KLEBSIELLA PNUEMONIAE -AN EMERGING NOSOCOMIAL INFECTION

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ABSTRACT

Klebsiella species are routinely found in the human nose, mouth, and gastrointestinal tract as normal flora; however, they can also behave as opportunistic human pathogens.Klebsiella species are known to also infect a variety of other animals, both as normal flora and opportunistic pathogens. Klebsiella species are found everywhere in nature. This is thought to be due to distinct sublineages developing specific niche adaptations, with associated biochemical adaptations which make them better suited to a particular environment. They can be found in water, soil, plants, insects and other animals including humans. This article reviews on the emerging role on the infections

KEYWORDS- nosocomial-infection-deadly-prevention

INTRODUCTION

Klebsiella pneumoniae is a Gram-negative, non-motile, encapsulated, lactose-fermenting, facultative anaerobic, rod-shaped bacterium. It appears as a mucoid lactose fermenter on MacConkey agar. Although found in the normal flora of the mouth, skin, and intestines,[1] it can cause destructive changes to human and animal lungs if aspirated, specifically to the alveoli resulting in bloody, brownish or yellow colored jelly like sputum. In the clinical setting, it is the most significant member of the genus Klebsiella of the Enterobacteriaceae. K. oxytoca and K. rhinoscleromatis have also been demonstrated in human clinical specimens. In recent years, Klebsiella species have become important pathogens in nosocomial infections.

It naturally occurs in the soil, and about 30% of strains can fix nitrogen in anaerobic conditions.[2] As a free-living diazotroph, its nitrogen-fixation system has been much-studied, and is of agricultural interest, as K. pneumoniae has been demonstrated to increase crop yields in agricultural conditions.[3]. Today, K. pneumoniae pneumonia is considered the most common cause of hospital-acquired pneumonia in the United States, and the organism accounts for 3% to 8% of all nosocomial bacterial infections. This activity reviews the evaluation and treatment of patients with Klebsiella pneumonia and the inter-professional team's role in managing patients with this condition.

ETIOLOGY

Klebsiella pneumoniae is one of a handful of bacteria that are now experiencing a high rate of antibiotic resistance secondary to alterations in the core genome of the organism. Alexander Fleming first discovered resistance to beta-lactam antibiotics in 1929 in gram-negative organisms.[4] Since that time, K. pneumoniae has been well studied and has been shown to produce a beta-lactamase that causes hydrolysis of the beta-lactam ring in antibiotics. Extended-spectrum beta-lactamase (ESBL) K. pneumoniae was seen in Europe in 1983 and the United States in 1989. ESBLs can hydrolyze oxyimino cephalosporins rending third-generation cephalosporins ineffective against treatment. [5]. Due to this resistance, carbapenems became a treatment option for ESBL. However, of the 9000 infections reported to the Centers for Disease Control and Prevention (CDC) due to carbapenem-resistant Enterobacteriaceae in 2013, approximately 80% were due to K. pneumoniae. Carbapenem resistance has been linked to an up-regulation in efflux pumps, alteration of the outer membrane, and increased production of ESBL enzymes in the organism[6]

TRANSMISSION OF KLEBSIELLA PNEUMONIEA

To get a K. pneumoniae infection, a person must be exposed to the bacteria. In other words, K. pneumoniae must enter the respiratory tract to cause pneumoniae, or the blood to cause a bloodstream infection. In healthcare settings, K. pneumoniae bacteria can be spread through person-to-person contact (for example, contaminated hands of healthcare personnel, or other people via patient to patient) or, less commonly, by contamination of the environment; the role of transmission directly from the environment to patients is controversial and requires further investigation.[7] However, the bacteria are not spread through the air. Patients in healthcare settings also may be exposed to K. pneumoniae when they are on ventilators, or have intravenous catheters or wounds. These medical tools and conditions may allow K. pneumoniae to enter the body and cause infection.[8]

HYPER VIRULENT KLEBSEILLA PNEUMONIA

It is a very virulent strain coming from Asia, with a high mortality rate. It often spreads to central nervous system and eye (causing endophthalmitis). A string test is used to help the diagnosis.[9] Further examinations and treatments are made on a case-by-case basis, as there are currently no international guidelines.[10]

SIGNS AND SYMPTOMS

Individuals with Klebsiella pneumonia tend to cough up a characteristic sputum, as well as having

- Fever
- Nausea
- Tachycardia
- vomiting.
- Klebsiella pneumonia tends to affect people with underlying conditions, such as alcoholism.[11]

TREATMENT AND MANAGEMENT

Treatment for Klebsiella pneumonia is by antibiotics such as amino-glycosides and cephalosporins, the choice depending upon the person's health condition, medical history and severity of the disease.
Klebsiella possesses beta-lactamase giving it resistance to ampicillin, many strains have acquired an extended-spectrum beta-lactamase with additional resistance to carbenicillin, amoxicillin, and ceftazidime. The bacteria remain susceptible to aminoglycosides and cephalosporins, varying degrees of inhibition of the beta-lactamase with clavulanic acid have been reported. Infections due to multidrug-resistant gram-negative pathogens in the ICU have invoked the re-emergence of colistin. However, colistin-resistant strains of K. pneumoniae have been reported in ICUs.[12][13][14][15] In 2009, strains of K. pneumoniae with gene called New Delhi metallo-beta-lactamase (NDM-1) that even gives resistance against intravenous antibiotic carbapenem, were discovered in India and Pakistan.Klebsiella cases in Taiwan have shown abnormal toxicity, causing liver abscesses in people with diabetes mellitus (DM), treatment consists of third generation cephalosporins.

PREVENTION OF SPREAD

To prevent spreading Klebsiella infections between patients, healthcare personnel must follow specific infection-control precautions,[16] which may include strict adherence to hand hygiene (preferably using an alcohol based hand rub (60-90%) or soap and water if hands are visibly soiled. Alcohol based hand rubs are effective against these Gram-negative bacilli)and wearing gowns and gloves when they enter rooms where patients with Klebsiella–related illnesses are housed. Healthcare facilities also must follow strict cleaning procedures to prevent the spread of Klebsiella.[17]

To prevent the spread of infections, patients also should clean their hands very often, including:

- Before preparing or eating food
- Before touching their eyes, nose, or mouth
- Before and after changing wound dressings or bandages
- After using the restroom
- After blowing their nose, coughing, or sneezing

- After touching hospital surfaces such as bed rails, bedside tables, doorknobs, remote controls, or the phone

DIFFERENTIAL DIAGNOSIS

The differential diagnosis for pneumonia caused by K. pneumoniae should include

- All organisms that typically cause community-acquired and hospital-acquired pneumonia, such as Staphylococcus, Pneumococcus, Pseudomonas, Acinetobacter, and Legionella.
- Tuberculosis
- Aspergellus infection
- Malignancy
- Acute respiratory distress syndrome [ARDS]
- Lung abscess
- Empyema and plueropulmonary infections

OUTCOMES

Klebsiella pneumonia usually signals a grim prognosis. Even with optimal therapy, this infection of the lung carries a mortality of 30 to 50%. The prognosis is usually worse in diabetics, the elderly, and those who are immunocompromised. Even those who survive often have residual impaired lung function, and recovery can take months.

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