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Emerging Bacterial Pathogens and Bacterial Infection

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Abstract

Emerging pathogens are now considered to be a major microbiologic public health threat, and medical communities have been dealing with emerging and reemerging infectious diseases since the 1950s. This review focuses on bacterial emerging diseases and examines the factors that contributed to their emergence as well as potential obstacles in the future. We found 26 major bacterial-based emerging and recurrent infectious diseases; the majority of them came from either animals (known as zoonoses) or water sources.

In the elderly, infections account for the majority of morbidity and mortality. The frequency and severity of infections in elderly patients may be affected by a number of factors, including immunosenescence, comorbid chronic diseases, and changes in normal physiological organ functions. In those patients, normal body responses to the infection, such as an increase in temperature, may be blunted, making it difficult to distinguish infection from other diseases. The respiratory and urinary tracts are the most frequently affected systems in severe infections, which may also result in severe sepsis. In the elderly who are admitted to the intensive care unit (ICU), indwelling vascular catheters are also linked to bacteraemia and sepsis. Patients who are older are also more likely to contract the Clostridioides difficult infection. The other principles of antimicrobial stewardship, including careful fluid management and careful individualized optimization of antibiotic therapy, are warranted in order to prevent an increase in infection-related mortality, even though the general management of infections in severely ill elderly patients is the same as in younger patients. When treating critically ill elderly patients in the intensive care unit, organized team management is essential and will reduce infection-related morbidity and mortality.

Keywords: Elderly, Severely ill, Infection, Antimicrobial stewardship, Immunosenescence, Antibiotics, Bacteria, Culture, Gram-negative

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Introduction

It was thought that bacterial diseases could be easily controlled after Alexander Fleming discovered penicillin in 1928 and subsequent scientific advancements in the 20th century. However, physicians have been confronted with emerging and reemerging infectious diseases (EIDs) since the 1950s, posing significant problems for public health and financial resources [1]. For instance, in 2010, medical professionals were confronted with an enigmatic clinical picture that linked a severe inflammatory syndrome to vascular events like transient ischemic attacks or venous thromboembolisms. Ten cases were reported, particularly among patients with autoimmune or hematologic malignancies. Increased susceptibility to infections, malignancy, autoimmune disorders, and impaired wound repair occur as the immune system ages and its normal capabilities of defense against infections, malignant or auto reactive cells, and autoimmune diseases decline [2]. Immunosenescence, age-related organ changes, comorbidities, geriatric syndromes, frailty, malnutrition, functional dysfunction, and polypharmacy all have an impact on the prognosis of elderly patients with infectious diseases, and many older adults have mild degrees of immunosuppression [3].

Bacteria are everywhere. They are crucial to the upkeep of our surrounding environment. Infections and diseases are only caused by a small percentage of the world's bacteria. The public's health is significantly impacted by these bacterial infections. Because there are more antimicrobial agents with activity against bacteria, bacterial infections are generally easier to treat than viral infections [4]. However, unlike infectious diseases brought on by viruses and parasites, bacterial resistance to antimicrobials is a rapidly developing issue that has the potential to have devastating effects. Because so many of them are normal flora that colonize the host without causing infection, bacteria are unique among prokaryotes. Clinically significant disease only occurs in a small percentage of infections, and a person may or may not develop disease once they are infected. There are many ways that bacterial infections can spread [5]. A sufficient number of organisms must survive in the environment and reach a susceptible host for the disease to spread. Many bacteria have adapted to live in food, water, soil, and other environments. Before spreading to another human, some infect animals or insects as a vector.

Bacterial Infection

Bacterial infections can affect any and all human organs. Each type of bacteria is more likely to infect some organs than others. Neisseria meningitides, for instance, typically causes meningitis in the central nervous system's covering of the meninges but can also cause pneumonia in the lungs. However, it is not a factor in skin infections [6]. Staphylococcus aurous, which most people carry on their skin or mucus membranes, is a type of bacteria that frequently causes infections of the skin and soft tissues. However, it can also easily spread throughout the body through the bloodstream and infect the lungs, abdomen, heart valves, and almost any other site. Either the organism's destruction of the body's cells or the immune system's response to the infection can lead to disease.

Infections in Elderly

Infections are more likely to occur in older people because of immunosenescence, comorbidity, malnutrition, and social determinants of health. One third of people 65 and older die from infection as the leading cause of death. In addition, infection significantly increases geriatric patients' morbidity, exacerbates underlying diseases, and causes functional decline [7]. Many biological, cultural, and social factors show that older people are more likely to get sick and have worse outcomes when they get sick. Additionally, these factors alter the elderly's presentation of infectious syndromes and may result in treatment modifications.

Disease burden is significantly more correlated with impaired immunity than with chronological age. Compared to adults without underlying health issues, older adults with chronic diseases are more susceptible to common infections and respond less strongly to vaccines.

Classification of bacteria

Prokaryotic bacteria contain their genetic information in a double-stranded, circular DNA molecule. Additional DNA can be found in the form of small, circular plasmids in some species. With the exception of Mycoplasma, all species have a complex cell wall and ribosomes in the cell cytoplasm. Some bacteria have capsules, flagella, or pili that are outside the cell wall. Typically, bacteria reproduce through binary fission. Some bacteria have the ability to divide and multiply rapidly when the conditions are right. As a result, some infections only require a small number of organisms to cause an infection that could be overwhelming [8].

Based on the characteristics of their cell wall, bacteria are categorized as Gram-positive or Gram-negative when stains are applied, a technique known as Gram staining that Hans Christian Gram developed in 1882. The majority of bacteria, but not all, fall into one of these two categories. One of the most important clinical distinctions between gram-positive and gram-negative organisms is that gram-negative bacteria typically produce an endotoxin that has the potential to kill, shock, and destroy tissue. Additionally, the antibiotic susceptibilities of the two categories of bacteria are distinct [9].

Treatment

The ideal target site for an antimicrobial agent is in the infecting organism but not in the host cells. Antibiotics can target four major bacterial cell sites because they are sufficiently distinct from human cells. The ribosome, the nucleic acid synthetic pathway, the cell membrane, and the cell wall are all examples of these. Antibiotics, also known as antibiotics, are typically the creations of other microorganisms in an effort to compete for resources and space. An antibacterial agent can be classified in one of three ways:

1. Depending on whether it is bactericidal, which kills bacteria, or bacteriostatic, which stops bacteria from growing
2. By its chemical composition
3. By the target location

Because they lack the antibiotic's target or are impermeable to it, some bacteria are naturally resistant to certain antibiotic classes. Some people are naturally susceptible, but they become resistant through one of a growing number of mechanisms. In addition to being able to spread throughout the host and even be transferred to other hosts, resistant strains of bacteria have the advantage of selective survival in the presence of antibiotics [10]. This phenomenon is significant in settings with high rates of antibiotic use, such as hospitals and nursing homes. Plasmids carry some resistance genes that can be transferred to other species of bacteria by autonomously replicating circular extra chromosomal DNA molecules.

Conclusion

It takes a lot of teamwork to manage infections in elderly patients who are seriously ill. In order to prevent death, a prompt, thorough, and laborious diagnostic workup is necessary, and an empirical antimicrobial regimen covering suspected pathogens may need to be applied as soon as possible. Once a microbiological diagnosis has been made, the initial treatment may change to be more specific and efficient. In the elderly, infections account for the majority of morbidity and mortality. The frequency and severity of infections in elderly patients may

be affected by a number of factors, including immunosenescence, comorbid chronic diseases, and changes in normal physiological organ functions. The ideal target site for an antimicrobial agent is in the infecting organism but not in the host cells. Antibiotics can target four major bacterial cell sites because they are sufficiently distinct from human cells. A comprehensive treatment plan is necessary because a number of non-infectious complications in elderly patients may alter the course and severity of infections in the elderly.

Acknowledgement

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Conflict of Interest

None

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