

# Bacterial Infections

## Background

The lower respiratory tract (LRT) consists of the larynx (voice box), trachea (windpipe), bronchial tubes, and the alveoli. Due to the mucous membrane and filtering mechanisms of the bronchial tubes, the LRT normally contains few microbes. Therefore, if pathogens enter the LRT, serious respiratory disease may result.

Several microbial diseases are associated with the LRT. Two of the bacterial diseases are pneumonia and tuberculosis, historically the two greatest infectious killers of humans. Infections of the LRT also exhibit themselves in several ways (see opposite page):

**Bronchitis:** An inflammation of the bronchial lining (wall) by viruses or bacteria

(*Streptococcus*, *Mycoplasma*, *Chlamydia*), producing a thick mucus that narrows the airways.

**Bronchiolitis:** Usually restricted to young children, a viral infection of the bronchiole lining causes a swelling and narrowing of the airways, making expiration difficult (a wheezing sound heard).

**Pneumonia:** An acute and complex syndrome resulting from an infection of the lung tissue and alveoli. Impaired gas exchange causes rapid and labored breathing, and cough.

## Signs and Symptoms

**Inhalation anthrax:** Fever, chills, cough, chest pain, headache, malaise; severe breathing and shock result.

**Tuberculosis:** Fever, fatigue, weight loss, cough; shortness of breath and chest pain; tubercle development.

**Primary atypical and chlamydial pneumonia:** Gradual and mild symptoms with fever, fatigue, and dry, hacking cough.

**Pertussis:** Catarrhal stage: malaise, dry cough, fever; Paroxysmal stage: violent (whooping) cough; Convalescent stage: sporadic cough that slowly subsides.

**Pneumococcal pneumonia:** High fever, chest pain, persistent cough, rust-colored sputum; increased pulse, and difficulty breathing.

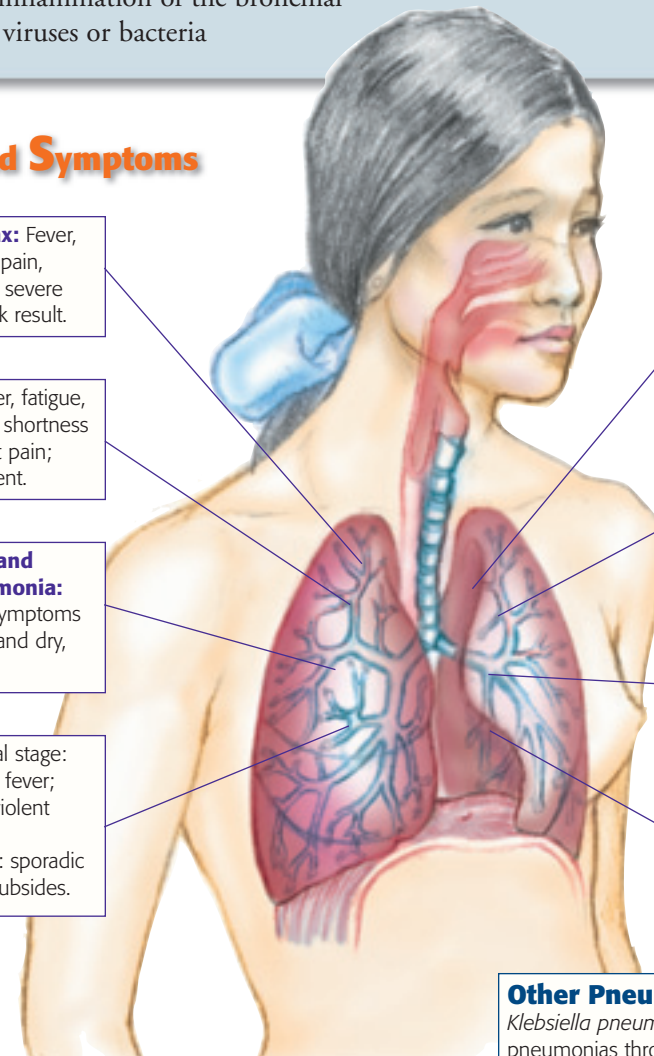
**Q fever:** Dry cough, high fever, chest pain, and severe headache.

**Legionellosis:** Pneumonia symptoms with fever, dry cough, diarrhea, and vomiting.

**Ornithosis:** Fever, headache, and dry cough.

## Other Pneumonias

*Klebsiella pneumoniae* and *Serratia marcescens* may produce pneumonias through a hospital-acquired infection. [FOM pp. 292–293]



## Common Clinical Conditions

Bacterial diseases of the LRT are outlined below.

### Bacterial Pneumonias

**Pneumococcal pneumonia:** *Streptococcus pneumoniae* is responsible for about 80% of all pneumonia cases. It usually starts after an URT viral infection damages the airways. Without appropriate antibiotic treatment, mortality is high, especially in the elderly. [FOM pp. 289–290]

**Primary atypical (walking) pneumonia:** Caused by *Mycoplasma pneumoniae*, the infection is common in children and teenagers. The disease is rarely fatal. [FOM pp. 290–292]

**Legionellosis (Legionnaires' disease):** *Legionella pneumophila* is inhaled as aerosols from air-conditioning devices or water supplies contaminated with the bacteria. After several days of incubation, symptoms appear with pneumonia being the most likely outcome. [FOM pp. 293–296]

**Q fever:** This pneumonia-like infection, caused by *Coxiella burnetii*, is transmitted by inhaling aerosol droplets or consuming contaminated meat or unpasteurized milk from infected animals. The mortality rate is low. [FOM pp. 296–297]

**Ornithosis (psittacosis):** A rare pneumonia caused by the bacterium *Chlamydia psittaci*. The obligate intracellular bacteria are inhaled in dried droppings from infected birds (parrots, parakeets, pigeons, turkeys). Most cases are mild. [FOM pp. 298–299]

**Chlamydial pneumonia:** *Chlamydia pneumoniae* also causes a form of pneumonia with symptoms and outcomes similar to primary atypical pneumonia. [FOM pp. 300–301]

### Other Bacterial Diseases

**Pertussis (whooping cough):** Caused by *Bordetella pertussis*, this highly contagious childhood disease produces mucus in the respiratory system, which triggers coughing. Straining for air causes the "whooping" sound. [FOM pp. 279–280]

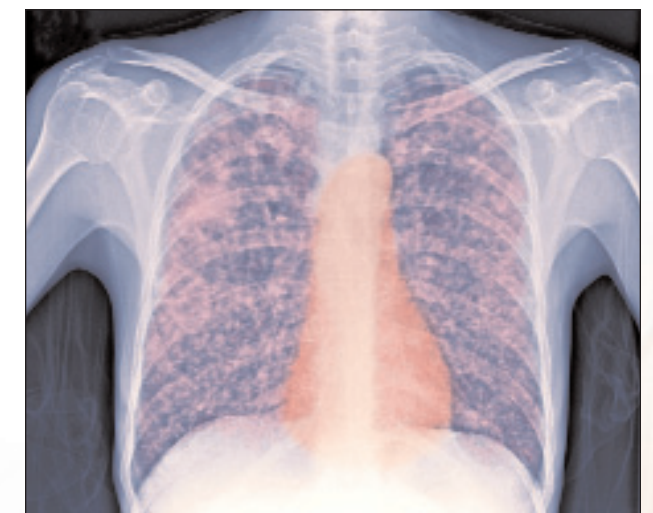
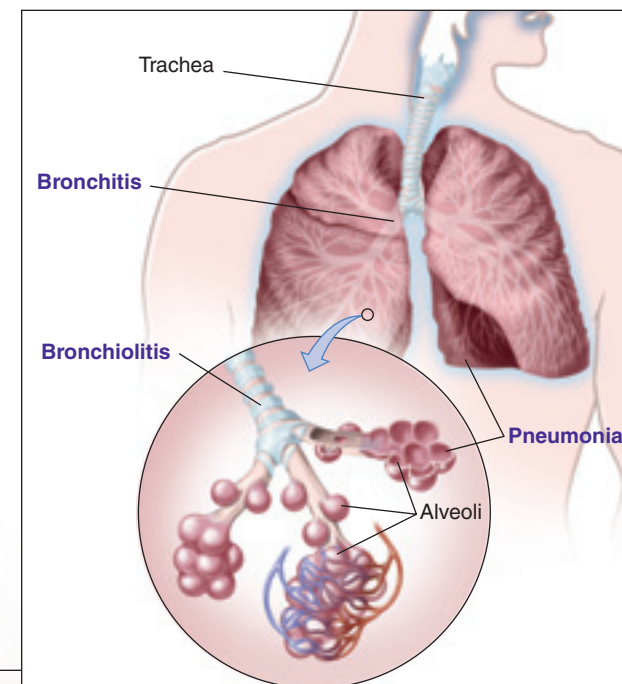
**Tuberculosis:** An infection by *Mycobacterium tuberculosis*, the major causative agent of tuberculosis (TB), starts by inhaling bacilli from an infected person. In the alveoli, the bacilli reproduce, leading to calcified aggregations of activated macrophages and lymphocytes (tubercles) surrounding the bacteria. [FOM pp. 284–288]

**Inhalation anthrax:** Without treatment, this deadly disease begins with typical cold symptoms, but quickly leads to breathing difficulties and shock from toxins produced by the cells from the germinated *Bacillus anthracis* spores. [FOM pp. 344–346]

## Treatment

Penicillin is the drug of choice for pneumococcal pneumonia. Primary atypical and chlamydial pneumonia are treated with erythromycin or tetracycline. Legionellosis also can be treated with erythromycin. Q fever can be treated with doxycycline, while ornithosis is best treated with tetracycline.

TB treatment involves extended use of isoniazid and rifampin for 6 to 9 months. Pertussis can be treated with erythromycin and, if caught very early, inhalation anthrax is treatable with ciprofloxacin.



False-colored chest X ray showing tuberculosis. The lungs contain lesions (pink) of infected tissue. (© Du Cane Medical Imaging, Ltd./Photo Researchers, Inc.)

Syndromes associated with the LRT.