



Infectious Diseases of the Lung

Narendran Selvakumar, Brian Casserly, and Sharon Rounds

PNEUMONIA

Definition and Epidemiology

Pneumonia is an infection of the lower respiratory tract parenchyma by bacteria, viruses, fungi, or parasites. It should be distinguished from pneumonitis, which is inflammation of the lungs caused by noninfectious causes, including chemicals, blood, radiation, and autoimmune processes. Pneumonia, the leading cause of death of children worldwide and the eighth leading cause of death in the United States, is responsible for 4 to 10 million respiratory infections each year.

Pathology

Microbial agents can be introduced to the lungs through several sources, including normal flora from the sinuses, nasopharynx, or oropharynx and inhalation of dust, liquid, or gases from environmental sources. The most common route is by aspiration of oropharyngeal secretions. Direct inhalation of organisms such as *Legionella* species, mycobacteria, endemic fungi, *Mycoplasma pneumoniae*, *Chlamydomphila pneumoniae*, and most viruses can cause pneumonia, resulting in geographic and seasonal clustering of cases.

Much less commonly, pneumonia can arise from hematogenous or embolic spread of infection from infected heart valves or venous clots. The small vessels of the pulmonary circulation act as filters for venous blood carrying small clusters of bacteria from the source. Hematogenous pneumonias are often multifocal with peripheral lesions susceptible to rapid cavitation.

Clinical Presentation

Patients usually exhibit respiratory symptoms, including productive cough, dyspnea, chest pain, and occasionally hemoptysis. Less specific symptoms include fever, general malaise, myalgias, and weight loss. The presentation may be acute (days to weeks), as observed in bacterial pneumonia, or subacute or chronic (weeks to years), as observed with tuberculosis (TB). Immunocompromised patients (e.g., with human immunodeficiency virus [HIV] infection) may be predisposed to specific illnesses, and knowledge of the specific impairment in host defense mechanisms may help to determine the cause of the infection.

The chest radiograph plays an important role. A parenchymal opacity is observed in the patient with pneumonia (E-Fig. 21-1) However, noninfectious disorders can mimic pneumonia, and no radiographic finding is specific for infection.

The initial antibiotic choice may be guided by Gram stain of respiratory secretions. This requires the demonstration

of a satisfactory sputum sample (i.e., >25 polymorphonuclear leukocytes and <10 epithelial cells per low-power field) and the presence of a predominant organism (>8 to 10 organisms per high-power field), particularly if the same bacteria are found in white blood cells. However, despite extensive laboratory testing, a causative organism can be identified in only about 50% of all pneumonia cases. Reasons include poor Gram-staining bacteria such as *Legionella pneumophila*, *C. pneumoniae*, absence of a peptidoglycan wall in *M. pneumoniae*, and various difficult-to-culture organisms that give inconclusive results. Table 21-1 lists the most common causative agents of pulmonary infections.

Clinical guidelines have been developed to provide a systematic approach to the diagnosis and management of pneumonia. The initial evaluation should determine whether the pneumonia is community acquired or health care associated.

Differential Diagnosis, Treatment, and Prognosis

Community-Acquired Pneumonia

Community-acquired pneumonia occurs twice as frequently during winter, and those at the extremes of age (<5 years and >65 years) are at increased risk. *Streptococcus pneumoniae* is the most common causative agent. *S. pneumoniae* is a gram-positive, diplococcal bacterium whose encapsulated structure and immunoglobulin A (IgA) protease protects it from host defense.

TABLE 21-1 ORGANISMS CAUSING PULMONARY INFECTIONS

PATHOGEN	COMMUNITY ACQUIRED INFECTIONS	NOSOCOMIAL INFECTIONS
Bacteria	70-80%	90%
<i>Streptococcus pneumoniae</i>	60-75%	3-9%
<i>Haemophilus influenzae</i>	4-5%	—
<i>Legionella</i> spp.	2-5%	Up to 25%
<i>Staphylococcus aureus</i>	1-5%	10-20%
Gram-negative bacilli	Rare	50
Atypical bacteria	10-20%	Rare
<i>Mycoplasma pneumoniae</i>	5-18%	—
<i>Chlamydia psittaci</i>	2-3%	—
<i>Coxiella burnetii</i>	1%	—
Viruses	10-20%	Rare
Influenza virus	—	8%
Hantavirus	—	Rare

Modified from Modaj J: Empiric therapy of severe infections in adults, Am J Med 88:12S-17S, 1990.