STREPTOCOCCAL PNEUMONIAE
Invasive disease or IPD

DISEASE AND EPIDEMIOLOGY

Clinical Description:

*Streptococcus pneumoniae* (Strep pneumo) is the most common cause of bacterial pneumonia, hospitalized pneumonia, and community-acquired pneumonia in the U.S. Strep pneumo can cause non-invasive illness (such as sinusitis or acute otitis media) as well as invasive illness (such as pneumonia or meningitis). Only invasive illness is reportable to Public Health.

Invasive disease presents as a disease of abrupt onset with fever, chills, and cough. People over 50 years of age may present with confusion or delirium. Common complications associated with invasive disease are sepsis, empyema, and necrotizing pneumonia.

Causative Agent:

Invasive pneumococcal disease (IPD) is caused by the bacterial pathogen *Streptococcus pneumoniae*. They are lancet-shaped, gram-positive diplococci. Of the 90 capsular serotypes that have been identified, 23 serotypes are responsible for most invasive disease in the U.S. Serotypes 4, 6B, 9V, 18C, 19F, and 23F cause most invasive childhood pneumococcal infections in the U.S. Some of these and other serotypes cause most disease in adults. Increasing antibiotic resistance in this organism is an important public health problem.

Differential Diagnosis:

Strep pneumo usually causes pneumonia, sepsis, or meningitis. The differential diagnosis depends upon the age of the patient, but usually includes a rule out of other bacterial and viral causes of these diseases.

Laboratory identification:

Strep pneumo is easily cultured and the capability for culture is widely available in clinical laboratories. Strep pneumo can be identified via culture or urinary antigen, however, the case definition for IPD is limited to culture isolates from normally-sterile sites. This is interpreted as:

- Blood or serum
- Joint or other internal body fluids such as pleural or pericardial fluids (but not urine)
- Bone or other tissue if collected steriley
- Abscesses if collected via aspiration (but not by a swab)
- Lung aspirates/bronchial washes/bronchial brushes only if Strep pneumo is the only organism recovered. If multiple organisms were recovered, then the sample was contaminated with normal flora and thus cannot be used to establish a public health case.

UPHL: Strep pneumo is not required to be submitted to UPHL for validation. UPHL cannot perform isolate serotyping.
Treatment:
Strep pneumo is treated with antibiotics, depending upon the susceptibility profile. Penicillin/amoxicillin, cephalosporins, quinolones, and/or vancomycin are typical treatment regimens depending upon resistance and presentation.

Case fatality:
Approximately 10% of all patients with IPD die of their illness, but case-fatality rates for the elderly and patients with underlying illnesses can exceed 50%, even with antimicrobial therapy.

Reservoir:
Humans are the only known reservoir. Roughly 50% of healthy adults (and an even greater percentage of healthy children) are colonized with at least one strain of Strep pneumo in their respiratory tract.

Transmission:
Strep pneumo is spread from person to person by respiratory droplets. Invasive disease arises in colonized individuals related mostly to host factors.

Susceptibility:
Children under the age of 2 and adults over the age of 65 have the highest rates of invasive disease.

Incubation period:
The incubation period is thought to be from 1-3 days, but is difficult to establish due to routine colonization.

Period of communicability:
The infectious period is generally unknown. Because organisms are transmitted but disease does not usually result, isolation of colonized or infected people is not necessary.

Epidemiology:
Incidence:
Strep pneumo causes an estimated 3,000 cases of meningitis; 63,000 cases of bacteremia; 125,000 hospitalizations due to pneumonia; and 6,800,000 cases of acute otitis media each year. Nationally, incidence varies by age and risk group. Nationally, incidence in healthy young adults is 3.8/100,000, whereas incidence in those under 2 years or greater than 64 years of age is ten times higher. Strep pneumo rates have been decreasing in Utah since 2010.

Cases are underestimated because:
  a. The case definition does not include individuals diagnosed via sputum cultures and
  b. Many people receive antibiotics prior to specimen collection.
Risk:
At risk populations include certain racial/ethnic groups (such as African/American and American Indian), alcohol abuse (past or present), smoking (active or passive), COPD, pregnancy, chronic heart, lung, liver, or renal disease, immunocompromised, incarceration, homelessness, and crack cocaine use. People infected with influenza are at increased risk.

✔ PUBLIC HEALTH CONTROL MEASURES

Public health responsibility:
• Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
• Determine whether the organism is non-susceptible to antibiotics – define which antibiotics and whether susceptible (S) intermediate (I) or resistant (R).
• Determine vaccination status of children under the age of 5.
• Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
• Identify clusters or outbreaks of this disease.

Prevention:
Vaccine is the only preventive measure.

Chemoprophylaxis:
None.

Vaccine:
PCV13 and PPV23 protect against 90% of invasive disease. Vaccination also decreases the need for antibiotics, therefore preventing antibiotic resistance. Investigation provides an opportunity to identify contacts with indications for pneumococcal vaccine.

PCV13 (Prevnar 13®) is recommended for:
• Routine immunization of all children 2–23 months of age;
• Children 24–59 months of age with the following high-risk medical conditions:
  o Sickle cell disease;
  o Functional or anatomic asplenia;
  o HIV infection;
  o Immunosuppression caused by illness, treatment or medication; and
  o Certain chronic medical diseases (e.g., cardiopulmonary disease, cochlear implants, CSF fluid leaks, renal failure, nephrotic syndrome, diabetes, liver disease).
• PCV13 should be considered for all children 24–59 months of age, with prioritization given to:
  o All children 24–35 months of age;
  o All children 36–59 months of age who are African American, Alaskan Native or Native American; and
  o All children attending out-of-home childcare (≥4 hours per week with ≥2 unrelated children).
PPV23 (Pneumovax®) is indicated for the following individuals:* Immunocompetent Persons

- All persons 65 years of age and older
- Persons 2–64 years of age with:
  - Cardiovascular disease
  - Pulmonary disease (excluding asthma)
  - Diabetes
  - Alcoholism or chronic liver disease
  - CSF leaks
  - Sickle cell disease
  - Cochlear implants

Persons 2–64 years of age:
- Living in long-term care facilities
- Who are Native American

*Immunocompromised Persons*

- Persons 2–64 years of age with:
  - Functional or anatomic asplenia
  - Leukemia, lymphoma, Hodgkin’s disease, multiple myeloma, generalized malignancy
  - Chronic renal failure or nephrotic syndrome
  - Conditions, such as organ transplants, associated with immunosuppression
  - HIV infection
  - Immunosuppressive therapy, including long-term corticosteroids (equivalent to ≥2 mg/kg/day, or a total of ≥20 mg/day of prednisone, for ≥14 days) and radiation

*Including children who received PCV7, as long as it has been ≥2 months since the last dose of PCV7.

Isolation and quarantine requirements:

**Isolation**: None
**Hospital**: Standard body substance precautions.
**Quarantine**: None

☑ CASE INVESTIGATION

Reporting (January 2010 definition):

**Case Definition**:

**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.

| Medical record containing a diagnosis of invasive *S. pneumoniae* disease | Confirmed | Suspect | S |
| Deceased certificate listing invasive *S. pneumoniae* disease as the cause or a contributing cause of death | Confirmed | Suspect | S |
| Other reported pneumococcal disease | Confirmed | Suspect | S |
| Isolation of *S. pneumoniae* from a normally sterile site | Confirmed | S |

S=This criterion alone is sufficient to classify a case.

**Case Investigation Process:**
1. Fill out the TriSano investigation form.
2. If the patient is less than five years of age – obtain PCV 7/13 vaccination status and dates.
3. Fill in the antibiotic susceptibility profile.
4. Attach the laboratory report form.

**Outbreaks:**
An outbreak will be defined as a monthly rate of IPD that is more than 2 standard deviations higher than the average monthly rate of IPD.

**Identification of case contacts:**
No investigation of case contacts is necessary.

**Version Control**
v. 2013 – Improved Lab Identification element to clarify that urine antigen tests are not reportable. Updated Epidemiology. Updated vaccine information to include PCV13. Changed reporting and case classification criteria to match CSTE guidance. Reduced the work requested for the case investigation process. Eliminated the identification of case contacts.