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## ***Streptococcus pneumoniae*, Invasive Disease in children less than Five (5) years of age**

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## ***Streptococcus pneumoniae*, Invasive Disease in Children less than five (5) years of age**

### **Overview**<sup>(1,2)</sup>

*Streptococcus pneumoniae* is commonly called pneumococcus and the diseases it causes may be referred to as pneumococcal disease. *Streptococcus pneumoniae* may cause pneumonia, meningitis, otitis media or a blood stream infection. *S. pneumoniae* is the leading cause of bacterial meningitis among children less than five (5) years of age. All *S. pneumoniae* isolates from normally sterile body fluids should be tested for antimicrobial susceptibility.<sup>(2)</sup>


**Pneumonia:** In adults, pneumococcal pneumonia is often characterized by sudden onset of illness with symptoms including shaking chills, fever, shortness of breath or rapid breathing, pain in the chest that is worsened by breathing deeply, and a productive cough. In infants and young children, signs and symptoms may not be specific, and may include fever, cough, rapid breathing or grunting.

**Meningitis:** High fever, headache, and stiff neck are common symptoms of meningitis in anyone over the age of two years. These symptoms can develop over several hours, or they may take one to two days. Other symptoms may include nausea, vomiting, discomfort looking into bright lights, confusion, and sleepiness. In newborns and small infants, the classic symptoms of fever, headache, and neck stiffness may be absent or difficult to detect, and the infant may only appear to be slow, inactive, or irritable, have vomiting, or feed poorly.

**Otitis media:** Children who have otitis media (middle ear infection) typically have a painful ear, and the eardrum is often red and swollen. Other symptoms that may accompany otitis media include sleeplessness, fever and irritability.

**Blood stream infections:** Infants and young children with blood stream infections, also known as bacteremia, typically have non-specific symptoms including fevers and irritability.

Two pneumococcal vaccines are available for use in children, the 13-valent pneumococcal conjugate vaccines (PCV13) and the 23-valent pneumococcal polysaccharide vaccine (PS23). The PS23 vaccine induces protective antibody responses to the most common pneumococcal serotypes in individuals 2 years of age or older, and the PCV 13 vaccine also induces protective antibody responses in children younger than 2 years of age. Ninety pneumococcal serotypes have been identified. Serotypes 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F and 23F (Danish system) are the 13 types contained in the 13-valent pneumococcal conjugate vaccine. The 13-valent supercedes PCV 7, which was licensed by the FDA in the year 2000.<sup>(3)</sup>

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For a complete description of *Streptococcus pneumoniae*, Invasive Disease in Children less than five (5) years of age, refer to the following texts:

- *Control of Communicable Diseases Manual (CCDM)*, American Public Health Association, 19<sup>th</sup> ed. 2008.
- American Academy of Pediatrics. *Red Book: 2012 Report of the Committee on Infectious Diseases*. 29<sup>th</sup> ed. 2012.
- Department of Health and Human Services, Centers for Disease Control and Prevention, *Epidemiology and Prevention of Vaccine-Preventable Diseases*, 12<sup>th</sup> ed. 2011.
- *Principles and Practice of Infectious Diseases*, 7<sup>th</sup> ed., Pennsylvania: Churchill Livingstone Elsevier, 2010

### **Case Definition**<sup>(4)</sup>

#### ***Clinical description***

*Streptococcus pneumoniae* causes many clinical syndromes, depending on the site of infection (e.g., acute otitis media, pneumonia, bacteremia, or meningitis).

#### ***Laboratory criteria for diagnosis***

Isolation of *S. pneumoniae* from a normally sterile site (e.g., blood, cerebrospinal fluid, or less commonly, joint, pleural or pericardial fluid), or internal body site (e.g. lymph node, brain).

#### ***Case classification***

*Confirmed:* A clinically compatible case in a child less than five (5) years of age caused by laboratory-confirmed culture of *S. pneumoniae* from a normally sterile site.


### **Information Needed for Investigation**

**Verify the diagnosis.** What laboratory tests were conducted? Obtain results of culture and sensitivity tests. What laboratory conducted the testing and what is their phone number? What are the patient’s clinical symptoms? What is the name and phone number of the attending physician?

**Establish the extent of illness.** Determine if household or other close contacts are, or have been ill, by contacting the health care provider, patient or family members.

### **Notification and Control Measures:**

- Contact the [District Communicable Disease Coordinator](#), or the [Senior Epidemiology Specialist](#), or the Department of Health and Senior Services’ Situation Room (DSR) at 800-392-0272 (24/7) immediately upon learning of a suspected outbreak\* of pneumococcal disease.

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- Contact the Bureau of Environmental Health Services at (573) 751-6095 and the Section for Child Care Regulation at (573) 751-2450, if the case is associated with a child care center.
- Contact the Section for Long Term Care Regulation at (573) 526-8524, if the case is associated with a long term-care facility.
- Contact the Bureau of Health Services Regulation at (573) 751-6303, if the case is associated with a hospital, hospital-based long-term care facility, or ambulatory surgical center.

\*Outbreak is defined as the occurrence in a community or region, illness(es) similar in nature, clearly in excess of normal expectancy and derived from a common or a propagated source.

### **Control Measures**


**General:** The PCV13 vaccine is recommended for routine administration as a 4-dose series for all children 23 months of age and younger at 2, 4, 6, and 12 to 15 months of age. Each 0.5mL dose of PCV13 should be administered intramuscularly. PCV13 has shown to reduce invasive disease caused by vaccine serotypes by 97%, and reduce invasive disease caused by all serotypes, including serotypes not in the vaccine, by 89%. The PCV 13 vaccine was licensed in 2010 and replaces the PCV7 vaccine. It covers the seven serotypes included in PCV& plus 6 additional serotypes.<sup>(3, 6)</sup>

Pneumococcal polysaccharide vaccine is recommended for administration to the elderly and the chronically ill. The (PS23) vaccine is indicated for persons aged  $\geq 2$  years with normal immune systems who have chronic illnesses, including cardiovascular disease, pulmonary disease, diabetes, alcoholism, cirrhosis, or cerebrospinal fluid leaks. Immunocompromised persons aged  $\geq 2$  years who are at increased risk of pneumococcal disease or its complications should also be vaccinated.<sup>(3,6)</sup>

The current recommendations for use of pneumococcal vaccine and vaccine schedules, including catch-up immunizations in previously unimmunized children, and children at highest risk of pneumococcal disease can be found in References 3 and 6.

### **General Information on Pneumococcal Vaccines**

- Pneumococcal vaccines should be deferred during pregnancy. However, the risk of severe pneumococcal disease in pregnant women should be considered when making decisions regarding the need for pneumococcal immunization.
- Children who have experienced invasive pneumococcal disease should receive all recommended doses of pneumococcal vaccines (PCV13 or PS23) appropriate for age and underlying condition. The full series of scheduled doses should be completed even if the series is interrupted by an episode of invasive pneumococcal disease.
- As appropriate, persons with uncertain or unknown vaccination status should be vaccinated.
- Persons with moderate or severe acute illness should not be vaccinated until their condition improves.

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- For both pneumococcal polysaccharide and conjugate vaccines, a serious allergic reaction to a dose of pneumococcal vaccine or a vaccine component is a contraindication to further doses of vaccine.
- See the Pneumococcal Infections section of the Red Book for additional recommendations on adolescent prevention and control, to include “Immunization recommendations for children five (5) years of age or older”.
- See the Pneumonia (Pneumococcal) section of the Control of Communicable Diseases Manual (CCDM), for “Control of patient, contacts and the immediate environment”.

#### **Child care contacts:**

Persons attending or working at child care centers are at moderate risk for infection. Antimicrobial chemoprophylaxis is not recommended for contacts of children with invasive pneumococcal disease, regardless of their immunization status in out-of-home care. Daily chemoprophylaxis is recommended for certain groups, such as children with functional or anatomic asplenia or children with sickle cell anemia (see Red Book for details).

#### **Isolation of the Hospital Patient:**

Standard precautions are recommended, including for patient with infections caused by drug-resistant *S. pneumoniae*.


#### **Laboratory Procedures**

Diagnosis is usually made by isolation of the organism from body sites that are normally sterile. The Missouri State Public Health Laboratory does not routinely test for *S. pneumoniae* or perform antimicrobial sensitivity studies.

#### **Reporting Requirements**

*Streptococcus Pneumoniae*, Invasive Disease in Children less than five (5) years of age is a Category 3 disease and shall be reported to the local health authority or to the Missouri Department of Health and Senior Services within three (3) days of first knowledge or suspicion.

1. For confirmed or probable cases, complete a “[Disease Case Report](#)” (CD-1).
  - a. For cases in children less than five (5) years of age with a sterile pneumococcal isolate and documented receipt of pneumococcal conjugate vaccine complete the CDC form “[Pneumococcal Conjugate Vaccine Failure Case Report](#)”.
  - b. For cases in children less than five (5) years of age with a sterile pneumococcal isolate, with **no** documented receipt of pneumococcal conjugate vaccine complete the CDC form “[Streptococcus Pneumoniae Surveillance Worksheet](#)”.
  - c. For cases in children less than five (5) years of age with a sterile pneumococcal isolate that is drug-resistant, with documented receipt of pneumococcal conjugate vaccine

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complete the CDC forms, “[Pneumococcal Conjugate Vaccine Failure Case Report](#)” and the “[Streptococcus Pneumoniae Surveillance Worksheet](#)”.


- d. For cases in children less than five (5) years of age with a sterile pneumococcal isolate that is drug-resistant, with **no** documented receipt of pneumococcal conjugate vaccine complete the CDC form, “[Streptococcus Pneumoniae Surveillance Worksheet](#)”.
2. Entry of the completed CD-1 into the WEBSURV database negates the need for the paper CD-1 to be forwarded to the District Health Office.
3. Send the completed secondary investigation form(s) to the District Health Office.
4. All outbreaks or "suspected" outbreaks should be reported as soon as possible (by phone, fax or e-mail) to the [District Communicable Disease Coordinator](#). This can be accomplished by completing the [Missouri Outbreak Surveillance](#) Report (CD-51).
5. Within 90 days from the conclusion of an outbreak, submit the final outbreak report to the District Communicable Disease Coordinator.

## **References**

1. [Control of Communicable Diseases Manual](#). CCDM. 19<sup>th</sup> ed, 2008.
2. American Academy of Pediatrics. In: *Red Book: 2012 Report of the Committee on Infectious Diseases*. 29<sup>th</sup> ed; 2012.
3. Centers for Disease Control and Prevention, “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), MMWR 12/10/10, Vol 59:RR-11.4  
Centers for Disease Control and Prevention. Epidemiology Program Office, Division of Public Health Surveillance and Informatics, Nationally Notifiable Infectious Diseases United States 2003.
4. Mandell, Douglas and Bennett’s *Principles and Practice of Infectious Diseases*. “Streptococcus pneumoniae”. G. Mandell, J. Bennett, R. Dolin, eds. 7<sup>th</sup> ed. 2010.
5. Centers for Disease Control and Prevention. *Epidemiology of Vaccine-Preventable Diseases*. “Pneumococcal Disease”. Atkinson W, Hamborsky J Wolfe S, eds. 12<sup>th</sup> ed. Washington, DC: Public Health Foundation, 2011.

## **Other Sources of Information**

1. Bacterial Infections of Humans Epidemiology and Control; 3<sup>rd</sup> Edition: Edited by Evans and Brachman: pages 559-582, 673-711
2. Infection Control in the Child Care Center and Preschool; 4<sup>th</sup> Edition, 1999, Edited by Donowitz: pages 235-237
3. Defining the Public Health Impact of Drug-Resistant Streptococcus pneumoniae: Report of a Working Group: Feb 16, 1996; Vol. 45; No. RR-1

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### **Web Sites**

1. Centers for Disease Control and Prevention, “*Streptococcus pneumoniae* Disease, Technical Information. [http://www.cdc.gov/ncidod/dbmd/diseaseinfo/streppneum\\_a.htm](http://www.cdc.gov/ncidod/dbmd/diseaseinfo/streppneum_a.htm) (4/12)
2. National Foundation for Infectious Diseases (NFID), Pneumococcal Disease. <http://www.nfid.org/pneumococcal/> (4/12)