Editorial

Micro and Nanoscale Materials for Boosting the Antimicrobial Fight

Antibiotics have critically contributed to the control of bacterial infectious diseases and to the significant rise of average life expectancy, being considered one of the four major discoveries of the modern society. However, the rapid emergence and boundless spread of resistance mechanisms have now become worldwide problems, requiring the rapid identification of novel and efficient antimicrobial strategies to prevent the entrance in the post-antibiotic. One of the current focuses concerning the great potential of nanotechnology to solve medical challenges is to use nanoscale solutions for fighting chronic infections involving multiresistant superbugs and biofilms development on tissues and medical devices. The purpose of this special issue is to give some insights on the directions of metallic nanoparticles and nanomaterials applications aimed to overcomethe antibiotic resistance phenomenon amplified by the bacterial ability to develop biofilms. The antimicrobial activity mechanisms and spectrum of metallic nanoparticles, the improvement of the antimicrobial properties of medical devices by coating with a nanostructured film as well as the design of antibiotic delivery systems based on metallic nano-components are presented.

Mara Mădălina Mihai *et al*. highlighted in their work the microbial composition, developmental stages, architecture and properties of medical biofilms, as well as the diagnostic tools used in the management of biofilm related infections. Also, the authors presented recently acquired knowledge on the etiopathogenesis, diagnosis and treatment of four chronic diseases associated with biofilm development in tissues (chronic periodontitis, chronic lung infection in cystic fibrosis, chronic wounds) and artificial substrata (medical devices-related infections). **Corina Silvia Pop** *et al*. paper refers to the antimicrobial activity of metal cations in micro- and nanoparticulate forms and the dependence of this biological activity on shape, size and physico-chemical conditions. **Faik N. Oktar** *et al*. report an up to date overview about the antibacterial and antiviral activity of metal NPs, including the molecular mechanisms by which NPs annihilate multidrug-resistant bacteria. **Alina Maria Holban** present the applications of magnetic nanostructures for the current and future diagnosis and therapy procedures used in the management of infectious diseases. Magnetic nanostructures could be used as efficient carriers for many natural and synthetic antimicrobials, which may be further utilized for the development of soluble anti-antimicrobial formulations and improved surfaces and coatings of different uses, optimized to reduce attachment and biofilm formation. In the same field of magnetic nanoparticles. **Ştefania Marin** *et al*. focuses her review on the applications of silver nanoparticles. In bioengineering, silver nanoparticles are considered potentially ideal gene delivery systems for tissue regeneration. The remote triggered detection and release of bioactive compounds by silver nanoparticles has proven their relevance in forensic sciences and *in vitro* and *in vivo* studies. Depending on the tissue and the animal species, studies often came to contrasting conclusions, regarding the cytotoxicity, genotoxicity or immunotoxicity of AgNPs, which seem to be dependent on their size, shape and dose. **Daniela Cabuzu** *et al.* reviewed the applications of gold nanoparticles (AuNPs) in biomedical engineering. **Marcela Popa** *et al*., present insights of the metal based materials used for dental implants, their limits, improvement strategies as well as the pathophysiology, diagnosis, treatment and prevention of periimplantar diseases. **Gozde Unsoy** *et al*., summarize the synthesis, functionalization and applications of magnetite nanoparticles (MNPs). This review discusses the applications of the magnetic nanomaterials by taking into account all the factors that can influence the properties of the final materials and consequently their potential applications.Therefore, we consider that the papers presented in this special issue are clearly proving the great contribution of metallic nanostructures and nanoparticles to the development of cost-effective solutions to fight superbugs and infectious diseases.

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