	Division of Community and Public Health	
	Section: 4.0 Diseases and Conditions	Revised 12/12
	Subsection: <i>Streptococcus pneumoniae</i> , Drug-Resistant Invasive Disease	Page 1 of 7

***Streptococcus pneumoniae*, Drug-Resistant Invasive Disease**

Table of Contents

[*Streptococcus pneumoniae*, Drug-Resistant Invasive Disease](#)

[Fact Sheet](#) (CDC)


Disease Case Report (CD-1)

[PDF format](#)

[Word format](#)

[Pneumococcal Conjugate Vaccine Failure Case Report](#) (CDC 52.87)

[Streptococcus Pneumoniae Surveillance Worksheet](#) (CDC)

	Division of Community and Public Health	
	Section: 4.0 Diseases and Conditions	Revised 12/12
	Subsection: <i>Streptococcus pneumoniae</i> , Drug-Resistant Invasive Disease	Page 2 of 7

***Streptococcus pneumoniae*, Drug-Resistant Invasive Disease**

Overview^(1,2, 4)

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 <5 years of age. All *S. pneumoniae* isolates from normally sterile body fluids should be tested for antimicrobial susceptibility.⁽²⁾

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 heptavalent 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 children 2 years of age or older, and the PCV13 vaccine also induces protective antibody responses in individuals younger than 2 years of age. Ninety pneumococcal serotypes have been identified. Serotypes 1, 3, 4, 6A, 7F, 6B, 9V, 14, 18C, 19A, 19F and 23F (Danish system) are the 13 types contained in the 13-valent pneumococcal conjugate vaccine.

In some areas of the United States up to 35% of the invasive pneumococcal isolates are resistant to penicillin. Serotypes 6B, 9V, 14, 19A and 23F are the most common isolates

	Division of Community and Public Health	
	Section: 4.0 Diseases and Conditions	Revised 12/12
	Subsection: <i>Streptococcus pneumoniae</i> , Drug-Resistant Invasive Disease	Page 3 of 7

associated with penicillin-nonsusceptibility (80% of penicillin-nonsusceptible strains are one of the 13 types contained in the PCV13 vaccine).

For a complete description of *Streptococcus pneumoniae*, Drug-resistant, Invasive disease, refer to the following texts:

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

Case Definition^(3,5,6)

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) **and**
- “Nonsusceptible” isolate (i.e., intermediate or high-level resistance of the *S. pneumoniae* isolate to at least one antimicrobial agent currently approved for use in treating pneumococcal infection).

Case classification


Confirmed: A clinically compatible case that is laboratory confirmed.

Probable: A clinically compatible case caused by laboratory-confirmed culture of *S. pneumoniae* identified as “nonsusceptible” (i.e., an oxacillin zone size of <20 mm) when oxacillin screening is the only method of antimicrobial susceptibility testing performed.

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.

	Division of Community and Public Health	
	Section: 4.0 Diseases and Conditions	Revised 12/12
	Subsection: <i>Streptococcus pneumoniae</i> , Drug-Resistant Invasive Disease	Page 4 of 7

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.
- 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:

Adults: Pneumococcal polysaccharide vaccine (PS23) is approximately 56-75% efficacious for the prevention of invasive pneumococcal infection caused by vaccine serotypes. PS23 should be administered routinely to all adults 65 years of age and older. The vaccine is also indicated for persons aged ≥ 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 ≥ 2 years who are at increased risk of pneumococcal disease or its complications should also be vaccinated.^(3,5, 6)

Children: 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 PCV7 should be administered intramuscularly. PCV13 has been 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%. Infants and children who have received ≥ 1 dose of the old PCV7 vaccine should complete the immunization series with PCV13. A single supplemental dose of PCV13 is recommended for all children aged 14-59 months who have received 4 doses of PCV7 or another age-appropriate, complete PCV7 schedule. For children who have underlying medical conditions, a supplemental PCV13 dose is recommended through age 71 months. Children age 2-18 years with underlying medical conditions should also receive PS23 after completing all recommended doses of PCV13.

Revaccination: Revaccination is recommended for persons 65 years of age or older who received an initial vaccination prior to age 65, if at least 5 years has elapsed since that dose. Revaccination is also recommended for persons less than 65 years of age with anatomic or functional asplenia or those who are immunocompromised, including patients with chronic renal failure and nephritic syndrome. For such patients who are older than 10 years of age,

	Division of Community and Public Health	
	Section: 4.0 Diseases and Conditions	Revised 12/12
	Subsection: <i>Streptococcus pneumoniae</i> , Drug-Resistant Invasive Disease	Page 5 of 7

revaccination should take place 5 years or more after the first dose. For younger patients, revaccination should be considered 3 years after the first dose.⁽⁴⁾

Vaccine Schedules: See References 3 and 6 for completed vaccine schedules.

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.
 - 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 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*.

	Division of Community and Public Health	
	Section: 4.0 Diseases and Conditions	Revised 12/12
	Subsection: <i>Streptococcus pneumoniae</i> , Drug-Resistant Invasive Disease	Page 6 of 7

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, drug-resistant invasive disease is a Category 2 disease and shall be reported to the local health authority or to the Missouri Department of Health and Senior Services within one (1) day of first knowledge or suspicion by telephone (800) 392-0272, facsimile or other rapid communication.

1. For all confirmed or probable *S. pneumoniae*, drug-resistant, invasive disease cases in persons ≥ 5 years of age complete a "[Disease Case Report](#)" (CD-1) and complete the CDC form "[Streptococcus Pneumoniae Surveillance Worksheet](#)".
 - a. For *S. pneumoniae*, drug-resistant, invasive disease in children <5 years old, with documented receipt of pneumococcal conjugate vaccine complete the CDC forms, "[Pneumococcal Conjugate Vaccine Failure Case Report](#)" and the "[Streptococcus Pneumoniae Surveillance Worksheet](#)".
 - b. For *S. pneumoniae*, drug-resistant, invasive disease in children <5 years old 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 must 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. 19th ed, 2008.
2. American Academy of Pediatrics. In: *Red Book: 2012 Report of the Committee on Infectious Diseases*. 29th 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. <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5911a1.htm> (12/12)

	Division of Community and Public Health	
	Section: 4.0 Diseases and Conditions	Revised 12/12
	Subsection: <i>Streptococcus pneumoniae</i> , Drug-Resistant Invasive Disease	Page 7 of 7

4. Mandell, Douglas and Bennett's *Principles and Practice of Infectious Diseases*. "Streptococcus pneumoniae". G. Mandell, J. Bennett, R. Dolin, eds. 7th ed. 2010
5. Centers for Disease Control and Prevention. *Epidemiology of Vaccine-Preventable Diseases*. "Pneumococcal Disease". Atkinson W, Hamborsky J Wolfe S, eds. 12th ed. Washington, DC: Public Health Foundation, 2011
6. .W. Atkinson, C. Wolfe, eds. "Pneumococcal Disease". *Epidemiology and Prevention of Vaccine-Preventable Diseases*, 7th ed. Centers for Disease Control and Prevention 2002: 205-217. <http://www.cdc.gov/vaccines/pubs/pinkbook/index.html> (12/12)

Other Sources of Information

1. Bacterial Infections of Humans Epidemiology and Control; 4th Edition: Edited by Brachman: and Abrutyn, 2009
2. Infection Control in the Child Care Center and Preschool; 4th 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

Web Sites

1. Centers for Disease Control and Prevention, "Drug-Resistant *Streptococcus pneumoniae* Disease, Technical Information," http://www.cdc.gov/ncidod/dbmd/diseaseinfo/drugresisstreppneum_t.htm (12/12)
2. Missouri Department of Health and Senior Services, "*Streptococcus pneumoniae*, Invasive Disease in Children less than 5 years of age," <http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/spid5.pdf> (12/12)