Pneumonia

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An acute or chronic inflammatory disease of the lungs. More specifically when inflammation is caused by an infectious agent, the condition is called pneumonia; and when the inflammatory process in the lung is not related to an infectious organism, it is called pneumonitis.

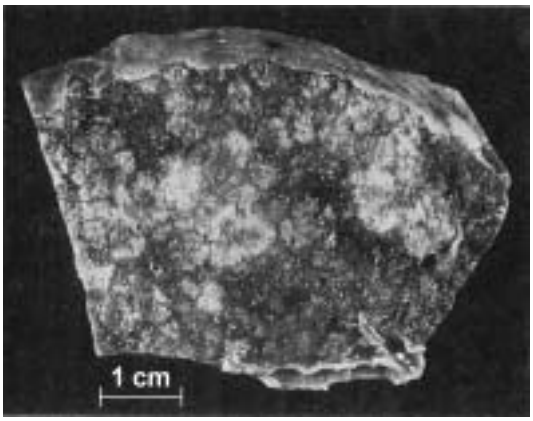
An estimated 45 million cases of infectious pneumonia occur annually in the United States, with up to 50,000 deaths directly attributable to it. Pneumonia is a common immediate cause of death in persons with a variety of underlying diseases. With the use of immunosuppressive and chemotherapeutic agents for treating transplant and cancer patients, pneumonia caused by infectious agents that usually do not cause infections in healthy persons (that is, pneumonia as an opportunistic infection) has become commonplace. Moreover, individuals with acquired immune deficiency syndrome (AIDS) usually die from an opportunistic infection, such as pneumocystis pneumonia or cytomegalovirus pneumonia. Concurrent with the variable and expanding etiology of pneumonia and the more frequent occurrence of opportunistic infections is the development of new antibiotics and other drugs used in the treatment of pneumonia. *See also:* ACQUIRED IMMUNE DEFICIENCY SYNDROME (AIDS); OPPORTUNISTIC INFECTIONS.

The incidence of noninfectious inflammatory conditions of the lung also seems to be increasing, or at least they are more frequently recognized. The number of drugs capable of inducing pneumonitis appears to be increasing as well. For example, cocaine derivatives have been shown to cause an inflammatory condition of the lung that may sometimes result in death.

Infectious pneumonia

Bacteria, as a group, are the most common cause of infectious pneumonia, although influenza virus has replaced *Streptococcus pneumoniae* (*Diplococcus pneumoniae*) as the most common single agent. Common bacterial agents causing pneumonia are *Streptococcus pneumoniae* (diplococci), other species of *Streptococcus, Staphylococcus* species, *Hemophilus influenzae, Klebsiella* species, *Pseudomonas aeruginosa, Legionella pneumophila, Mycobacterium tuberculosis*, and *Mycoplasma pneumoniae.* Some of these bacteria are normal inhabitants of the body and proliferate to cause disease only under certain conditions. Other bacteria are contaminants of food or water. *See also: STREPTOCOCCUS PNEUMONIAE* (PNEUMOCOCCUS).

Most bacteria cause one of two main morphologic forms of inflammation in the lung. *Streptococcus pneumoniae* causes a type of pneumonia referred to as lobar pneumonia, in which an entire lobe of a lung or a large portion of



Representative region of lung tissue from the right lower lobe. The nodular whitish areas represent acute bronchopneumonia and appear white due to the influx of white blood cells, which represent an inflammatory reaction to the bacteria.

a lobe, usually the lower lobe, becomes consolidated (firm, dense) and nonfunctional secondary to an influx of fluid and acute inflammatory cells (polymorphonuclear leukocytes) that represent a reaction to the bacteria. This type of pneumonia is uncommon today, usually occurring in people who have poor hygiene and are debilitated. If lobar pneumonia is treated adequately, the inflammatory process may entirely disappear, although in some instances it undergoes a process called organization, in which the inflammatory tissue changes into fibrous tissue. This results in a permanent obliteration of the normal lung architecture, usually rendering that portion of the lung nonfunctional.

The other morphologic form of pneumonia, which is caused by the majority of bacteria, is called bronchopneumonia. In this form, there is patchy consolidation of lung tissue, usually around the small bronchi and bronchioles, again most frequent in the lower lobes (see **illustration**). Bronchopneumonia usually begins as an infection in the lumina of the small airways of the lower lobe and progresses to involve the surrounding alveoli, with an associated acute inflammatory response. This type of pneumonia may also undergo complete resolution if there is adequate treatment, although rarely it organizes.

Among the many viruses known to cause pneumonia are influenza A, influenza B, adenovirus, respiratory syncytial virus, cytomegalovirus, and herpes simplex virus. Viral pneumonia is usually a diffuse process throughout the lung and produces a different type of inflammatory reaction than is seen in bronchopneumonia or lobar pneumonia. Mycoplasma pneumonia, caused by *Mycoplasma pneumoniae*, is referred to as primary atypical pneumonia and causes an inflammatory reaction similar to that of viral pneumonia. Mycoplasma pneumonia usually occurs in families and groups and may become chronic and difficult to eradicate.

Fungal organisms causing pneumonia include *Coccidioides immitus, Cryptococcus neoformans*, and *Histoplasma capsulatum.* Pneumonia can be caused by a variety of other fungal organisms, especially in

debilitated persons such as those with cancer or AIDS. *Mycobacterium tuberculosis*, the causative agent of pulmonary tuberculosis, produces an inflammatory reaction similar to fungal organisms. *See also:* MYCOBACTERIAL DISEASES; TUBERCULOSIS.

Legionella pneumonia

Legionella pneumonia, initially called Legionnaires' disease, is caused by bacteria of the genus *Legionella.* The condition is frequently referred to under the broader name of legionellosis. Although the illness was originally described as being caused by *Legionella pneumophila*, the organism that was isolated from patients who succumbed during the 1976 American Legion convention in Philadelphia, many other *Legionella* species are now recognized. Legionellosis is not uncommon, and two clinical syndromes are manifested: an acute pneumonia with a high mortality rate, and a self-limited flulike illness. Legionella pneumonia may also occur in compromised hosts as an opportunistic infection. The disease may be preceded by several days of fever, chills, malaise, and muscle aches, and it may be associated with nonpulmonary symptoms such as diarrhea and encephalopathy (brain dysfunction). The legionella organism is a coccobacillus that does not strain easily with the conventional (Gram) stain used to identify bacteria, and requires a special type of medium to grow in culture. *See also:* LEGIONNAIRES' DISEASE.

Pneumocystis pneumonia

Pneumocystis pneumonia is caused by *Pneumocystis carinii*, a putative protozoan parasite. Before the AIDS epidemic, this organism was a rare cause of pneumonia, occurring mainly in infants and young children and also in immunocompromised cancer patients. Between October 1980 and May 1981, five men in California were treated for pneumocystis pneumonia, and all five also had cytomegalovirus pneumonia. They were subsequently found to be immunodeficient, and pneumocystis pneumonia was quickly recognized as the primary cause of death in patients with AIDS. The pneumocystis organism, which is about the size of a red blood cell, causes a rapid consolidation of the lung. It is best identified with a silver stain in tissue sections or in special preparations made of fluid obtained from the lungs. The pneumonia can be effectively treated with erythromycin and pentamidine.

Hypersensitivity pneumonitis

Some persons are allergic to certain organic antigens, often the spores of various types of bacteria. When these antigens are inhaled into the lungs of susceptible persons, an inflammatory reaction occurs that can progress from acute to a more chronic disease. The most frequently recognized hypersensitivity pneumonitis is called farmer's lung: susceptible farmers or other persons dealing with such items as moldy hay inhale the spores of the bacteria *Thermoactinomyces vulgaris.* About 4–6 h later, they develop fever, cough, shortness of breath, and chest pain. X-ray shows a patchy infiltrate in their lungs. The disease can rapidly clear when the person is removed from the offending antigen or is treated with cortisone-type medicines.

Drug-induced pneumonitis

Many drugs can induce inflammation in the lungs. The mechanisms by which various drugs cause pneumonitis can either depend on the dose or be secondary to a hypersensitivity reaction. Alkylating agents such as busulfan, which is used in treating various types of solid tumors, are the drugs most frequently recognized to cause pneumonitis. The pneumonitis may occur weeks to months after the drug has been started and usually appears to depend on the dose. Gold sodium thiomalate, a drug used to treat rheumatoid arthritis, and amiodarone, a drug used in treating heartbeat irregularities, are agents that can cause a pneumonitis that may progress to fibrosis and that represents a hypersensitivity reaction. *See also:* CHEMOTHERAPY AND OTHER ANTINEOPLASTIC DRUGS.

Cocaine and its derivatives have been associated with the development of a nonspecific type of pneumonitis and fibrosis, as well as pulmonary hemorrhage. The exact mechanism by which cocaine causes these types of change is uncertain but may be related to its effect on the contraction and relaxation of blood vessels. *See also:* COCAINE.

Other types of pneumonitis and agents

Idiopathic interstitial pneumonitis, also referred to as idiopathic pulmonary fibrosis, is characterized by a chronic inflammation in the lung in association with the formation of fibrous tissue. The cause of most cases is uncertain, although some have been associated with diseases such as systemic lupus erythematosus. Bronchiolitis obliterans or organizing pneumonitis is characterized by inflammation of the bronchioles as well as lobar fibrosis. It usually is associated with cough, fever, and chest pain. Its cause is usually unknown, and most cases are reversible when treated with cortisone-type drugs.

Oxygen, when delivered at concentrations greater than 40% for more than 24 h, can cause inflammation in the lung. This usually begins as acute damage to the alveoli and can progress to pulmonary fibrosis. Radiation, used in the treatment of thoracic tumors, can also cause inflammation of the lung with subsequent fibrosis. Aspiration of blood or gastric contents can produce a localized region of severe inflammation and cellular death in the lung. The aspiration of an oily substance, such as oily nose drops, can result in the accumulation of lipid material in the lung, referred to as lipoid pneumonitis.

Signs, symptoms, and diagnosis

The signs and symptoms of pneumonia and pneumonitis are usually nonspecific, consisting of fever, chills, shortness of breath, and chest pain. Fever and chills are more frequently associated with infectious pneumonias, but may also be seen in pneumonitis. The physical examination of a person with pneumonia or pneumonitis may reveal abnormal lung sounds indicative of regions of consolidation of lung tissue. A chest x-ray also shows the consolidation, which appears as an area of increased opacity (white area). Cultures of sputum or bronchial secretions may identify an infectious organism capable of causing the pneumonia. In AIDS patients, fluid is frequently instilled into the pulmonary bronchial tree and then rapidly removed; examination of special

preparations of this fluid may show such microorganisms as *Pneumocystis carinii.* In some cases of pneumonia or pneumonitis in which no definite cause can be determined from routine studies, the chest cavity must be opened surgically and the lung biopsied.

Treatment

The treatment of pneumonia and pneumonitis depends on the cause. Bacterial pneumonias are treated with antimicrobial agents such as penicillin. If the organisms can be cultured, the sensitivity of the organism to a specific antibiotic can be determined. Viral pneumonia is difficult to treat, as most drugs only help control the symptoms. The treatment of pneumonitis depends on identifying its cause; many cases are treated with cortisone-type medicines.

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