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Synthesis of chitosan base curcumin/PMMA hybrid nanocomposite in the targeted treatment of osteoporosis**Abbishek Sridharan**

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Osteoporosis is of serious concern with the increasing complication of a skeleton disorder, mostly in aged females at the age of 60 to 65. This include the bones from the spinal-cord in the spine, wrists and the hips. This complication develops at the time of menopause, due to the low levels of oestrogen which causes the lowering of bone mass. In this study, we present a novel nanocomposite of chitosan base curcumin/PMMA hybrid nanocomposite in the targeted treatment of Osteoporosis. The nanocomposite is synthesized in a reproducible process with incorporating Curcumin, a natural compound with well-documented anti-inflammatory properties, in the Chitosan matrix, a biocompatible and biodegradable polymer followed by the addition of Poly-methyl Methacrylate (PMMA), widely used polymer in orthopedic applications. The characterization of the nanocomposite using Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), X-ray diffraction (XRD) and Raman Spectroscopy, confirmed the successful integration of the components and the formation of a homogenous material. In vitro studies demonstrate that the nanocomposite significantly promotes the proliferation and differentiation of osteoblasts, indicating its potential to facilitate bone regeneration. The anti-inflammatory and antioxidant effects of curcumin further contribute to the therapeutic efficacy, mitigating the inflammation and oxidative stress associated with osteoporosis. Mechanical testing reveals that the composite possesses adequate strength and flexibility to withstand physiological loads, making it suitable for orthopedic applications. Overall, this research presents a promising approach for the treatment of osteoporosis, combining the regenerative properties of chitosan, the therapeutic benefits of curcumin, and the structural support of PMMA. The chitosan/curcumin/PMMA nanocomposite holds significant potential for clinical applications, offering an innovative solution to enhance bone health and quality of life for patients suffering from osteoporosis. Future studies will focus on in vivo assessments and the optimization of composite formulation for enhanced therapeutic outcomes.

Biography

Abhishek Sridharan is a Materials Engineering researcher at RWTH Aachen University, Germany. His work focuses on the synthesis of Chitosan-based Curcumin/PMMA hybrid nanocomposites for the targeted treatment of osteoporosis. By combining biocompatible chitosan, therapeutic curcumin, and strong PMMA, his research aims to develop advanced materials for bone regeneration and effective disease management.