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Superbugs: A global threat

Jayalaxmi G

Superbugs are microbes that have developed resistance to modern antibiotics. Resistance development is a well-studied phenomenon and scientists have narrowed it down to two main reasons. The first reason is evolution; microbes, especially bacteria, evolve at a faster rate as compared to complex organisms. Secondly, R-plasmid conjugation can occur when a plasmid containing genes for resistance is transferred from one bacterium to another one. The horizontal gene transfer by conjugation can happen between the same species and amongst different bacterial species. Therefore, superbugs are being reported annually by many countries and hence have become a global concern. Many initiatives have been taken up by the World Health Organisation (WHO) to tackle antimicrobial resistance, such as World Antimicrobial Awareness Week (WAAW), the Global Antibiotic Research and Development Partnership (GARDP), The Global Antimicrobial Resistance Surveillance System (GLASS) and Interagency Coordination Group on Antimicrobial Resistance (IACG). Moreover, antimicrobial resistance can be prevented and controlled by reducing the overuse and misuse of antibiotics. This can be ensured by using antibiotics only when prescribed by a health professional, maintaining strong hygiene, completing the drug regimen, avoiding products that are cultured with antibiotics and practising safe food consumption. Further, many antibiotics have been used to treat superbugs, like colistin, fosfomycin, temocillin and rifampicin. Among them, polymyxin has exhibited promising results. Although colistin (polymyxin E) exhibits good results, doctors are still hesitant to use them as they are nephrotoxic in nature. Many studies have been conducted to negate the negative effect of polymyxin. Recently, antimicrobial peptides (AMPs) have gained the attention of scientists. AMPs are host defence peptides found in many organisms including humans. While most AMPs disrupt the activity of the pathogen membrane, some target intracellular components of the pathogen. AMPs are better alternatives to traditional and modern antibiotics as they exhibit immunomodulatory response along with antibiotic activity. They also induce an immune response in the host. Development of resistance against AMPs is unlikely as AMPs target many different sites when compared to antibiotics. However, studies have shown that resistance to AMPs is still a possibility. Therefore, this indicates that further research is required in this field to understand AMP resistance which is a potential opportunity to combat these superbugs.

Keywords: superbugs, antimicrobial resistance, R-plasmid conjugation, polymyxin, antimicrobial peptides

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