

PREPARATION AND CHARACTERIZATION OF A CHITOSAN-HPMC AND GLYCEROL HEMOSTATIC SPONGE FOR DENTAL APPLICATIONS

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Bleeding is a leading cause of mortality in accidents, general surgeries, and dental procedures. In this context, polysaccharides—particularly cellulose and chitosan—are highly valued for their renewability, biodegradability, low cost, and minimal environmental impact. These polymers exhibit hydrophilic properties and are degradable by human enzymes, making them both biocompatible and biodegradable, two key features required for biomedical applications. This study aimed to develop a biodegradable, micro/nano-structured, porous hemostatic sponge composed of chitosan and cellulose (CS/HPMC/GI), produced via the freeze-drying method for potential biomedical use.

The CS/HPMC/GI composite was created by blending a 2% chitosan solution in acetic acid with a 2% hydroxypropyl methylcellulose (HPMC) solution, dispersed in 2% glycerol (GI). This formulation significantly improved the mechanical properties and pore distribution of the material, resulting in an average pore size of $190.3 \pm 32.8 \mu\text{m}$ and a density of approximately 2.3 mg/cm^3 . The material demonstrated a swelling rate of 19.4 within the first minute of incubation, and a uniaxial compression test produced a value of 118.45 kPa.

An in vitro bacterial inhibition assay, performed with *Staphylococcus aureus* and *Escherichia coli*, suggested that the material has an antibacterial effect, particularly against *S. aureus*. Furthermore, cytotoxicity testing on hFOB119 osteoblast cells revealed no adverse impact on cell viability. After eight days of simulated biodegradation, the sponge exhibited nearly complete degradation (99.16%) in the presence of lysozyme, while degradation in PBS reached 63.56%.

The CS/HPMC/GI sponges displayed favorable characteristics, as confirmed by FTIR analysis, thermogravimetric studies, and morphological evaluations, including both micrometric and nanometric pores. The material's swelling capacity, mechanical robustness, and biodegradation behavior highlight its potential for in vivo biological testing and wider biomedical applications.

Keywords: Biomaterial, Chitosan, hydroxypropylmethylcellulose

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