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The Book of Abstracts

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Zlatibor, Serbia

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ABSTRACTS

Engineering Materials

Invited lecture

BIOMIMETIC BIOREACTORS IN CHARACTERIZATION OF NOVEL BIOMATERIALS

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Abstract

Development of novel biomaterials for potential biomedical applications requires comprehensive preclinical studies. Traditional methods for biomaterial evaluation are based on in vitro testing routinely performed in monolayer cell cultures followed by in vivo animal studies. However, these methods have numerous limitations. Although studies in cell monolayers allow rapid evaluation of biomaterials by standardized protocols, quantitative and comparable results, cell metabolism and morphology is changed in the 2-dimensional environment often leading to unreliable results. On other hand, animal studies are complex, time-consuming, expensive and raise ethical concerns. One of the approaches to address this problem and obtain reliable results in a more efficient way is utilization of biomimetic bioreactors. These bioreactors are primarily developed as an essential component in tissue engineering mimicking physiological in vivo conditions in particular tissue or organ by providing all necessary biochemical (e.g. pH, nutrients, gases, growth factors) and biophysical signals (e.g., shear stress, hydrostatic pressure, mechanical strains) for cell differentiation and metabolic activity. Some examples include perfusion bioreactors, bioreactors with shear stresses and/or dynamic compression, and bioreactor with stretch and shear stresses imitating conditions in vascularized tissues, articular cartilage, and vascular grafts, respectively. Such physiologically relevant, while strictly controlled environment is also beneficial for biomaterial assessment, investigation of cell-biomaterial interactions, and prediction of biomaterial behaviour upon application. The present review provides readers with up-to-date studies and results regarding utilization of biomimetic bioreactors as tools for comprehensive and efficient evaluation of novel biomaterials, such as determination of mechanical characteristics, release of bioactive substances, cell-biomaterial interactions and cytotoxicity.

Keywords

In vivo-like conditions, cytotoxicity, mechanical characterization, release studies

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