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Methicillin-resistant *Staphylococcus aureus* (MRSA)

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ABSTRACT

MRSA, or Methicillin-resistant Staphylococcus aureus, is a type of bacterium that has developed resistance to many commonly used antibiotics. It's a significant concern in healthcare settings because it can cause difficult-to-treat infections. Review articles on MRSA typically cover various aspects, including its epidemiology, mechanisms of antibiotic resistance, clinical manifestations, treatment options, and prevention strategies. MRSA represents a formidable healthcare-associated and community-acquired pathogen characterized by its ability to resist multiple antibiotics, its diverse clinical manifestations, and its impact on public health. Effective strategies for prevention, surveillance, and treatment are essential for mitigating the burden of MRSA infections and reducing their associated morbidity and mortality. In conclusion, veterinarian doctors are responsible for protecting food safety and public health since MRSA is regarded as an emerging zoonotic pathogen that affects both humans and animals.

Keywords: MRSA, Public Health Issue, antimicrobial resistance, virulence factors, epidemiology, treatment

Introduction

Methicillin-resistant Staphylococcus aureus (MRSA) is a bacterium that has garnered considerable attention in recent decades due to its ability to cause difficult-to-treat infections, particularly in healthcare settings [1]. Initially recognized as a problem primarily confined to hospitals, MRSA has since emerged as a significant community-acquired pathogen as well, presenting a multifaceted challenge to public health worldwide. Methicillin-resistant Staphylococcus aureus (MRSA) is a main human pathogen and a historically emergent zoonotic pathogen with public health and veterinary importance. In humans, MRSA commonly causes severe infectious diseases, such as food poisoning, otitis media, pneumonia, pyogenic endocarditis, osteomyelitis, and pyogenic infections of the skin, soft tissues [2].

The emergence of MRSA can be traced back to the mid-20th century when Staphylococcus aureus, a common bacterium responsible for a wide range of infections, began showing resistance to multiple antibiotics, including methicillin, a synthetic penicillin derivative. The first documented cases of MRSA were reported in healthcare settings in the 1960s, prompting concerns about the limited treatment options available for these infections [3].

MRSA's ability to resist multiple antibiotics, including beta-lactams like methicillin, is conferred by the acquisition of the mecA or mecC gene, which codes for an altered penicillin-binding protein (PBP2a). This protein has reduced affinity for beta-lactam antibiotics, rendering them ineffective against MRSA strains. Furthermore, MRSA often exhibits resistance to other classes of antibiotics, complicating treatment and necessitating the use of alternative agents [4].

Epidemiology

Initially regarded as a healthcare-associated pathogen primarily affecting hospitalized patients, MRSA has increasingly been implicated in community-acquired infections among otherwise healthy individuals with no recent healthcare exposure. Community-associated MRSA (CA-MRSA) strains often possess distinct genetic characteristics and virulence factors compared to healthcare-associated strains, contributing to their ability to cause infections in community settings [5].

Who gets MRSA?

The majority of MRSA cases are found in patients who are already in the hospital, particularly if they have been there for a while. In the hospital, certain wards—like the intensive care units—have higher MRSA rates than others. Individuals who are extremely sick, HIV-positive, or who have wounds or open sores (such as burns or bedsores) are more likely to get MRSA. It is possible for the wounds or sores to get infected with MRSA, which makes treatment challenging. Skin infections have the potential to spread and develop into more dangerous infections. Additionally, MRSA can occasionally contaminate thin, flexible tubes such as urinary catheters and tubes that enter veins or other bodily areas [6].

Clinical Manifestations

MRSA infections can manifest across a spectrum of severity, ranging from mild skin and soft tissue infections, such as cellulitis and abscesses, to more serious invasive infections, including bloodstream infections, pneumonia, and surgical site infections. The clinical presentation of MRSA infections may vary depending on the site of infection, patient factors, and the presence of comorbidities [7,8].

Public Health Impact

The increasing prevalence of MRSA infections poses significant challenges to public health due to the limited treatment options available and the potential for transmission within healthcare facilities, communities, and other settings. In addition to causing morbidity and mortality, MRSA infections can lead to increased healthcare costs, prolonged hospitalizations, and the need for more intensive interventions. MRSA is considered the main cause of hospital-acquired infections and community-acquired infections

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therefore, MRSA is not only known as a nosocomial bacterium [9].

Prevention and Control

Strategies to prevent the transmission of MRSA in healthcare settings are crucial for reducing infection rates. The majority of commercial antibiotics no longer work against MRSA infections. Using the antibiotic sensitivity test (disc diffusion method), resistant strains must be investigated and screened in order to control the issue of antibiotic resistance in both humans and animals. Additionally, alternative, environmentally friendly treatment plans, such as symbiotic relationships and herbal remedies, should be used [10,11].

Conclusion

In conclusion, veterinarians are responsible for protecting food safety and public health since MRSA is regarded as an emerging zoonotic pathogen that affects both humans and animals.

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