

Centers for Disease Control and Prevention

National Center for Immunization and Respiratory Diseases



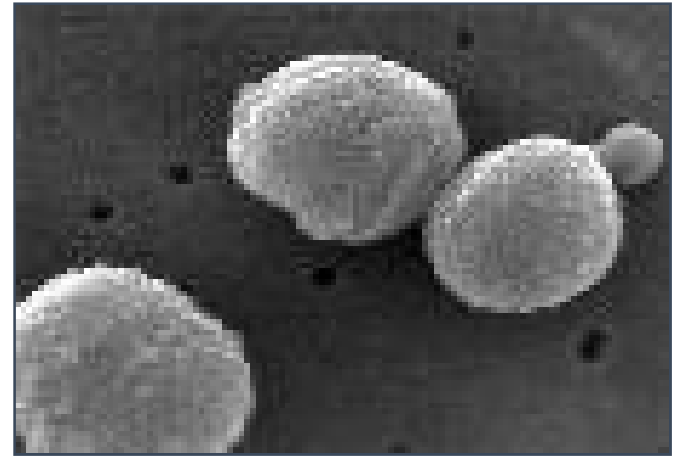
Pneumococcal Disease and Pneumococcal Vaccines

September 2018

Chapter 17

Streptococcus pneumoniae

- Gram-positive bacteria
- 92 known serotypes
- Polysaccharide capsule important virulence factor
- Type-specific antibody is protective
- Limited cross-reactivity

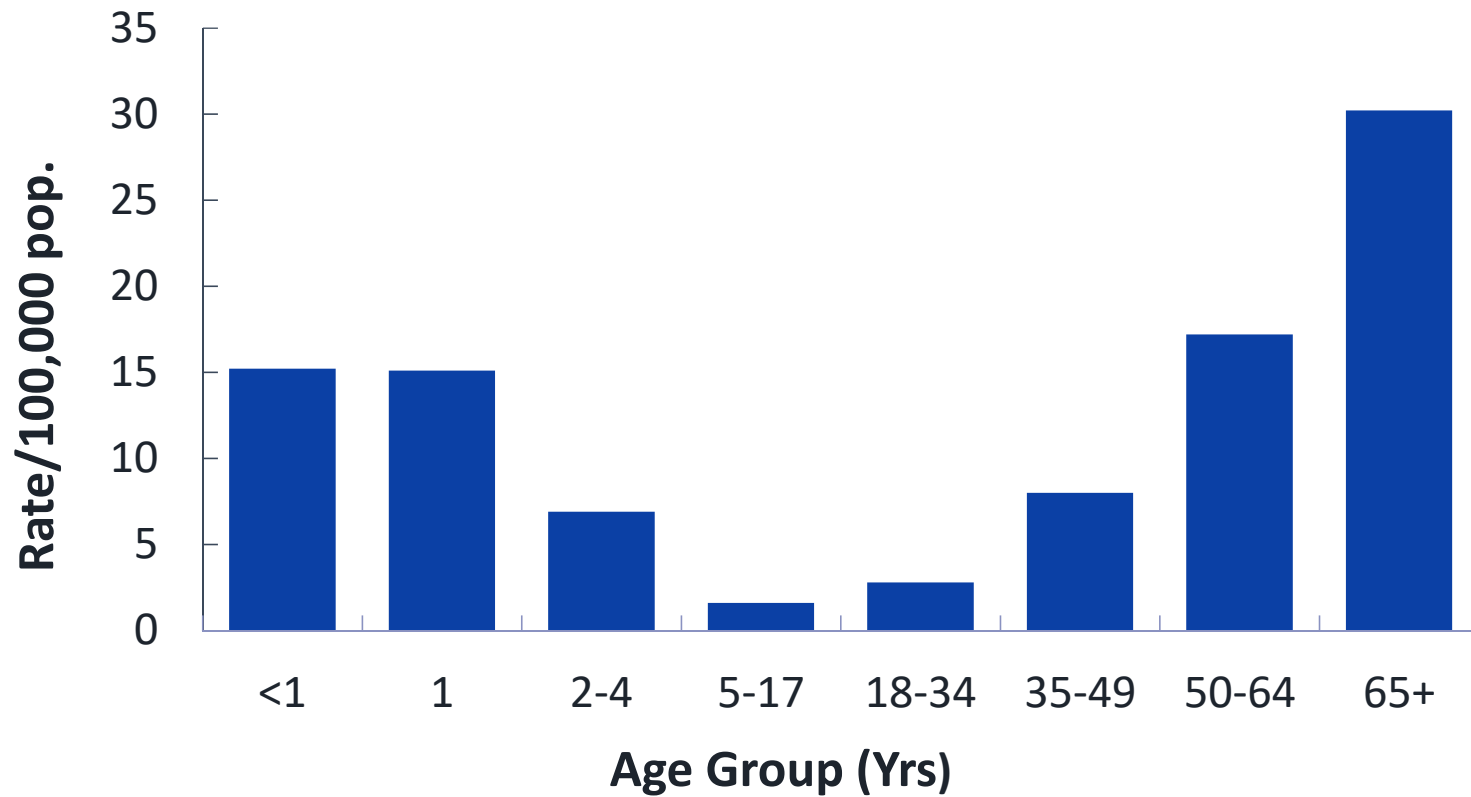


Pneumococcal Disease

- **Second most common cause of vaccine-preventable death in the U.S.**
- **Major clinical syndromes**
 - Pneumonia
 - Bacteremia
 - Meningitis



Invasive Pneumococcal Disease Incidence by Age Group–2013*



*CDC Active Bacterial Core surveillance 2009 report:
<http://www.cdc.gov/abcs/reports-findings/survreports/spneu13.html>

Risk Factors for Invasive Pneumococcal Disease

- Functional or anatomic asplenia, including sickle-cell disease
- Altered immunocompetence
- Underlying medical conditions, including chronic renal disease, nephrotic syndrome, and CSF leak
- Cochlear implant



Pneumococcal Disease Epidemiology

- **Reservoir** Human carriers
- **Transmission** Respiratory and autoinoculation
- **Temporal pattern** Winter and early spring
- **Communicability** Unknown; probably as long as organism in respiratory secretions



Pneumococcal Vaccines

- **1977** ▪ 14-valent polysaccharide vaccine licensed
- **1983** ▪ 23-valent polysaccharide vaccine licensed (PPSV23)
- **2000** ▪ 7-valent polysaccharide conjugate vaccine licensed (PCV7)
- **2010** ▪ 13-valent polysaccharide conjugate vaccine licensed (PCV13)



Pneumococcal Polysaccharide Vaccine (PPSV23)

Characteristics

- **Purified capsular polysaccharide antigen from 23 types of pneumococcus**
- **Not effective in children younger than 2 years**

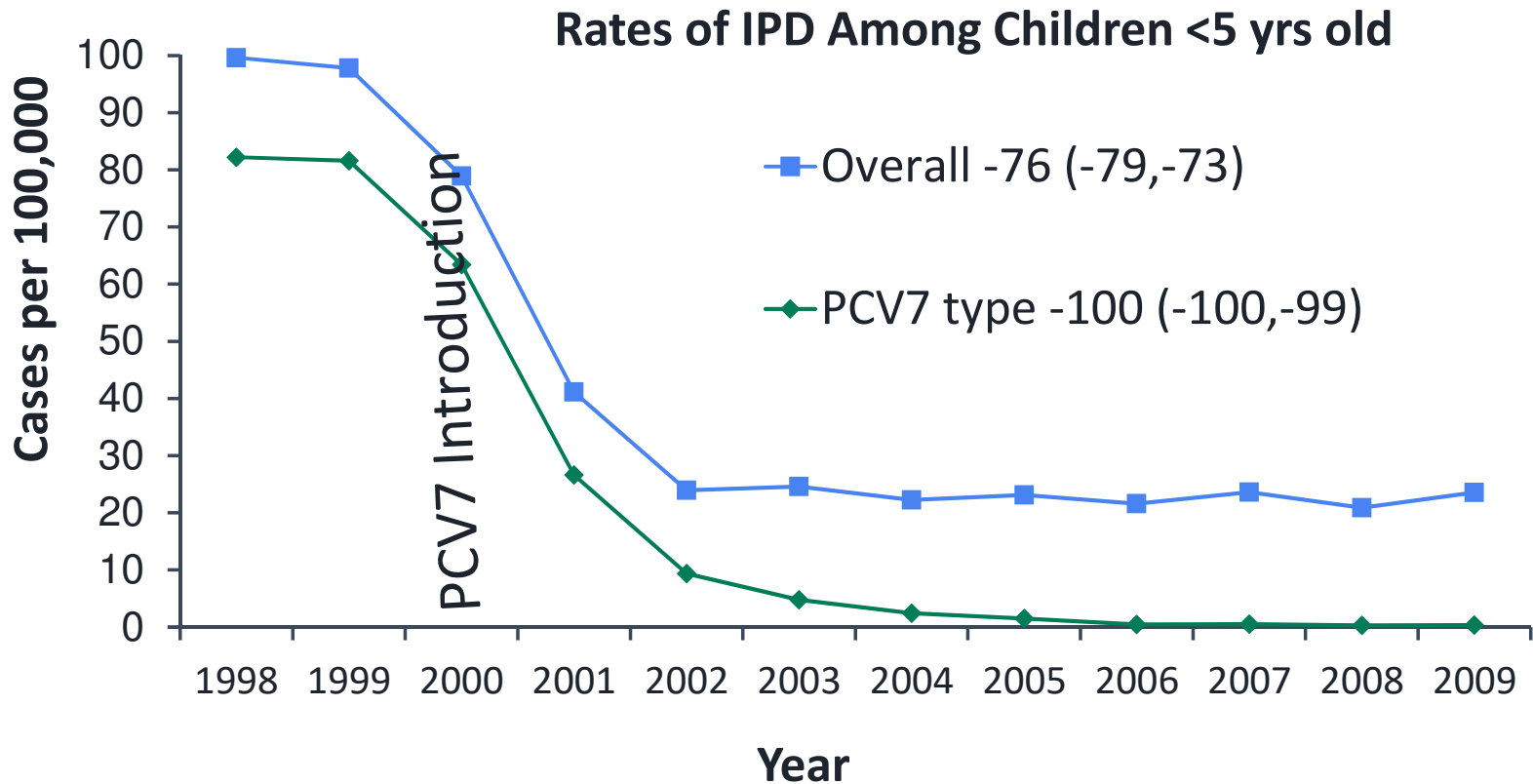


Pneumococcal Conjugate Vaccine (PCV13) Characteristics

- Contains 13 serotypes of *S. pneumoniae* conjugated to nontoxic diphtheria CRM197 carrier protein
- Approval based on demonstration of immunologic noninferiority to PCV7 rather than clinical efficacy

PCV7 Introduction Among U.S. Children and its Impact on Invasive Pneumococcal Disease

PCV7 introduced into routine schedule 2000



Pneumococcal Conjugate Vaccine (PCV13) in Children

- **In 2008, 61% of invasive pneumococcal disease cases among children younger than 5 years were attributable to the serotypes included in PCV13**



Pneumococcal Polysaccharide Vaccine (PPSV23)

Immunogenicity/Effectiveness

- **Most estimates range between 60%-70% effective against invasive disease among immunocompetent older persons and adults with underlying illnesses**
- **Effectiveness among immunocompromised or very old persons not demonstrated**



Pneumococcal Conjugate Vaccine (PCV13) Immunogenicity/Efficacy

- **Highly immunogenic in infants and young children, including those with high-risk medical conditions**
- **PCV7 was 97% effective against invasive disease caused by vaccine serotypes (presumably PCV13 as well)**





MMWRTM

Morbidity and Mortality Weekly Report

www.cdc.gov/mmwr

Recommendations and Reports

December 10, 2010 / Vol. 59 / No. RR-11

Prevention of Pneumococcal Disease Among Infants and Children – Use of 13-Valent Pneumococcal Conjugate Vaccine and 23-Valent Pneumococcal Polysaccharide Vaccine

Recommendations of the Advisory Committee on Immunization Practices (ACIP)

PCV13 Licensure

- **PCV13 is approved by the Food and Drug Administration for:**
 - Children 6 weeks through 17 years of age
 - Adults 18 years of age and older
- **ACIP recommended use of PCV13 for immunocompromised persons 6 years and older (2012, 2013)**



ACIP Recommendations for PCV13

- **Routinely recommended for infants and children 2 through 59 months of age**
 - 4 doses at 2, 4, 6, and 12 to 15 months
 - Fewer doses if series started at 7 months of age or older
- **Children who have received 1 or more doses of PCV7 should complete the immunization series with PCV13**

Pneumococcal Conjugate Vaccine Schedule for Unvaccinated Older Children-Primary Series

Age at First Dose	# of Doses	Booster
7-11 months	2 doses	Yes
12-23 months	2 doses*	No
24-59 months	1 dose	No
24-71 months, with medical conditions**	2 doses*	No

*Separated by at least 8 weeks; see MMWR 2010;59(RR-11):1-19

**Chronic heart, lung disease, diabetes, CSF leak, cochlear implant, sickle cell disease, other hemoglobinopathies, functional or anatomic asplenia, HIV infection, immunocompromising conditions



PCV13

- ACIP recommended use of PCV13 for immunocompromised persons 6 years and older (2012, 2013)



ACIP Recommendations for PCV13 Dose

- **A dose of PCV13 should be administered to children 6 through 18 years of age who are at increased risk for invasive pneumococcal disease* (and no prior PCV13 doses)**
 - Functional or anatomic asplenia, including sickle cell disease
 - HIV infection and other immunocompromising conditions
 - Cochlear implant
 - CSF leak
- **Regardless of previous history of PCV7 or PPSV vaccine**

*Off-label recommendation, ACIP vote, February 20, 2013



Pneumococcal Conjugate (PCV13) Vaccine Administration

- **Administer PCV13 vaccine via intramuscular (IM) injection**
 - Needle gauge: 22–25 gauge
 - Needle length*: 5/8 – 1.5 inch depending on the patient’s age and/or weight
 - Site*:
 - Birth–11 months: Vastus lateralis muscle is preferred
 - 1–2 years: Vastus lateralis muscle is preferred; deltoid muscle may be used if the muscle mass is adequate
 - 3 years and older: Deltoid muscle is preferred; vastus lateralis muscle may be used
- **Administer at the same medical visit as other vaccines, except Men ACWY-D in asplenic persons (others, OK to administer)**

*Professional judgement should be used to determine the proper needle length and site. Factors influencing site including local reaction, number of vaccine to be administered age and muscle mass

Pneumococcal Polysaccharide Vaccine Recommendations

- **Persons 2 years and older with normal immune systems who have chronic illness**

Cardiovascular or pulmonary disease
(asthma if 19 years old or older)

Diabetes

Liver disease

Alcoholism

Smoking (19 years old or older)

CSF leak

Cochlear implant



Pneumococcal Polysaccharide Vaccine Recommendations

- **Persons 2 years and older who are immunocompromised (due to disease or treatment)**
 - Asplenia (functional or anatomic)
 - Chronic renal failure
 - Nephrotic syndrome
 - Hodgkin disease
 - Lymphoma and leukemia
 - Multiple myeloma
 - Organ transplant
 - HIV infection



Pneumococcal Polysaccharide Vaccine Recommendations

- **Administer 1 dose of PPSV23 to children 2 years of age and older with normal immune systems who have a chronic illness including:**
 - Cardiovascular or pulmonary disease
 - Diabetes
 - CSF leak
 - Liver disease
 - Cochlear implant
 - Alcoholism
- **Consider for Alaskan Natives/American Indians in environments or settings with increased risk**



Pneumococcal Polysaccharide Vaccine Recommendations

- **Administer 2 doses to children 2 years and older who are immunocompromised (due to disease or treatment)**
 - Asplenia (functional or anatomic)
 - Chronic renal failure
 - Nephrotic syndrome
 - Hodgkin disease
 - Lymphoma and leukemia
 - Multiple myeloma
 - Organ transplant
 - HIV infection



Pneumococcal Polysaccharide Vaccine Revaccination

- **Routine revaccination of immunocompetent persons is not recommended**
- **Revaccination recommended for persons 2-64 years of age who are at highest risk of serious pneumococcal infection**
 - Immunocompromising conditions
 - Functional or anatomic asplenia

Pneumococcal Polysaccharide Vaccine

Candidates for Revaccination

- **Routine revaccination of immunocompetent persons is not recommended**
- **Separate doses of PPSV23 by 5 years interval**
- **Revaccination recommended for persons 2-64 years of age who are at highest risk of serious pneumococcal infection**
 - Functional or anatomic asplenia (including sickle cell disease)
 - Immunosuppression (including HIV infection)
 - Transplant
 - Chronic renal failure
 - Nephrotic syndrome

Administering PCV13 and PPSV23 Vaccines

General Rules

- **PCV13 and PPSV23 should not be administered during the same clinic visit**
 - Either vaccine may be administered simultaneously with influenza vaccine
- **Administer PCV13 before PPSV23 whenever possible**



Pneumococcal polysaccharide (PPSV23) Vaccine Administration

- **Administer PPSV23 vaccine via intramuscular (IM) or subcutaneous injection**
 - Choose needle size based on route and patient considerations
 - age and/or size
 - IM Site*:
 - 2–3 years: Vastus lateralis muscle is preferred; deltoid muscle may be used if the muscle mass is adequate
 - 4 years and older: Deltoid muscle is preferred; vastus lateralis muscle may be used
 - Subcut site:
 - Subcutaneous tissue over the upper outer triceps of arm
- **Administer at the same medical visit as other vaccines**

*Professional judgement should be used to determine the proper needle length and site. Factors influencing site including local reaction, number of vaccine to be administered age and muscle mass

Vaccine Administration Errors

Pneumococcal Vaccines

- **Frequent vaccine administration errors:**
- **Wrong vaccine**
 - PPSV23 to an infant
- **Schedule error:**
 - More than 1 PPSV23 revaccination dose to immunocompetent at-risk persons



Pneumococcal Polysaccharide Vaccine Candidates for Revaccination

- **5-year interval (2-64 years) with additional dose after 65th birthday, 5 years after previous dose:**
 - Functional or anatomic asplenia (including sickle cell disease)
 - Immunosuppression (including HIV infection)
 - Transplant
 - Chronic renal failure
 - Nephrotic syndrome
 - Generalized malignancy
 - Hematologic malignancy

- **1 dose is recommended after the 65th birthday, but only 1 dose recommended after 65th birthday**

- **Maximum three doses of PPSV23 in a lifetime**

Pneumococcal Vaccines

Adverse Reactions

	PPSV23	PCV13
▪ Local reactions	30%-50%	5%-49%
▪ Fever, myalgia	<1%	24-35%
▪ Febrile seizures	---	Rare: 1-14/100,000; with IIV 4 -45/ 100,000
▪ Severe adverse reactions	rare	8% (local)



Pneumococcal Vaccines

Contraindications and Precautions

- **Severe allergic reaction to vaccine component or following prior dose of vaccine**
- **Moderate or severe acute illness**



Vaccine Storage and Handling

- **Store PCV13 and PPSV23 vaccines in a refrigerator between 2°C - 8°C (36°F - 46°F)**
- **Store:**
 - In the original packaging with the lids closed
 - In a clearly labeled bin and/or area of the storage unit – not next to each other
- **Do not freeze the vaccine**

PCV13 (Pneumovax 13)

Ages: All children 6 weeks through 5 years
Increased risk children 6 years through 18 years

Increased risk adults 19 years and older
Adults 65 years and older who have never received PCV13

Route: Intramuscular (IM) injection

PPSV23 (Pneumovax 23)

Ages: Healthy adults 65 years and older
Increased risk persons 2 years through 64 years

Route: Intramuscular (IM) injection OR
Subcutaneous (subcut) injection

No more than two doses of PPSV23 recommended before 65th birthday and one dose after 65.

What Do You Think?

- A 6 year-old patient has sickle cell disease. Her immunization history includes a complete PCV13 series, and PPSV23 at 4 years of age. Should PPSV23 be administered today?
 - Yes
 - No





PLEASE PLACE QUESTIONS IN THE BASKET

