Recent Tools to Overcome Antibacterial Resistance

Infectious diseases, such as endocarditis, chronic skin infections, middle ear infections and sinusitis are responsible for over 15 million deaths a year [1]. The high mortality rate is due to the widespread use of antibiotics in humans which cause increased resistance by bacterial strains. Microorganisms can induce antibiotic resistance by several mechanisms: hydrolysis or chemical modification of the antibiotic through the production of enzymes, alteration of the antibiotic target site, decrease in membrane permeability and/or increase active efflux of the antibiotic, and modification of the metabolic pathways to circumvent the antibiotic effect [2]. Moreover, bacteria in biofilms communicate by means of molecules, which activate genes responsible for the production of virulence factors (quorum sensing mechanisms). Current antibiotic therapy is generally effective against free-floating bacteria while it is often unproductive against pathogens forming biofilms because biofilm colonies can be up to 1000 times more resistant to conventional therapies [3].

Increasing resistance to antibacterial agents has augmented the need for the development of new drugs and drug delivery approaches to treat infections [4, 5]. Investigations concerning the development of novel strategies to overcome antibiotic resistance represent a great challenge for both the academic world and industry since bacterial infections represent a significant issue that includes several areas such as public health or food contamination [6, 7].

This issue highlights the chemical and pharmacological features of novel compounds to treat antibacterial infections and recent therapeutic approaches to overcome antibiotic resistance. The papers included in this special issue confirmed the importance of both well-known natural products with low molecular weight and antimicrobial peptides in the management of chronic and nosocomial infections. However, natural antimicrobial peptides and polyphenolics derivatives could suffer from chemical instability, photosensibility, and enzymatic degradation, which hamper their clinical use. Here, to overcome these limitations, medicinal chemistry approaches, such as chemical modifications, replacement of hydrolysis sensible groups or introduction of mimetics of natural amino acids, were analyzed and reported. Thus, this special issue collects latest advances in the field of antibacterial drug discovery and delivery such as the use of natural-based antibiofilm and antimicrobial peptides, naturally occurring prenyloxyphenylpropanoids, and polyphenolics as suitable clinical tools for the treatment of infections.

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REFERENCES


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