

Causes of Pneumonia – general - Bacteria

Bacteria are the most common cause of pneumonia. However, pneumonia can also be caused by viruses, fungi, and other agents. It is often impossible to identify the specific culprit.

Many bacteria are grouped into one of two large categories by the laboratory procedure used to look at them under a microscope. The procedure is known as Gram staining. Bacteria are stained with special dyes, then washed in a special solution. The color of the bacteria after washing determines whether they are Gram-negative or Gram-positive. Knowing which group the bacteria belong to helps determine the severity of the disease, and how to treat it. Different bacteria are treated with different drugs.

Gram-Positive Bacteria. These bacteria appear blue on the stain and are the most common organisms that cause pneumonia. They include:

- *Streptococcus (S.) pneumoniae* (also called pneumococcus), the most common cause of pneumonia. This Gram-positive bacterium causes 20 - 60% of all community-acquired bacterial pneumonia (CAP) in adults. Studies also suggest it causes 13 - 38% of CAP in children.
- *Staphylococcus (S.) aureus*, the other major Gram-positive bacterium responsible for pneumonia, causes about 2% of CAP and 10 - 15% of hospital-acquired pneumonias. It is the organism most often associated with viral influenza, and can develop about 5 days after the onset of flu symptoms. Pneumonia from *S. aureus* most often occurs in people with weakened immune systems, very young children, hospitalized patients, and drug abusers who use needles. It is uncommon in healthy adults.
- *Streptococcus pyogenes* or Group A streptococcus.

Gram-Negative Bacteria. These bacteria stain pink. Gram-negative bacteria commonly cause infections in hospitalized or nursing home patients, children with cystic fibrosis, and people with chronic lung conditions.

- *Haemophilus (H.) influenzae* is the second most common organism causing community-acquired pneumonia, accounting for 3 - 10% of all cases. It generally occurs in patients with chronic lung disease, older people, and alcoholics.
- *Klebsiella (K.) pneumoniae* may be responsible for pneumonia in alcoholics and other people who are physically debilitated. It is also associated with recent use of potent antibiotics.
- *Pseudomonas (P.) aeruginosa* is a major cause of hospital-acquired pneumonia (nosocomial pneumonia). It is a common cause of pneumonia in patients with chronic or severe lung disease.
- *Moraxella (M.) catarrhalis* is found in everyone's nose and mouth. Experts have identified this bacterium as an uncommon cause of certain pneumonias, particularly in people with lung problems such as asthma or emphysema.

- *Neisseria (N.) meningitidis* is one of the most common causes of meningitis (central nervous system infection), but the organism has been reported in pneumonia, particularly in epidemics of military recruits.
- Other Gram-negative bacteria that cause pneumonia include *E. coli*, proteus (found in damaged lung tissue), enterobacter, and acetinobacter.

Atypical Pneumonia

Atypical pneumonias produce mild symptoms and a dry cough. Organisms that cause atypical pneumonias include:

- *Mycoplasma (M.) pneumoniae*, the most common atypical pneumonia organism. Mycoplasma is a very small bacterium that lacks a cell wall. Pneumonia caused by *M. pneumoniae* spreads when someone carrying the infection comes in close contact with others for a long period of time. It is most often found in school-aged children and young adults. The condition, commonly called "walking pneumonia," is usually mild.
- *Chlamydia (C.) pneumoniae* is now thought to cause 10% of all CAP cases. This atypical pneumonia is most common in young adults and children, and is usually mild. It is less common, but usually more severe, in the elderly.
- *Legionella pneumophila* causes Legionnaires' disease. It is contracted by breathing in drops of contaminated water. Outbreaks are often reported in hotels, cruise ships, and office buildings, where people are exposed to contaminated droplets from cooling towers and evaporative condensers. They have also been reported in people who have been near whirlpools and saunas. *Legionella pneumophila* is not passed from person to person. Some experts believe the organism causes 29 - 47% of all pneumonia cases. Legionnaires' disease was first described in 1976 after an outbreak of fatal pneumonia at an American Legion convention. The newly described organism that caused the disease was named *Legionella pneumophila*, shown in this picture.

Viral Pneumonia (this is what is caused by other diseases)

A number of viruses can cause pneumonia, either directly or indirectly. They include:

- **Influenza (Flu)**. Pneumonia is a major complication of the flu and can be very serious. Influenza-associated pneumonia is particularly risky for the elderly and people with underlying heart disease. It can develop about 5 days after flu symptoms start. The flu weakens the body's defense systems, making it easier for bacteria to grow in the lungs.
- **Respiratory syncytial virus (RSV)**. Most infants are infected with RSV at some point, but it is most often mild. However, RSV is a major cause of pneumonia in infants, as well as adults with damaged immune systems. Studies indicate that RSV pneumonia may be more common in adults, especially the elderly, than previously thought.

- **Severe acute respiratory syndrome (SARS).** SARS is a respiratory infection caused by a newly-described coronavirus, which appears to have jumped from animals to humans. The disease was first reported in China in 2003.
- **Human parainfluenza virus.** This virus is a leading cause of pneumonia and bronchitis in children, the elderly, and patients with damaged immune systems.
- **Adenoviruses.** Adenoviruses are common and usually are not problematic, although they have been linked to about 10% of childhood pneumonias. Adenovirus 14 has been linked to an outbreak of severe community-acquired pneumonia in the Pacific northwest.
- **Herpes viruses.** In adults, herpes simplex virus and varicella zoster (the cause of chickenpox) can cause pneumonia in people with impaired immune systems.
- **Avian influenza.** Type A influenza subtype H5N1 in birds is spreading around the globe. Fortunately, only a few hundred human cases have been identified. Most have resulted from close contact with infected birds. Person-to-person contact is rare. All patients diagnosed with "bird flu" show signs of pneumonia, although symptoms may be mild. Oseltamivir (Tamiflu) is the most effective treatment for this type of influenza, which can be fatal.

Aspiration Pneumonia and Anaerobic Bacteria

The mouth contains a mixture of bacteria that is normally harmless. However, if this mixture reaches the lungs, it can cause a serious condition called aspiration pneumonia. This may happen after a head injury or general anesthesia, or when a patient takes drugs or alcohol. In such cases, the gag reflex doesn't work as well as it should, so bacteria can enter the airways. Unlike other organisms that are inhaled, bacteria that cause aspiration pneumonia do not need oxygen to live. These bacteria are called anaerobic bacteria.

Opportunistic Pneumonia

Impaired immunity leaves patients vulnerable to serious, life-threatening pneumonias known as opportunistic pneumonias. They are caused by organisms that are harmless to people with healthy immune systems. Infecting organisms include:

- *Pneumocystis carinii*, renamed *Pneumocystis jiroveci* in 2002, is an atypical organism. Originally thought to be protozoa, it is now classified as a fungus. *P. jiroveci* is very common and generally harmless in people with healthy immune systems. It is the most common cause of pneumonia in AIDS patients.
- Fungi, such as *Mycobacterium avium*
- Viruses, such as cytomegalovirus (CMV)

In addition to AIDS, other conditions put patients at risk for opportunistic pneumonia. They include cancers, such as lymphoma and leukemia. Long-term use of corticosteroids and drugs known as immunosuppressants also increases the risk for these pneumonias.

Occupational and Regional Pneumonias

Exposure to chemicals can also cause inflammation and pneumonia. Where you work and live can put you at higher risk for exposure to pneumonia-causing organisms.

- Workers exposed to cattle, pigs, sheep, and horses are at risk for pneumonia caused by anthrax, brucella, and *Coxiella burnetii* (which causes Q fever).
- Agricultural and construction workers in the Southwest are at risk for coccidioidomycosis (Valley fever). The disease is caused by the spores of the fungus *Coccidioides immitis*.
- Those working in Ohio and the Mississippi Valley are at risk for histoplasmosis, a lung disease caused by the fungus *Histoplasma capsulatum*.
- Workers exposed to pigeons, parrots, parakeets, and turkeys are at risk for psittacosis, a lung disease caused by the bacteria *Chlamydia psittaci*.
- Hantavirus, a rare virus carried by rodents, causes a dangerous form of lung disease. It does not spread from person to person. Cases have occurred in New Mexico, Arizona, California, Washington, and Mexico.

<http://health.nytimes.com/health/guides/disease/pneumonia/causes.html>

<http://www.medicinenet.com/pneumonia/article.htm>