

## Silver Nanoparticles Loaded Cellulose Nanofibers (Cnf)/mesoporous Bioactive Glass Hydrogels For Periodontitis Treatment

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**Abstract :** Periodontitis, a severe gum disease, poses a significant threat to the integrity of bone and soft tissues supporting teeth, primarily initiated by bacterial accumulation around the gum line. Conventional treatments like scaling/root planning and plaque removal are widely employed, but integrating modern technologies such as nanotechnology holds promise for innovative therapeutic approaches. This study explores the utilization of silver nanoparticles encapsulated within cellulose nanofiber (CNF) and mesoporous bioactive glass hydrogel matrices for periodontitis management. Silver nanoparticles exhibit potent antimicrobial properties by disrupting microbial cell membranes, inducing reactive oxygen species (ROS) generation, and interfering with vital cellular processes like ATP production and nucleic acid synthesis. Mesoporous bioactive glass, renowned for its high surface area, osteoconductive, and bioactivity, presents a favorable platform for pharmaceutical applications. Incorporating CNF enhances the properties of the hydrogel due to its biocompatibility, biodegradability, and water absorption capacity. The proposed composite material is anticipated to exert beneficial effects in periodontitis treatment by demonstrating antibacterial and anti-inflammatory activities, offering a promising avenue for future therapeutic interventions.

**Keywords :** periodontitis, cellulose nanofibers, silver nanoparticles, mesoporous bioactive glass, antibacterial activity, anti-inflammatory activity

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