



Pathophysiology of Bacterial Pneumonia and its Detection

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DESCRIPTION

Bacterial pneumonia is the lung illness caused by certain bacteria. Streptococcus (pneumococcus) is the most typical; however other bacteria may also be the cause. Bacteria can enter the lungs if immune system deteriorates. As a result, the air sacs in the lungs gets infected and swollen. As a result of the excess fluid, pneumonia develops.

Other bacteria that can cause pneumonia include

Staphylococcus aureus, *Moraxella catarrhalis*, *Streptococcus pyogenes*, *Neisseria meningitidis*, and *Klebsiella pneumoniae* are much more bacteria that can cause pneumonia.

SYMPTOMS

Chills, fever, headaches, muscle discomfort, lethargy or extreme exhaustion, wet, pale skin, appetite loss, coughing, dyspnoea, and chest pain are some of the symptoms. Infants, early children, and older adults often have dry coughs, while older children and adults typically have productive coughs. The dyspnoea is often modest, and the chest pain is confined near the infected area.

DIAGNOSIS TESTS

Blood tests

Blood tests are used to both identify the type of organism that is causing an infection and to confirm the presence of an infection. It's not always feasible to identify something precisely, though.

Chest X-ray

Chest X-ray is used in locating the infection's extent and location, but cannot reveal what kind of micro organism is causing the disease.

Sputum test

After a vigorous cough, a sample of the fluid from the lungs (sputum) is obtained and examined to identify the infection's origin.

Pleural fluid culture

A fluid sample from the pleural area is obtained by inserting a needle between the ribs, and it is then analyzed to help identify the infection kind. Patients with severe illness, failed outpatient antibiotic therapy, pleural effusion, active alcohol misuse, or severe liver disease are advised to get the pneumococcal antigen test. This test is especially helpful if sufficient blood or sputum samples could not be acquired prior to starting antibiotic therapy. Despite the fact that it does not reveal antimicrobial susceptibility, a positive test can be used to customize antibiotic therapy.

CT scan

Chest CT scan provides more precise picture of the lungs if pneumonia isn't improving as rapidly as anticipated.

Lung biopsy with a needle

In order to identify the reason of pneumonia, the doctor may do a lung biopsy. The lungs will be sampled many times during this operation, and the samples will then be examined.

PATHOPHYSIOLOGY

Particulate matter and environmental pathogens are continuously exposed to the pulmonary system and airways. Micro-aspiration is the most typical method by which the pathogens or microbes enter the lung. Other methods include macro-aspiration and homogenous spread. The mucociliary system, immunological response, and cough reflex are pulmonary defense mechanisms that aid in maintaining low levels of the micro biome. It happens when the body's natural defenses are compromised, a virulent infection overwhelms the immune system, or there is a significant inoculum of infectious microbes.

When these pathogenic bacterial strains invade and spread within the lung parenchyma as a result of micro-aspiration, the host's immune system reacts, which sets off a chain reaction of inflammatory reactions that results in pneumonia.

The main immune cell that reacts to lower airway germs is the

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alveolar macrophage. When a dangerous disease or a huge inoculum prompts these alveolar macrophages to enlist Polymorph Nuclear Neutrophils (PMN) to phagocytize and engulf the bacteria, a greater immune response is activated. Tumor necrosis factor-alpha and interleukins are two cytokines that are released by alveolar macrophages. Granulocyte colony-stimulating

factor and interleukin-8 encourage neutrophil maturation and chemo attraction. Dyspnea may result from cytokine-induced alveolar-capillary membrane leaking, which can also reduce compliance. This inflammatory response leads to bacterial pneumonia. Although these cytokines are crucial for immunity, an overabundance can cause sepsis and multi-organ failure.