EDITORIAL

Antimicrobial Strategies based on Natural Products: Recent Progress in Bio and Nanotechnology

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Even if we are living in the era of antibiotics, microbial infections still represent one of the major causes of mortality and morbidity worldwide. Recent focus of research is to develop novel therapeutic approaches to diminish and remove pathogenic resistant bacteria. This special issue aims to cluster recent data regarding antimicrobial therapies based on natural compounds and to underline the contribution of bio and nanotechnology to the development of new strategies for fighting pathogens. We expect that this special issue will increase the specialists awareness regarding the wide opportunity offered by naturally-originated products for the antimicrobial therapy and will reveal new prospects for integrating traditional natural compounds and last generation technologies.

The paper of Michail Karavolos is well suited on the topic of Host-Pathogens interactions and offers an updated perspective on molecular cross-talk signaling pathways. The author highlights the potential new benefits researchers may obtain by interfering with this intricate signaling, to profit the host and prolong a healthy life.

Through the paper entitled "Prevention of Microbial Communities: Novel Approaches Based on Natural Products", Mogoşanu and collaborators introduce the readers in the amazing field of natural products with antimicrobial effect. Their work reveals the impact of modern and ecologic strategies on particular high risk infections, as ones that involve biofilms formation and resistant pathogens. Natural products containing secondary metabolites such as aromatic compounds, sulphurated derivatives, terpenoids (essential oils) and alkaloids as quorum-sensing inhibitors and biofilm disruptors are promising alternatives for the prophylaxis and treatment of chronic infections. Surface modification of medical devices with nonpolar functionalized nanoparticles stabilizes natural compounds and inhibits microbial adhesion and biofilm formation and growth for a longer period of time. Finally, this paper reveals the acute necessity of an interdisciplinary approach for developing these anti-infectious strategies, due to the large number of natural derivatives and their combination with biocompatible and biodegradable micro-/nano-engineered materials.

Holban and coworkers review and discuss the impact of nanotechnology on the inhibition of microbial colonization and biofilm development on modified surface prosthetic devices, in the paper entitled: "Prosthetic devices with nanostructurated surfaces for increased resistance to microbial colonization". In the first part of the paper the current status of infections related to prosthetic devices and the inquiries resulting from the increased number of patients with these infections are briefly reviewed. The second part discusses several aspects about the implication of nanotechnology in prosthetic devices surface modification and its impact on the prevention of infections. In the last part authors reveal the main aspects regarding the biocompatibility and the application of these nanomodified prosthetic devices in tissue engineering.

The paper of Mateescu *et al.*, describe the most recent technologies based on nanostructured bioactive polymers used in food-packaging. The development of effective packaging materials is crucial, because microorganisms from food can determine economic issues, but more importantly they may constitute a danger to public health. This work discusses some of the most recent findings in regards of food preservation through intelligent packaging methods, using biodegradable polymers, efficient antimicrobial agents and nanocomposites with improved mechanical and oxidation stability, barrier properties, and biodegradability compared to conventional polymeric matrices.

Radulescu and coworkers highlight the impact of chitosan based formulations in developing novel biocompatible antimicrobial therapies and for different biomedical applications. Because of its physico-chemical characteristics, the biodegradable and biocompatible polymer derived from crustacean shells, Chitosan, is one of the preferred candidates for green biomedical applications and also for several industries. This paper reviews the main utilities of chitosan as drug delivery component and describes the most recent technologies which utilize this polymer for developing nanostructured systems with antimicrobial effect, offering a perspective of using these findings in new, ecological biomedical applications.

In the work of Saviuc *et al.* is revealed the great variety and microbicidal activity of essential oils (EOs). Plants are rich in a wide variety of secondary metabolites that have proven antimicrobial properties. The aim of this review is to screen the relevant literature for identifying current research directions regarding EOs, in terms of antimicrobial effects, analysing methods and mechanisms of action.

The paper entitled "Antimicrobial and antiparasitic activity of lectins" by Iordache and coworkers highlight the role of lectins to mediate a variety of biological processes such as cell-to-cell and host-pathogen interactions, innate immune response, cell-to cell signalling. Recently lectins have become the focus of interest for their research and applications in agriculture and medicine due to antiparasitic and antimicrobial potential. This review focuses on the recent data regarding the antimicrobial and antiparasitic activity of lectins, by presenting the role of lectins in host-pathogen interaction and also the cytotoxic effects on microorganisms and parasites. Identification and characterisation of new lectins with antimicrobial activity could serve as a natural alternative for treating of infections caused by antibiotic-resistant microorganisms and parasites.

Guest Editors: Current Pharmaceutical Biotechnology

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