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NANOTECHNOLOGY IN MEDICINE

Introduction

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Nanotechnology is an emerging field that is influencing research in diverse areas of study ranging from physical sciences to bioengineering. While the semiconductor industry has driven technology development at the nanoscale for more than a decade, the interest in nanoscale phenomena and materials in medicine is a recent shift. Interrogation of biological interactions has previously been based on techniques that are limited to microscale resolution, largely due to physical detection limits of engineering tools. Current advances in materials development, processing, and imaging techniques has enabled researchers to explore new frontiers in nanoscale engineering for biological sciences.

The interaction between cells and tissues with materials is typically studied at the microscale, which is consistent with the length scale of cellular processes. However, biomolecular signals including proteins, enzymes, and genetic codes that underlie these cell-material interactions are typically less than 100 nm in size. With the advent of nanotechnology in medicine, it is now possible to design nanoscale interventions on these relevant length scales to mimic biomechanisms using tools from the physical sciences. Potential applications for nanoscale advancements include detection and diagnostics, device development, drug delivery, and biomaterial design. Seemingly insignificant nano-sized innovations could hold the potential for substantial impact in the understanding of biological interactions and development of therapeutics.

In this issue, *YJBM* presents two review articles on the state-of the-art nanotechnological advances in biomedical engineering. Surface engineering using biofilms to achieve antimicrobial properties and controllable bioactivity has been comprehensibly reviewed by Dr. Van Tassel in his article titled "Nanotechnology in Medicine: Nanofilm Biomaterials." Potential therapeutic strategies aimed at mitigating fibrosis using nanotechnologies including nanoparticle-based delivery systems are discussed in "Microvascular Targets for Anti-Fibrotic Therapeutics" by Pu et al. We hope these articles motivate investigators to develop symbiotic research collaborations among biomedical and physical scientists to explore the range of applications of nanotechnology in medicine.

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