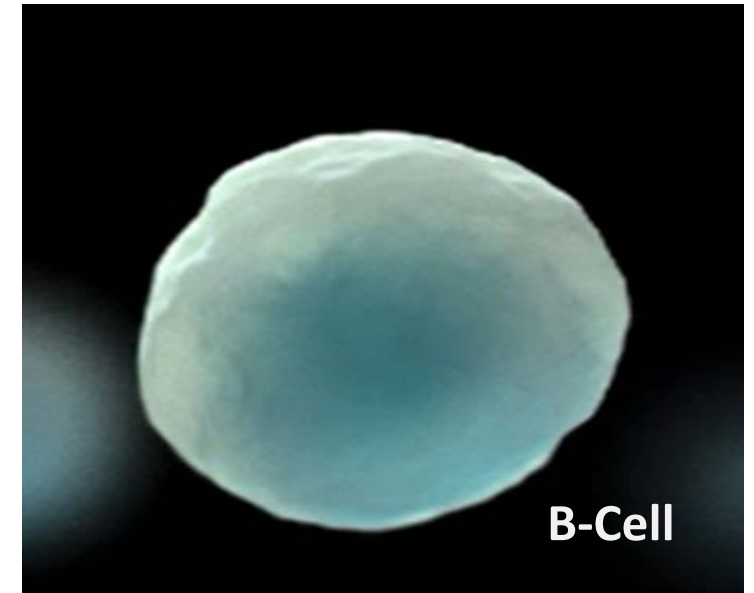
- **Live or inactivated substances (e.g., viruses, bacteria, toxins)**
 - Capable of stimulating an immune response
- **Antigen = antibody generator**



Antibody

- Protein molecules (immunoglobulins)
- Help infection-fighting cells recognize and kill the microorganism

- Antibodies = are produced by the body



Arms of the Immune System

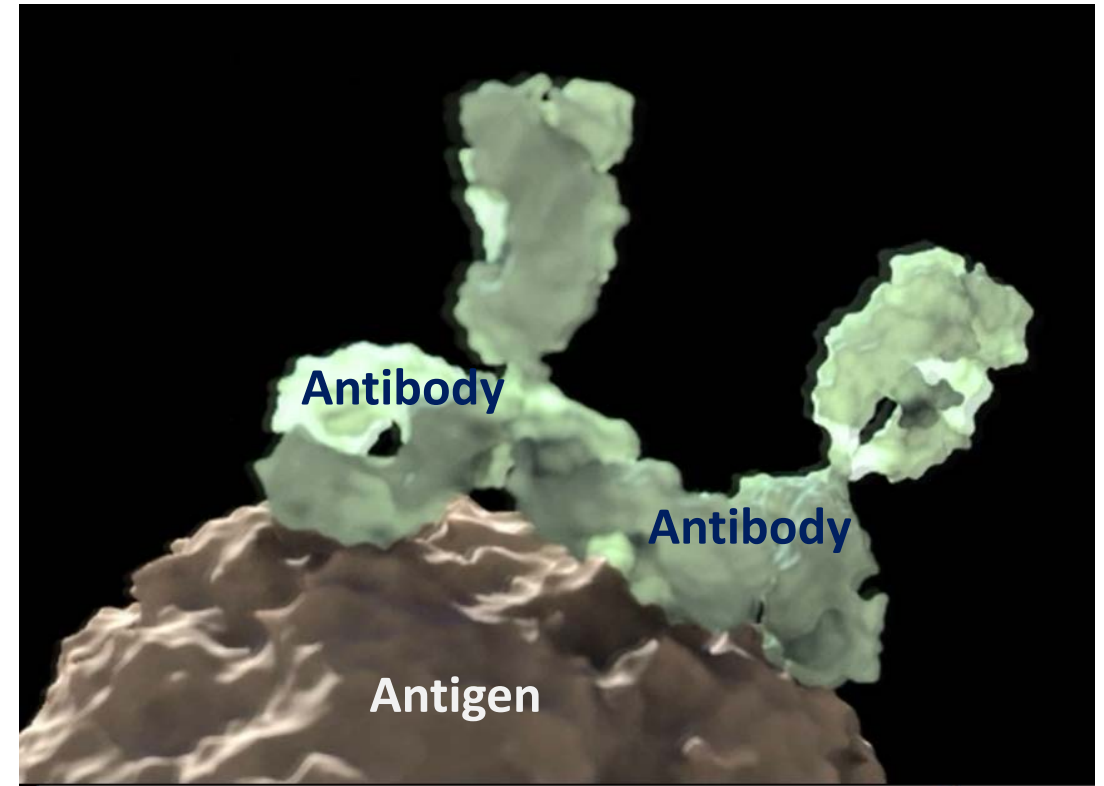
- Humoral
- Cell-mediated

Antigen

Arms of the Immune System, cont.

■ Humoral

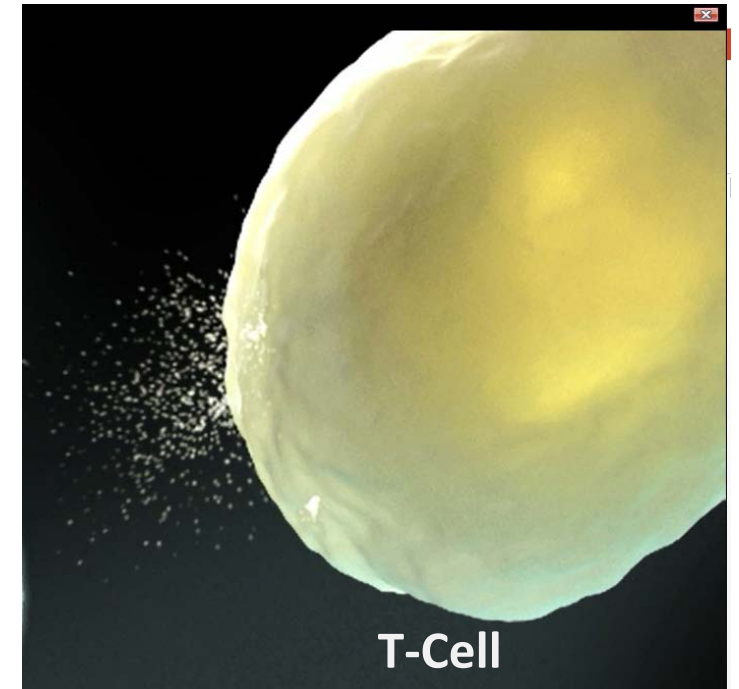
- Antibodies attach to invading organism and interfere with its ability to produce more invading organisms
- Antibodies are produced by B-cells (lymphocytes) to bind to a corresponding antigen (lock and key mechanism)
- B-cells develop in the bone marrow



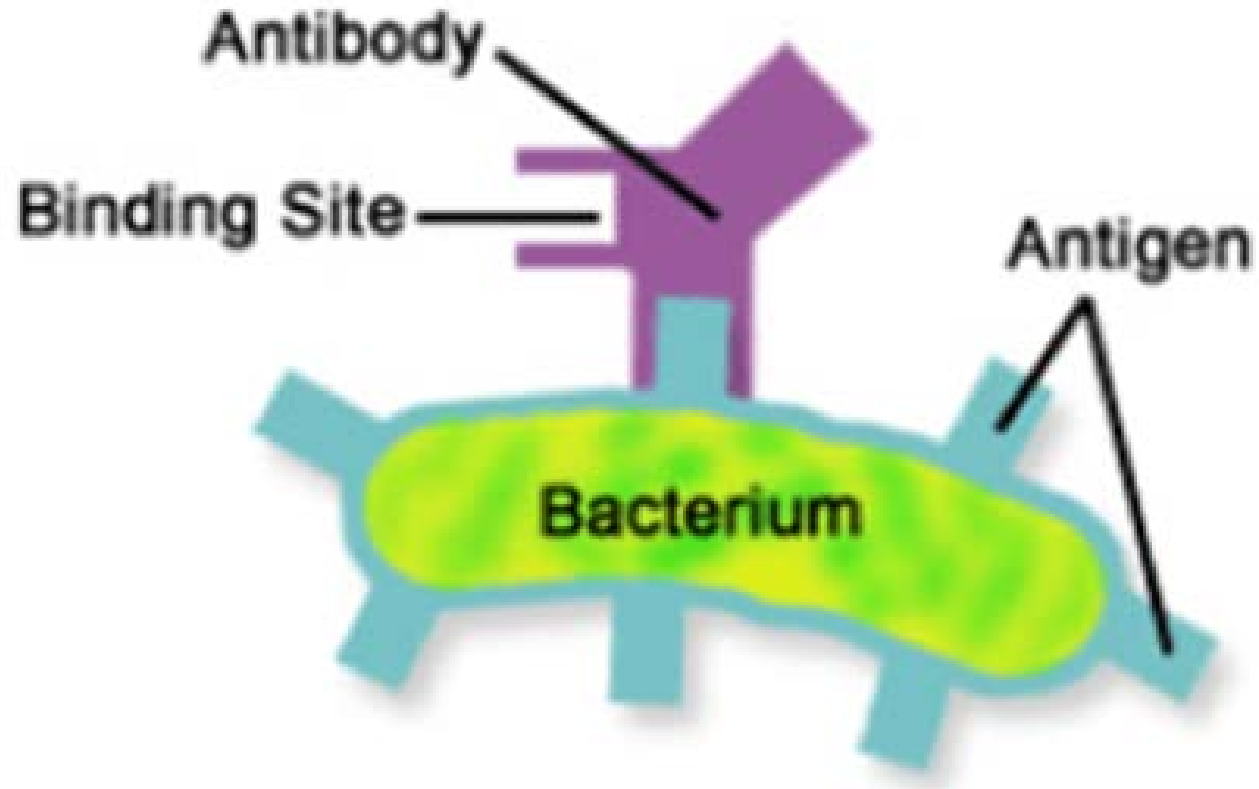
Antibodies attaching to antigens

Arms of the Immune System, cont.

- **Cell-mediated**
 - Involves the activation of T-cells, macrophages, and other substances that eliminate the antigen
 - T-cells mature in the thymus gland



Immune System



Knowledge Check

- Which of the following helps infection-fighting cells recognize and kill a microorganism?
 - A. Antigen
 - B. Antibody



Answer

- Which of the following helps infection-fighting cells recognize and kill a microorganism?
 - A. ~~Antigen~~
 - B. Antibody



2

**Types of
Immunity:
Passive and
Active**

Types of Immunity

- **Passive immunity**
- **Active immunity**

Passive Immunity

- **Transfer of antibody produced by one human or animal to another**
 - Transfer of antibody through placenta – important to protect infants
- **Temporary protection that wanes with time**

Sources of Passive Immunity

- **Many types of blood or blood products**
- **Homologous pooled human antibody (immune globulin or IG)**
 - IgG antibody from the blood of thousands of adult donors
 - Hepatitis A and measles post-exposure prophylaxis (PEP)

Sources of Passive Immunity, cont.

- **Homologous human hyperimmune globulin (e.g., HBIG)**
 - From donors with high concentrations of a specific antibody
 - HBIG, RIG, TIG, VariZIG, VIG
- **Heterologous hyperimmune serum**
 - Antitoxin (e.g., diphtheria antitoxin)
 - Serum sickness

Sources of Passive Immunity, cont.

■ Monoclonal antibodies

- Derived from a single type, or clone, of antibody-producing cells (B-cells)
 - Immune globulin from human sources is polyclonal (contains many kinds of antibodies)
- Antibody is specific to a single antigen or closely related group of antigens
- Used for diagnosis of and therapy for certain cancers and autoimmune and infectious diseases, as well as prevention of transplant rejection
- Monoclonal-antibody-derived drugs end in –mab (i.e., palivizumab)

Antibody for Prevention of RSV

- **Palivizumab (Synagis)**

- Monoclonal
- Contains only RSV antibody
- Will not interfere with the response to a live-virus vaccine

Passive Immunity Video



Active Immunity

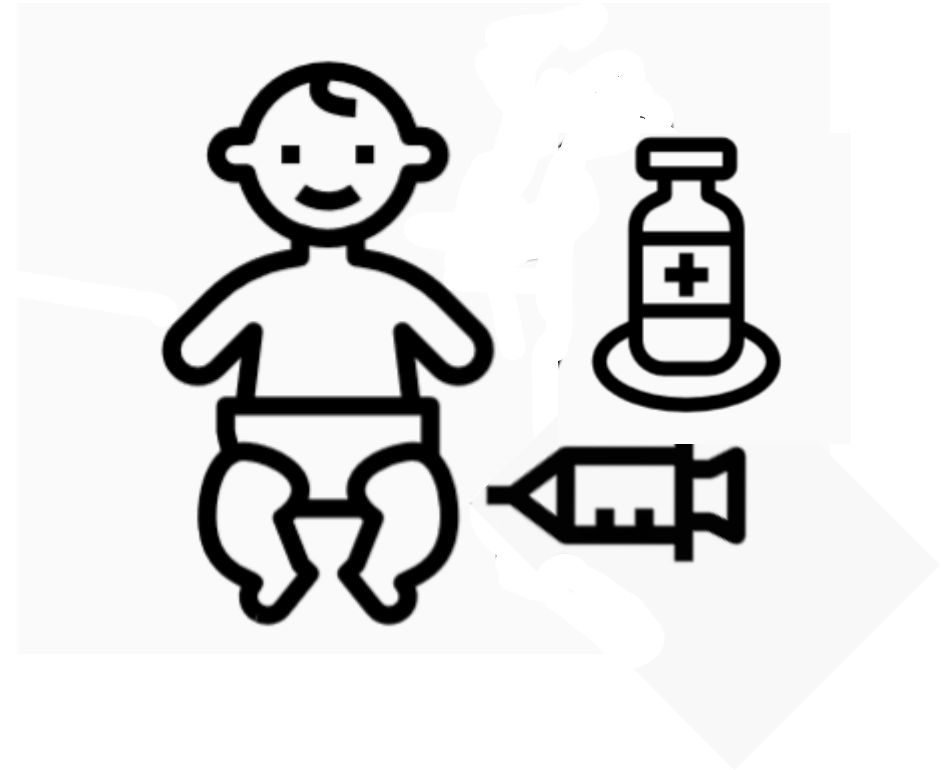
- Protection produced by a person's own immune system
- Lasts for many years, often lifetime

Sources of Active Immunity

- Infection with disease-causing form of organism



- Vaccination



Vaccination

- **Active immunity produced by vaccine**
 - Vaccine delivers an attenuated (weakened, nonpathogenic) or dead form of the pathogen
- **Immunity and immunologic memory similar to natural infection but without risk of disease**
 - Immunologic memory allows for an anamnestic response after the primary immune response so that antibody reappears when the antigen is introduced

Active Immunity Video



Knowledge Check

- Which type of immunity lasts longer?
 - A. Passive immunity
 - B. Active immunity



Answer

- Which type of immunity lasts longer?
- ~~A. Passive immunity~~
- **B. Active Immunity**



3

**Principles of
Vaccination**

Principles of Vaccination

■ General rule:

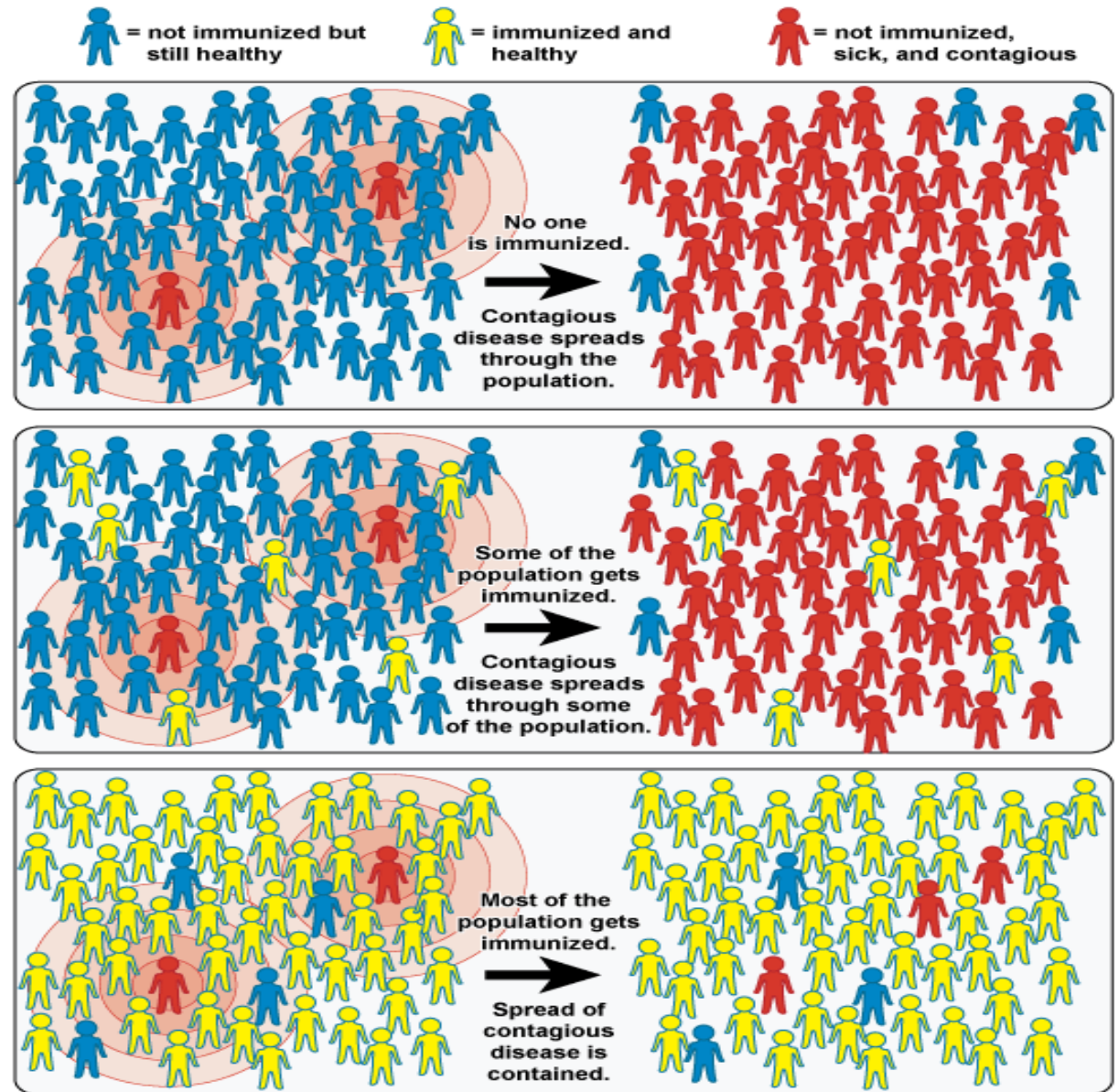
- The more similar a vaccine is to the natural disease, the better the immune response to the vaccine.

Factors that Affect Immune Response to Vaccines

- **Presence of maternal antibodies**
- **Nature and amount of antigen in vaccine**
- **Route of administration**
- **Presence of an adjuvant (ingredient that promotes a stronger immune response)**
- **Storage and handling of vaccine**
- **Vaccine recipient**
 - Age
 - Nutritional status
 - Genetics
 - Coexisting disease

Community Immunity

- When a significant portion of the population is immune and provides protection for individuals who are not immune
- Also known as *herd immunity*



4

**Classification
of Vaccines**

Classification of Vaccines

- **Live**

- Most live vaccines used in the United States are “live attenuated,” meaning that the microbe in the vaccine is alive but has been weakened (attenuated)

- **Non-live**

Classification of Vaccines, cont.

- **Live**

- Viral or bacterial

- **Non-live**

- Viral or bacterial

Classification of Vaccines, cont.

- **Live**

- **Non-live**
 - Whole-cell
 - Subunit
 - Toxoid
 - Recombinant
 - mRNA

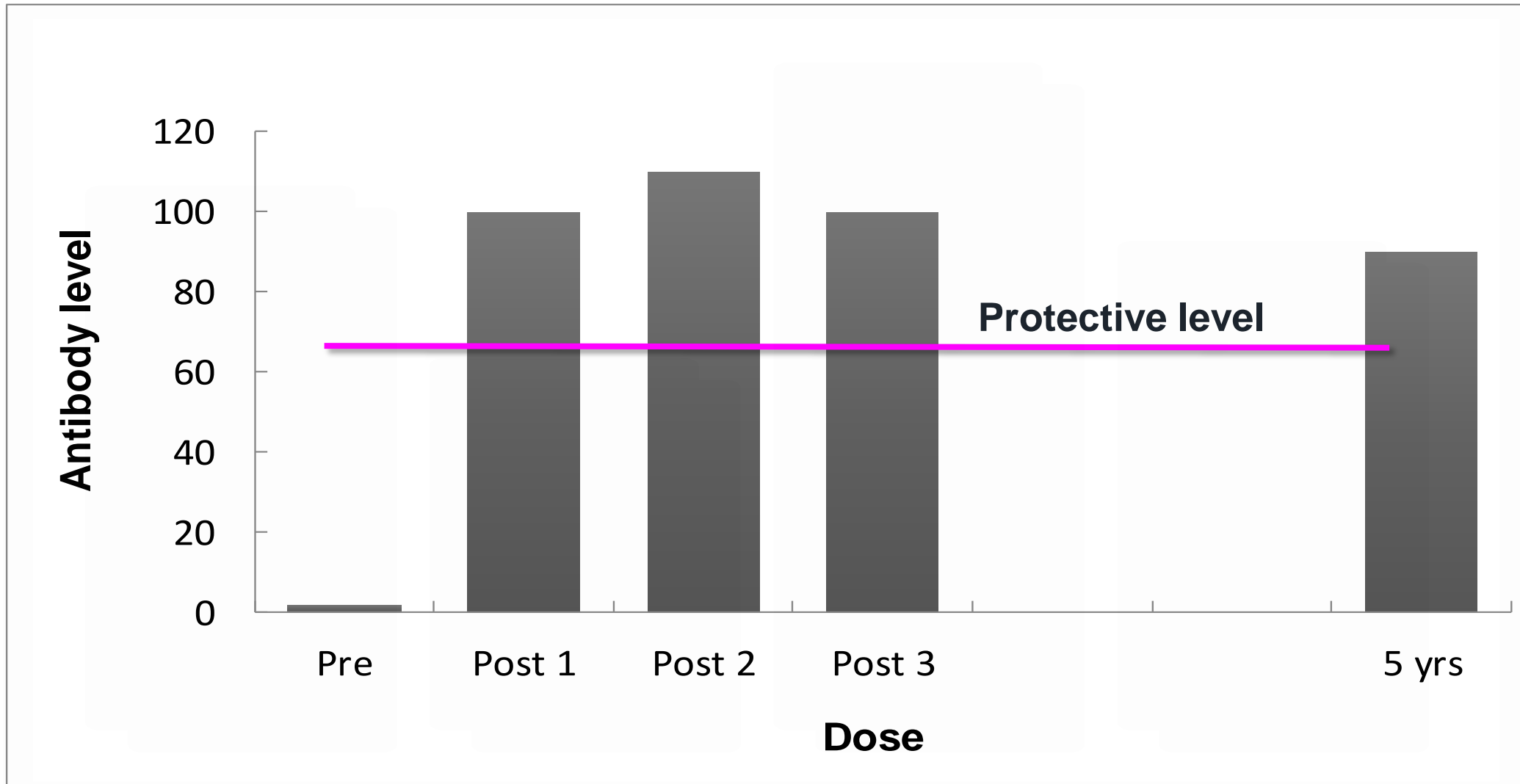
Live Vaccines

- **“Wild” virus or bacterium weakened by repeated passage in culture media**
- **Must replicate to produce an immune response**
- **Immune response virtually identical to natural infection**
- ***Usually* produce immunity with 1 dose**
 - Except those administered orally

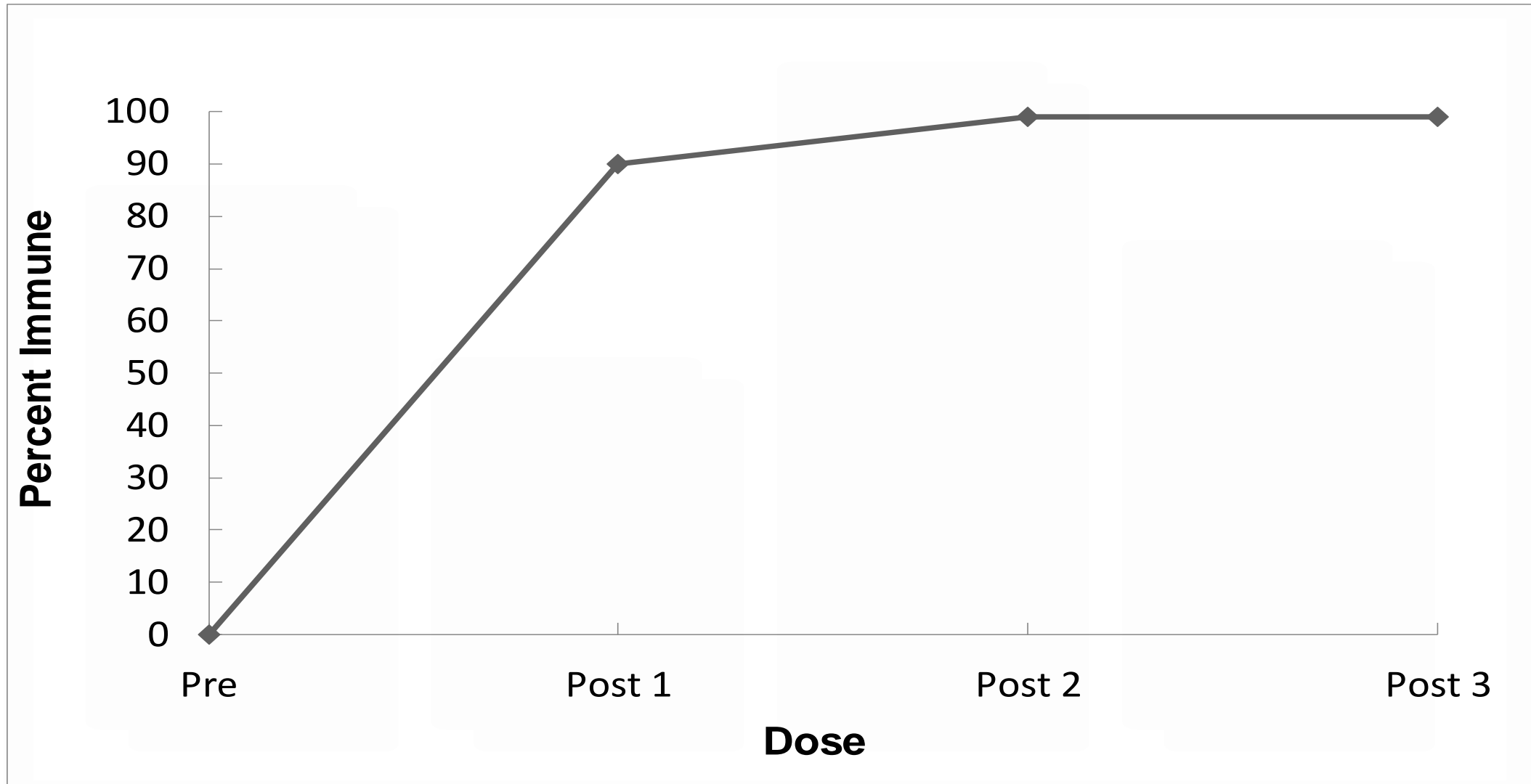
Live Vaccines, cont.

- **Severe reactions possible in persons with immune compromise**
- **Interference from circulating antibody**
- **Fragile – must be stored and handled carefully**

Individual Response to Live Vaccine



Population Response to Live Vaccine



Live, Attenuated Vaccines

■ Viral

MMR, varicella, rotavirus, LAIV (intranasal influenza), dengue, yellow fever, oral adenovirus,* oral polio,** Ebola, smallpox***

■ Bacterial

BCG,**** oral typhoid, oral cholera

*Live, but not attenuated

**Not used in the United States

***Jynneos vaccine does not replicate and behaves like non-live vaccine

****Not used in the United States for routine TB protection

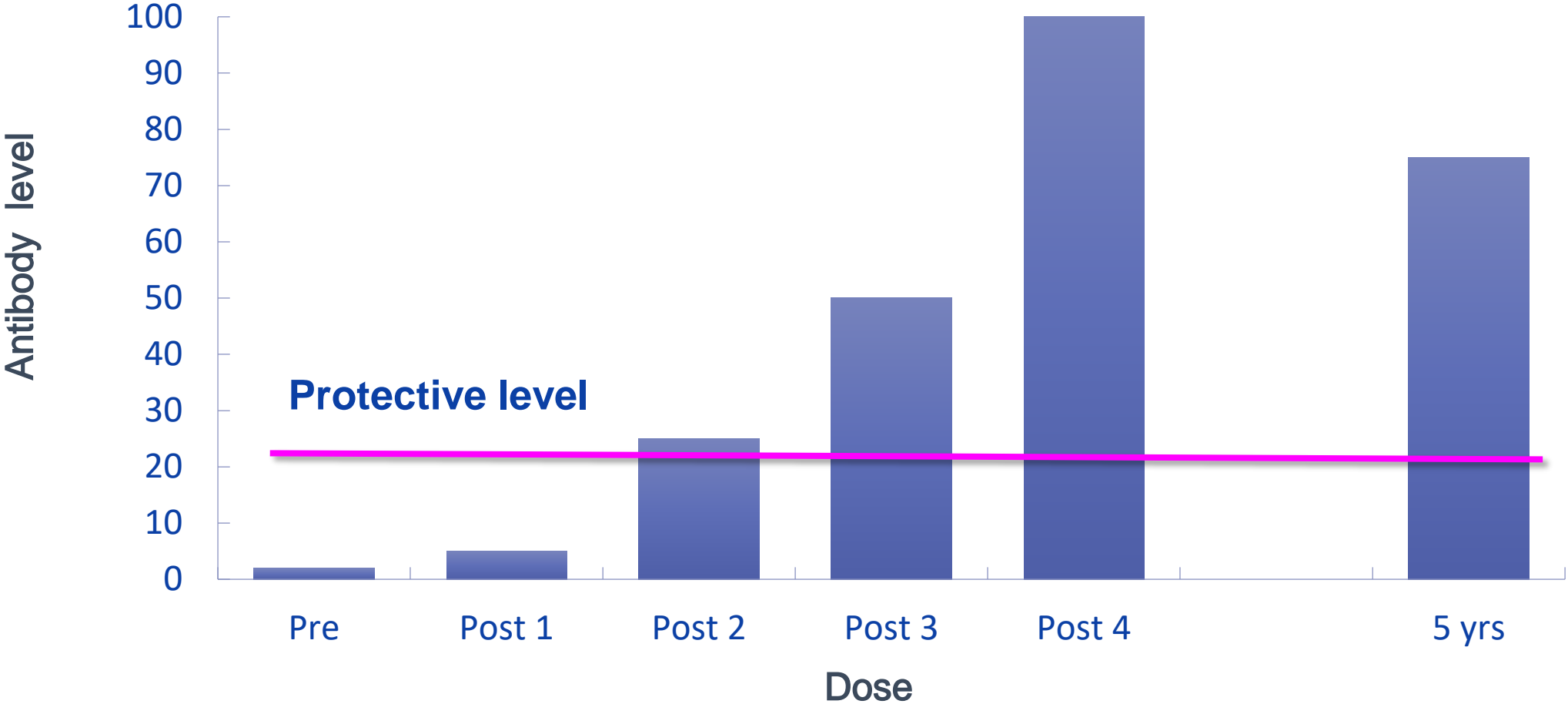
Live Vaccine Video



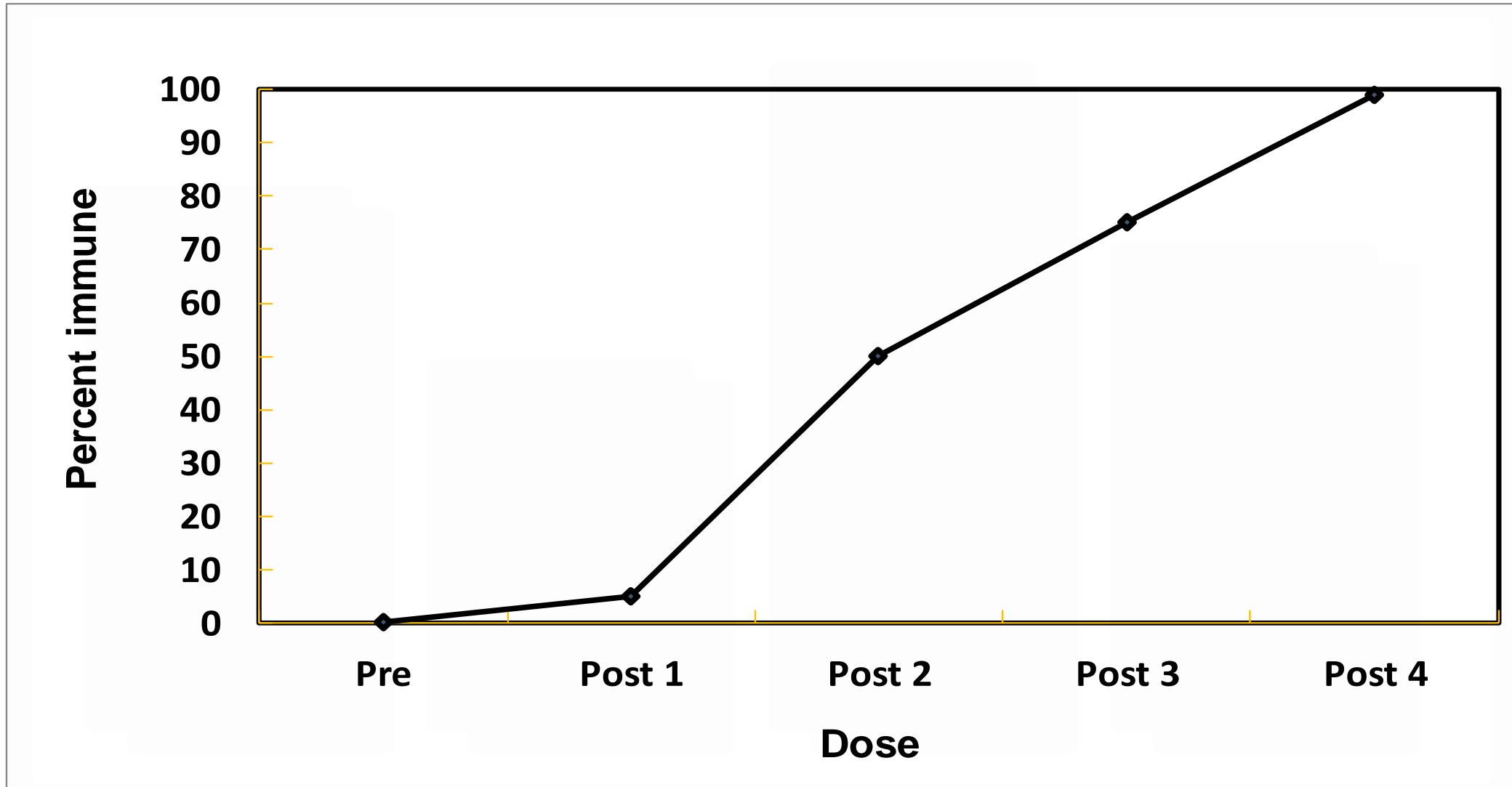
Non-live Vaccines

- **Cannot replicate**
- **Immune response mostly humoral**
- **Less affected by circulating antibody than live vaccines**
- **Require multiple doses/periodic supplemental doses**
- **Antibody titer diminishes with time**

Individual Response to Non-live Vaccine



Population Response to Non-live Vaccine



Non-live Vaccines

- **Whole-cell**

- Polio, hepatitis A, rabies

- **Subunit**

- Antigens can be protein, polysaccharide, or combination of polysaccharide and protein molecule (i.e., conjugate vaccine)

- **Toxoid**

- Diphtheria, tetanus

- **Recombinant**

- Hepatitis B, HPV

- **mRNA**

Non-live Vaccine Video



Knowledge Check

- Which type of vaccine must replicate to generate an immune response?
 - A. Live vaccine
 - B. Non-live vaccine

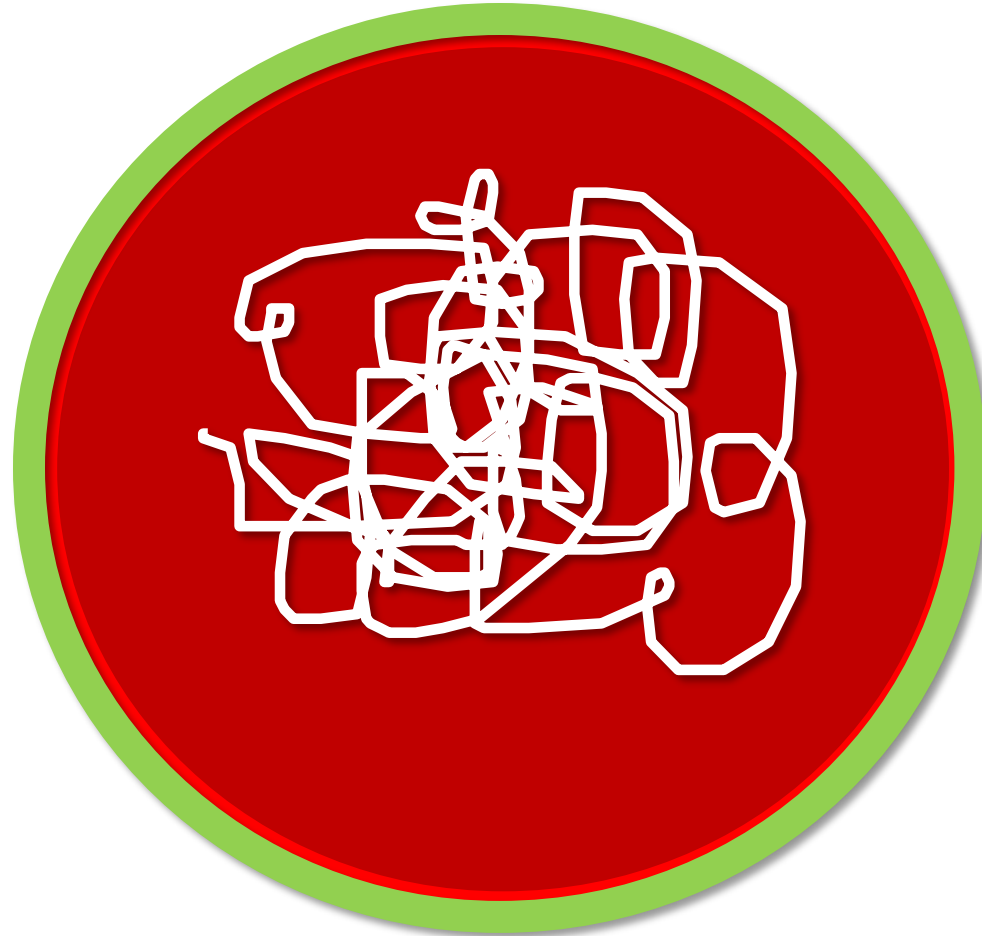


Answer

- Which type of vaccine must replicate to generate an immune response?
- A. Live vaccine
- ~~B. Non-live vaccine~~



Capsular Polysaccharide



Pure Polysaccharide Vaccines

- Immune response typically T-cell-independent
- Not consistently immunogenic in children younger than 2 years of age
- No booster response
- Antibody with less functional activity (IgM rather than IgG)
- Immunogenicity improved by conjugation
 - i.e., combined with a protein

Polysaccharide Vaccines

■ Pure polysaccharide

- Pneumococcal (PPSV23)
- *Salmonella* Typhi (Vi)

■ Conjugate polysaccharide

- *Haemophilus influenzae* type b (Hib)
- Pneumococcal (PCV13, PCV15, PCV20)
- Meningococcal ACWY

Knowledge Check

- **Which type of polysaccharide vaccine has improved immunogenicity?**
 - A. Pure polysaccharide vaccine
 - B. Conjugated polysaccharide vaccine



Answer

- Which type of polysaccharide vaccine has improved immunogenicity?
- ~~A. Pure polysaccharide vaccine~~
- **B. Conjugated polysaccharide vaccine**



5

Schedules

Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2022

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	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		
Hepatitis B (HepB)	1 st dose	← 2 nd dose →			← 3 rd dose →														
Rotavirus (RV): RV1 (2-dose series), RV5 (3-dose series)			1 st dose	2 nd dose	See Notes														
Diphtheria, tetanus, acellular pertussis (DTaP <7 yrs)			1 st dose	2 nd dose	3 rd dose			← 4 th dose →				5 th dose							
Haemophilus influenzae type b (Hib)			1 st dose	2 nd dose	See Notes		← 3 rd or 4 th dose, See Notes →												
Pneumococcal conjugate (PCV13)			1 st dose	2 nd dose	3 rd dose		← 4 th dose →												
Inactivated poliovirus (IPV <18 yrs)			1 st dose	2 nd dose	← 3 rd dose →							4 th dose							
Influenza (IIV4)						Annual vaccination 1 or 2 doses								Annual vaccination 1 dose only					
OR														OR					
Influenza (LAIV4)												Annual vaccination 1 or 2 doses			Annual vaccination 1 dose only				
Measles, mumps, rubella (MMR)					See Notes		← 1 st dose →					2 nd dose							
Varicella (VAR)							← 1 st dose →					2 nd dose							
Hepatitis A (HepA)					See Notes		2-dose series, See Notes												
Tetanus, diphtheria, acellular pertussis (Tdap ≥7 yrs)															1 dose				
Human papillomavirus (HPV)															See Notes				
Meningococcal (MenACWY-D ≥9 mos, MenACWY-CRM ≥2 mos, MenACWY-TT ≥2 years)			See Notes													1 st dose		2 nd dose	
Meningococcal B (MenB-4C, MenB-FHbp)																		See Notes	
Pneumococcal polysaccharide (PPSV23)																		See Notes	
Dengue (DEN4CYD; 9–16 yrs)																		Seropositive in endemic areas only (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
 Recommended vaccination can begin in this age group
 Recommended vaccination based on shared clinical decision-making
 No recommendation/not applicable

Recommended Catch-up Immunization Schedule for Children and Adolescents Who Start Late or Who Are More than 1 Month Behind, United States, 2022

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
Hepatitis B	Birth	4 weeks	8 weeks <i>and</i> at least 16 weeks after first dose minimum age for the final dose is 24 weeks		
Rotavirus	6 weeks Maximum age for first dose is 14 weeks, 6 days.	4 weeks	4 weeks maximum age for final dose is 8 months, 0 days		
Diphtheria, tetanus, and acellular pertussis	6 weeks	4 weeks	4 weeks	6 months	6 months
<i>Haemophilus influenzae</i> 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 1 st 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 <i>and</i> first dose was administered at younger than age 7 months <i>and</i> 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 <i>and</i> first dose was administered at age 7 through 11 months; OR if current age is 12 through 59 months <i>and</i> first dose was administered before the 1 st birthday <i>and</i> 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 1 st birthday.	
Pneumococcal conjugate	6 weeks	No further doses needed for healthy children if first dose was administered at age 24 months or older 4 weeks if first dose was administered before the 1 st birthday 8 weeks (as final dose for healthy children) if first dose was administered at the 1 st birthday or after	No further doses needed for healthy children if previous dose was administered at age 24 months or older 4 weeks if current age is younger than 12 months and previous dose was administered at <7 months old 8 weeks (as final dose for healthy children) if previous dose was administered between 7–11 months (wait until at least 12 months old); OR if current age is 12 months or older and at least 1 dose was administered before age 12 months	8 weeks (as final dose) This dose only necessary for children age 12 through 59 months who received 3 doses before age 12 months or for children at high risk who received 3 doses at any age.	
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)	
Measles, mumps, rubella	12 months	4 weeks			
Varicella	12 months	3 months			
Hepatitis A	12 months	6 months			
Meningococcal ACWY	2 months MenACWY-CRM 9 months MenACWY-D 2 years MenACWY-TT	8 weeks	See Notes	See Notes	



Children and adolescents age 7 through 18 years					
Meningococcal ACWY	Not applicable (N/A)	8 weeks			
Tetanus, diphtheria; tetanus, diphtheria, and acellular pertussis	7 years	4 weeks	4 weeks if first dose of DTaP/DT was administered before the 1 st birthday 6 months (as final dose) if first dose of DTaP/DT or Tdap/Td was administered at or after the 1 st birthday	6 months if first dose of DTaP/DT was administered before the 1 st birthday	
Human papillomavirus	9 years	Routine dosing intervals are recommended.			
Hepatitis A	N/A	6 months			
Hepatitis B	N/A	4 weeks	8 weeks <i>and</i> at least 16 weeks after first dose		
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.	
Measles, mumps, rubella	N/A	4 weeks			
Varicella	N/A	3 months if younger than age 13 years. 4 weeks if age 13 years or older			
Dengue	9 years	6 months	6 months		

Recommended Child and Adolescent Immunization Schedule by Medical Indication, United States, 2022

Always use this table in conjunction with Table 1 and the Notes that follow.

VACCINE	INDICATION									
	Pregnancy	Immunocompromised status (excluding HIV infection)	HIV infection CD4+ count ¹		Kidney failure, end-stage renal disease, or on hemodialysis	Heart disease or chronic lung disease	CSF leak or cochlear implant	Asplenia or persistent complement deficiencies	Chronic liver disease	Diabetes
			<15% or total CD4 cell count of <200/mm ³	≥15% and total CD4 cell count of ≥200/mm ³						
Hepatitis B	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Rotavirus	Yellow	Red (SCID ²)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Diphtheria, tetanus, and acellular pertussis (DTaP)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
<i>Haemophilus influenzae</i> type b	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Pneumococcal conjugate	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Inactivated poliovirus	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Influenza (IIV4) OR Influenza (LAIV4)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Influenza (LAIV4)	Yellow	Yellow	Yellow	Yellow	Yellow	Red (Asthma, wheezing: 2–4yrs ³)	Yellow	Yellow	Yellow	Yellow
Measles, mumps, rubella	Red (*)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Varicella	Red (*)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Hepatitis A	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Tetanus, diphtheria, and acellular pertussis (Tdap)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Human papillomavirus	Red (*)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Meningococcal ACWY	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Meningococcal B	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Pneumococcal polysaccharide	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Dengue	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

Yellow Vaccination according to the routine schedule recommended
Purple Recommended for persons with an additional risk factor for which the vaccine would be indicated
Yellow with dots Vaccination is recommended, and additional doses may be necessary based on medical condition or vaccine. See Notes.
Orange Precaution—vaccine might be indicated if benefit of protection outweighs risk of adverse reaction
Red Contraindicated or not recommended—vaccine should not be administered
Lightgrey No recommendation/not applicable
 *Vaccinate after pregnancy

¹ For additional information regarding HIV laboratory parameters and use of live vaccines, see the *General Best Practice Guidelines for Immunization*, "Altered Immunocompetence," at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/immunocompetence.html and Table 4-1 (footnote J) at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html.
² Severe Combined Immunodeficiency
³ LAIV4 contraindicated for children 2–4 years of age with asthma or wheezing during the preceding 12 months

Recommended Adult Immunization Schedule by Age Group, United States, 2022

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Influenza inactivated (IIV4) or Influenza recombinant (RIV4) or Influenza live, attenuated (LAIV4)	1 dose annually			
Tetanus, diphtheria, pertussis (Tdap or Td)	1 dose Tdap each pregnancy; 1 dose Td/Tdap for wound management (see notes) 1 dose Tdap, then Td or Tdap booster every 10 years			
Measles, mumps, rubella (MMR)	1 or 2 doses depending on indication (if born in 1957 or later)			
Varicella (VAR)	2 doses (if born in 1980 or later)	2 doses		
Zoster recombinant (RZV)	2 doses for immunocompromising conditions (see notes)		2 doses	
Human papillomavirus (HPV)	2 or 3 doses depending on age at initial vaccination or condition	27 through 45 years		
Pneumococcal (PCV15, PCV20, PPSV23)	1 dose PCV15 followed by PPSV23 OR 1 dose PCV20 (see notes)			1 dose PCV15 followed by PPSV23 OR 1 dose PCV20
Hepatitis A (HepA)	2 or 3 doses depending on vaccine			
Hepatitis B (HepB)	2, 3, or 4 doses depending on vaccine or condition			
Meningococcal A, C, W, Y (MenACWY)	1 or 2 doses depending on indication, see notes for booster recommendations			
Meningococcal B (MenB)	2 or 3 doses depending on vaccine and indication, see notes for booster recommendations 19 through 23 years			
Haemophilus influenzae type b (Hib)	1 or 3 doses depending on indication			

■ Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection
 ■ Recommended vaccination for adults with an additional risk factor or another indication
 ■ Recommended vaccination based on shared clinical decision-making
 ■ No recommendation/Not applicable

Recommended Adult Immunization Schedule by Medical Condition or Other Indication, United States, 2022

Vaccine	Pregnancy	Immuno-compromised (excluding HIV infection)	HIV infection CD4 percentage and count		Asplenia, complement deficiencies	End-stage renal disease, or on hemodialysis	Heart or lung disease; alcoholism ¹	Chronic liver disease	Diabetes	Health care personnel ²	Men who have sex with men
			<15% or <200 mm ³	≥15% and ≥200 mm ³							
IIV4 or RIV4 or LAIV4	1 dose annually										
	Contraindicated					Precaution			or 1 dose annually		
Tdap or Td	1 dose Tdap each pregnancy	1 dose Tdap, then Td or Tdap booster every 10 years									
MMR	Contraindicated*	Contraindicated	1 or 2 doses depending on indication								
VAR	Contraindicated*	Contraindicated		2 doses							
RZV		2 doses at age ≥19 years				2 doses at age ≥50 years					
HPV	Not Recommended*	3 doses through age 26 years			2 or 3 doses through age 26 years depending on age at initial vaccination or condition						
Pneumococcal (PCV15, PCV20, PPSV23)		1 dose PCV15 followed by PPSV23 OR 1 dose PCV20 (see notes)									
HepA				2 or 3 doses depending on vaccine							
HepB	3 doses (see notes)	2, 3, or 4 doses depending on vaccine or condition									
MenACWY		1 or 2 doses depending on indication, see notes for booster recommendations									
MenB	Precaution	2 or 3 doses depending on vaccine and indication, see notes for booster recommendations									
Hib		3 doses HSCT ³ recipients only		1 dose							

 Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection
 Recommended vaccination for adults with an additional risk factor or another indication
 Recommended vaccination based on shared clinical decision-making
 Precaution—vaccination might be indicated if benefit of protection outweighs risk of adverse reaction
 Contraindicated or not recommended—vaccine should not be administered.
 No recommendation/Not applicable

1. Precaution for LAIV4 does not apply to alcoholism. 2. See notes for influenza; hepatitis B; measles, mumps, and rubella; and varicella vaccinations. 3. Hematopoietic stem cell transplant.

Continuing Education Information

- CE credit, go to: <https://tceols.cdc.gov/>
- Search course number: WD4564-070522
- CE credit expires: July 1, 2024
- CE instructions are available on the Pink Book Web-on-Demand Series web page
- Questions and additional help with the online CE system, e-mail CE@cdc.gov

The screenshot shows the TCEO website interface. At the top, there is a blue header with the text "Training and Continuing Education Online (TCEO)". Below the header is the TCEO logo, which consists of the letters "TCEO" in a bold, blue font, with a green circular arrow icon to the right. Underneath the logo, the text "TRAINING AND CONTINUING EDUCATION ONLINE" is displayed in a smaller, blue font. On the left side of the page, there is a vertical navigation menu with several blue buttons: "TCEO Home", "Search Courses", "Create Account", "9 Simple Steps to Earn CE", "Frequently Asked Questions", and "Contact TCEO". The main content area on the right side of the page has a white background and contains the following text: "New to TCEO? Visit [Create Account](#). Once your account has been created, you will be able to search for courses and complete requirements to receive CE." Below this, there is a section titled "Already have a TCEO account from the previous system?" with instructions on how to sign in. Another section titled "Not sure how to get started?" provides a link to "9 Simple Steps to Earn CE". At the bottom of the page, there is a "Welcome to TCEO" message and a small paragraph of text: "Training and Continuing Education Online (TCEO) is a system that provides access to CDC educational activities for continuing education (CE). Use TCEO to search for CE opportunities, complete course ex". To the right of the text, there is a row of four small images: a woman smiling at a child, a man in a suit looking at a screen, a doctor holding a dog, and a woman working at a computer.

E-mail Your Immunization Questions to Us

- NIPINFO@cdc.gov



Thank You From Atlanta!

