

Nanobiomaterials: Revolutionizing Drug Delivery and Tissue Engineering for Advanced Therapeutic Applications

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Abstract : The development of nanobiomaterials has opened new avenues in the field of biomedical engineering, offering unparalleled possibilities for advanced therapeutic applications. This study explores the synthesis and characterization of a distinct class of nanobiomaterials designed to enhance drug delivery systems and support tissue engineering. By integrating biodegradable polymers with bioactive nanoparticles, we have engineered a multifunctional platform that ensures controlled drug release, targeted delivery, and improved biocompatibility. Our findings demonstrate that these nanobiomaterials not only exhibit excellent mechanical properties but also promote cell proliferation and differentiation, making them ideal candidates for regenerative medicine. Furthermore, *in vitro* and *in vivo* assessments reveal that the engineered materials significantly reduce cytotoxicity while enhancing the therapeutic efficacy of encapsulated drugs. This research presents a promising approach to addressing current challenges in drug delivery and tissue regeneration, with the potential to revolutionize the treatment of chronic diseases and injury repair. Future work will focus on optimizing the material composition for specific clinical applications and conducting large-scale studies to evaluate long-term safety and effectiveness.

Keywords : nanobiomaterials, drug delivery systems, therapeutic efficacy, bioactive nanoparticles

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