

## ***Streptococcus pneumoniae* (Sp) Invasive Disease**

**Organism:** *Streptococcus pneumoniae* (pneumococcus), Gram-positive encapsulated coccus. More than 90 serotypes exist.

**Incubation Period:** Not well determined; may be as short as 1-3 days.

**Infectious Period:** Presumably until discharges of the mouth and nose no longer contain virulent pneumococci in significant numbers. Penicillin will render patients with susceptible strains noninfectious within 24-48 hours.

**Transmission Route:** Droplet spread, direct oral contact, or indirectly through articles freshly soiled with respiratory discharges. Person-to-person transmission of the organisms is common, but illness among casual contacts and attendants is infrequent.

**Treatment:** Because pneumococci resistant to penicillin and other antimicrobials are increasingly recognized, sensitivities of strains isolated from normally sterile sites, including blood or CSF, should be determined.

For pneumonia and other pneumococcal infections, parenteral beta-lactam antibiotics (penicillin, third generation cephalosporins) are likely to be effective in most cases. Where beta-lactam resistance is common, vancomycin should be included in the initial regimen for the treatment of meningitis caused by pneumococcus until susceptibilities can be determined.

### **Information Needed for the Investigation**

#### **Verify the Diagnosis**

- Clinically
  - Acute lower respiratory bacterial infection
  - Sudden onset, high fever with chills or rigor, myalgia, arthralgia, headache, malaise, pleural pain, dyspnea, tachypnea, cough productive of “rusty” sputum
  - Elderly – less abrupt onset, fever, SOB, altered mental status
  - Infants and young children – fever, vomiting, convulsions
- Lab Findings
  - Isolation of pneumococci from blood, CSF, pleural, joint or middle ear fluid
  - Leukocytosis (neutrophilia)
  - Elevated C-reactive protein
  - Accelerated ESR
- Radiological findings
  - Typically shows lobar or segmental consolidation, may be bronchopneumonic especially in children and the aged.
  - Pneumococcal pneumonia is an important cause of death in infants and the aged.

#### **Determine the Extent of the Illness**

- Investigation of source of infection and contacts is of no practical value.
- In outbreak in institutions or other closed groups, immunization may be carried out unless it is known that the type causing the disease is not included in the vaccine.

### Laboratory Specimens

- Blood culture, CSF, or joint fluid
- CBC
- ESR (erythrocyte sedimentation rate)
- C-reactive protein

### Contact and Control Measures

- Avoid crowding in living quarters; crowding of populations bears a risk of disease.
- Of strains causing invasive disease, 88% are serotypes included in the 23-valent polysaccharide vaccine.
- See updated vaccine recommendations for Alaskans (Box below).
- No immunization of contacts; verify children and adults requiring vaccine are up to date on IZ. Document immunization is given. Notify Immunization Program.
- Concurrent disinfection of discharge from nose and throat. Terminal cleaning.

### Hospital Considerations

- Use Droplet Precautions for 24 hours after initiation of effective therapy.
- In addition, Contact Precautions if skin lesions are present.

### Reporting Requirements

- Enter into AK-STARS Database.
- Fax report to CDC Arctic Investigations Program (AIP) upon receipt.
- Assure that all isolates are sent to CDC/AIP for serogrouping.

### References

- Control of Communicable Disease Manual (19<sup>th</sup> Edition), 2008
- Centers for Disease Control and Prevention, [http://www.cdc.gov/ncidod/dbmd/diseaseinfo/streppneum\\_t.htm](http://www.cdc.gov/ncidod/dbmd/diseaseinfo/streppneum_t.htm), October 24, 2005
- Red Book (27<sup>th</sup> Edition), 2006
- Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee. 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Available at <http://www.cdc.gov/hicpac/pdf/isolation/isolation2007.pdf>
- Alaska Pneumococcal Polysaccharide Vaccine Recommendations Revised, Box pasted in below [http://www.epi.alaska.gov/bulletins/docs/b2012\\_24.pdf](http://www.epi.alaska.gov/bulletins/docs/b2012_24.pdf)

**Table. Medical Conditions or Other Indications for Administration of PCV13 and PPSV23 and Revaccination for Adults Aged  $\geq 19$  Years, \* by Risk Group<sup>1</sup>**

Risk Group and Underlying Medical Condition	Recommended		Revaccinate 5 years after 1 <sup>st</sup> dose
	PCV13	PPSV23	PPSV23
<b>Immunocompetent Persons</b>			
Chronic heart disease <sup>†</sup>		✓	
Chronic lung disease <sup>‡</sup>		✓	
Diabetes mellitus		✓	
Cerebrospinal fluid leak	✓	✓	
Cochlear implant	✓	✓	
Alcoholism		✓	

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Chronic liver disease, cirrhosis		✓	
Cigarette smoking		✓	
<b>Persons with Functional or Anatomic Asplenia</b>			
Sickle cell disease/other hemaglobinopathy	✓	✓	✓
Congenital or acquired asplenia	✓	✓	✓
<b>Immunocompromised Persons</b>			
Congenital or acquired immunodeficiency**	✓	✓	✓
Chronic renal failure	✓	✓	✓
Nephrotic syndrome	✓	✓	✓
Leukemia/Lymphoma/Hodgkins	✓	✓	✓
Generalized malignancy	✓	✓	✓
Iatrogenic immunosuppression††	✓	✓	✓
Solid organ transplant	✓	✓	✓
Multiple myeloma	✓	✓	✓

\*All adults aged  $\geq 65$  years should receive a dose of PPSV23, regardless of previous history of vaccination with pneumococcal vaccine.

†Including congestive heart failure and cardiomyopathies, excluding hypertension.

± Including chronic obstructive pulmonary disease, emphysema, and asthma.

\*\*Includes B- (humoral) or T-lymphocyte deficiency, complement deficiencies (particularly C1, C2, C3, and C4 deficiencies), phagocytic disorders (excluding chronic granulomatous disease), and human immunodeficiency virus infection.

††Diseases requiring treatment with immunosuppressive drugs, including long-term systemic corticosteroids and radiation therapy.

# **Invasive Pneumococcal Disease (IPD, *Streptococcus pneumoniae*, invasive disease)**

## **2010 Case Definition**

CSTE Position Statement Number: 09-ID-06

### **Invasive Pneumococcal Disease**

#### **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 body site (e.g., blood, cerebrospinal fluid, or, less commonly, joint, pleural or pericardial fluid)

#### **Case classification**

*Suspected:* Any reported case lacking confirmation of isolation of *Streptococcus pneumoniae* from a normally sterile body site.

*Confirmed:* Isolation of *Streptococcus pneumoniae* from a normally sterile body site in a person of any age.



## ***Streptococcus pneumoniae*/Pneumococcal Invasive Disease Fact Sheet**

### **What is pneumococcal disease?**

Pneumococcal diseases are infections caused by the bacteria *Streptococcus pneumoniae*, also known as pneumococcus. The most common types of infections caused by these bacteria include middle ear infections, pneumonia, blood stream infections (bacteremia), sinus infections, and meningitis.

### **Which children are most likely to get pneumococcal disease?**

Young children are much more likely than older children and adults to get pneumococcal disease. Children under 2, children in group child care, and children who have certain illnesses (for example sickle cell disease, HIV infection, and chronic heart or lung conditions) are at higher risk than other children to get pneumococcal disease. In addition, pneumococcal disease is more common among children of certain racial or ethnic groups, such as Alaska Natives, Native Americans, and African-Americans, than among other groups.

### **How prevalent is pneumococcal disease?**

Each year in the US *Streptococcus pneumoniae* causes approximately 700 cases of meningitis, 17,000 cases of bacteremia or other invasive disease in children under the age of 5. Children under 2 average more than 1 middle ear infection each year, many of which are caused by pneumococcal infections. *Streptococcus pneumoniae* is the most common cause of bacteremia, pneumonia, meningitis and otitis media in young children.

### **Who is at most serious risk?**

Children at increased risk of pneumococcal infections include those with anatomic or functional asplenia (including sickle cell disease), patients taking immunosuppressive chemotherapy, those with congenital and acquired immune deficiency (including HIV infections), those with chronic renal disease and healthy Native American, Alaska Native, and African American children. Children less than 60 months of age in out of home care are at 2-3 fold higher risk of experiencing invasive pneumococcal infections than children in home.

### **What are the symptoms of pneumococcal disease?**

#### ***Meningitis:***

High fever, headache, and stiff neck are common symptoms of meningitis in anyone over the age of 2 years. These symptoms can develop over several hours, or they may take 1 to 2 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 slow or inactive, or be irritable, have vomiting, or be feeding poorly.

***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.

***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.

**How serious is pneumococcal disease?**

Pneumococcal disease is a very serious illness in young children. Pneumococcal infections are now the most common cause of invasive bacterial infection in U. S. children. In the United States it is estimated that pneumococcal infections cause 200 deaths, 700 cases of meningitis, 17,000 cases of bacteremia, and 4.9 million cases of otitis media (ear infections) annually in children less than 5 years of age.

Meningitis is the most severe type of pneumococcal disease. Of children less than 5 years with pneumococcal meningitis, about 5% will die of their infection and others may have long-term problems such as hearing loss. Many children with pneumococcal pneumonia or blood stream infections will be ill enough to be hospitalized; about 1% of children with blood stream infections or pneumonia with a blood stream infection will die of their illness. Nearly all children with ear infections recover, although children with recurrent infections can suffer hearing loss.

**How is pneumococcal disease spread?**

The bacteria are spread through contact between persons who are ill or who carry the bacteria in their throat. Transmission is mostly through the spread of respiratory droplets from the nose or mouth of a person with a pneumococcal infection. It is common for people, especially children, to carry the bacteria in their throats without being ill from it.

**How is pneumococcal disease treated/cured?**

Pneumococcal disease is treated with antibiotics. Over the last decade, many pneumococci have become resistant to some of the antibiotics used to treat pneumococcal infections; high levels of resistance to penicillin are common.

**Can pneumococcal disease in children be prevented?**

The FDA recently licensed a new vaccine for the prevention of pneumococcal disease in children. The new pneumococcal vaccine, Prevnar ® (manufactured by Wyeth-Lederle Vaccines), is a vaccine in which the serotypes are conjugated (or linked) to a protein. This new pneumococcal conjugate vaccine has been shown to be highly effective in preventing invasive pneumococcal disease in preventing invasive pneumococcal disease (such as young children. In a study of the new vaccine among 37,000 infants in California, the vaccine was over 90% effective in preventing invasive disease among the children studied.

The children who received the new vaccine also had 7% fewer episodes of otitis media and a 20% decrease in the number of tympanostomy tubes (ear tubes) placed. The vaccine was also shown to decrease the number of episodes of pneumonia.

Pevnar ® is indicated for use in infants and toddlers. The vaccine should be given to all infants < 24 months of age at 2, 4, and 6 months of age, followed by a booster dose at 12-15 months of age. Children who are unvaccinated and are 7 to 11 months of age should be given a total of 3 doses (2 months apart) and children age 12 to 23 months should be given a total of 2 doses at least two months apart. Most children who are 24 months of age or older only need one dose of the vaccine.

The Advisory Committee on Immunization Practices also recommends the new pneumococcal childhood vaccine be given to children age 24 to 59 months at highest risk of infection, including those with certain illness (sickle cell anemia, HIV infection, chronic lung or heart disease). Vaccine should be considered for other children through 59 months of age with a priority for those at higher risk which includes Alaska Natives, American Indians, or African Americans and those children who attend out of home day care for more than 4 hours per week and all children aged 24-35 months.

The recently licensed pneumococcal conjugate vaccine, Pevnar ®, is the first pneumococcal vaccine that can be used in children under the age of 2 years. However, pneumococcal vaccines for the prevention of disease among children and adults who are 2 years and older have been in use since 1977. Pneumovax ® and Pnu-Immune ® are 23-valent polysaccharide vaccines that are currently recommended for use in all adults who are > 65 years of age and for persons who are 2 years and older and at high risk for disease such as persons with sickle cell disease, HIV infection, or other immunocompromising condition.

Campaigns for judicious use of antibiotics may also slow or reverse emerging drug resistance found among pneumococcal infection.