



# Infections Caused by *Klebsiella pneumoniae*: Prevention, Diagnosis, and Treatment

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## DESCRIPTION

A member of *Enterobacteriaceae* family, *Klebsiella pneumoniae* has been linked to pneumonia in patients with alcohol use disorder or diabetes mellitus. It is a gram-negative, encapsulated, non-motile bacterium that is found in the environment. The bacterium typically colonises the oropharynx and Gastro Intestinal (GI) tract mucosa of humans. The bacterium can exhibit high levels of virulence and antibiotic resistance once it has entered the body. Numerous elements that can cause infection and antibiotic resistance contribute to the bacterium's virulence. The organism's polysaccharide capsule, which protects the bacteria from opsonophagocytosis and serum death by the host organism, is its most crucial virulence component. A major contributor to the sequela in sepsis and septic shock is the release of an inflammatory cascade in the host organism upon sensing lipopolysaccharides. Fimbriae, another virulence component enable the bacterium to adhere to host cells. Another virulence component required by the organism to infect hosts is siderophores. For the purpose of enabling the infection, siderophores take iron from the host.

One of a few bacteria experiencing a high rate of antibiotic resistance as a result of changes to the organism's basic genome is *Klebsiella pneumoniae*. In 1929, Alexander Fleming made the initial discovery that gram-negative bacteria were resistant to beta-lactam medicines. Ever since then, *K. pneumoniae* according to an extensive research produce a beta-lactamase that breaks down the antibiotics beta-lactam ring. The *Klebsiella pneumoniae* bacteria, which spread from the intestines and feces, can cause a variety of infections and are frequently resistant to antibiotics.

The main reservoir for *K. pneumoniae* is humans. Between 5% and 38% of people in general population have the organism in their faeces, and between 1% and 6% have it in their nasopharynx. The patient's digestive system and hospital staff member's hands are the main infection reservoirs, where a nosocomial outbreak may result. However, individuals of Chinese ancestry and those who struggle with persistent alcoholism have been found to face higher rates of colonisation. The carrier rate for *K. pneumoniae* is significantly higher in

hospitalised patients than in the general population. According to a study, the number of antibiotics administered is connected to carrier rates in the stools of hospitalised patients, which can reach to 77%.

There are two types of pneumonia caused by *K. pneumoniae*, pneumonia acquired in the community and pneumonia acquired in a hospital. Although *K. pneumoniae* infection is relatively uncommon, community-acquired pneumonia is a fairly common diagnosis. Infections caused by *K. pneumoniae* are thought to be responsible for only 3% to 5% of community-acquired pneumonia cases in the west, but they can account for 15% of pneumonia cases in underdeveloped nations like Africa. Globally, *K. pneumoniae* is responsible for about 11.8% of hospital-acquired pneumonia. *K. pneumoniae* causes 8% to 12% of pneumonia cases in people who get it while using a ventilator, but only 7% of pneumonia cases in people who don't. The mortality rate for patients with alcoholism and septicemia ranges from 50% to 100%.

Healthy individuals rarely acquire infections because they have robust immune systems that can fight off microorganisms. However, illnesses including alcoholism, cancer, diabetes, renal failure, liver disease, and lung disease increases the risk of contracting infections. Other treatments or long-term use of specific antibiotics can potentially increases the risk of developing a *Klebsiella* infection. These pathogens are not airborne, and one must have a direct contact to become sick. One way would be of touching the cuts on with unclean hands. Hospitals, nursing homes, and other facilities with large populations of sick people are where most infections occur. The germs can also spread when they come into contact with medical equipment, such as IV catheters, tubes that are inserted into veins to deliver medications, endotracheal tubes, ventilators, and urinary catheters, which drain urine.

The location of the illness affects the symptoms. For instance, if bacteria cause pneumonia, people may experience the symptoms like fever, cough, chest pain, breathing difficulties, and increased mucus, which may be thick and bloody. People can get *Klebsiella pneumoniae* in other body parts as well and is possible for surgical

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wound to get easily infected. Additionally, infections in the blood (bacteremia or septicemia), brain (meningitis), heart (endocarditis), skin (cellulitis), and Urinary Tract (UT) are also possible.

## PREVENTION

Healthcare workers must adhere to particular infection control precautions in order to prevent the transmission of *Klebsiella* infections among patients. When entering rooms where patients with *Klebsiella*-related infections are confined, they may be required to employ stringent hand hygiene and wear gowns and gloves. To stop the spread of *Klebsiella*, healthcare institutions must also adhere to strict cleaning protocols. Patients should also wash their hands frequently to prevent the spread of infections, such as before preparing or eating food, before touching their eyes, nose, or mouth, before and after changing bandages or dressings, after using the restroom, and after touching hospital fixtures like bed rails, bedside tables, doorknobs, remote controls, or phones.

## DIAGNOSIS AND TREATMENT

In order to identify *Klebsiella* infections, doctors typically examine a sample of infected tissue, sputum, urine, or blood. Ultrasounds, X-rays, and CT scans are among the medical imaging procedures that doctors occasionally request for diagnosis. Before choosing the best course of action, a doctor who suspects that the bacteria have become resistant to certain antibiotics can order tests to see how sensitive the bacteria are to various antibiotics. Doctors treat infections that are hospital-associated with a class of antibiotics known as carbapenems. The decreasing effectiveness of antibiotics may make it difficult for doctors to treat *K. pneumoniae* infections. Some *K. pneumoniae* have most recently evolved carbapenem resistance. Doctors typically advise a two week course of treatment with a third or fourth generation cephalosporin, a fluoroquinolone, or one of these antibiotics combined with an aminoglycoside. Aztreonam or a quinolone regimen is necessary for those who are allergic to penicillin.