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Effect of Composition on Bioactive Glass Hybrid Membranes for Biomedical Applications

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Abstract

Hybrid membranes combining bioactive glass and natural polymers have emerged as promising biomaterials for a wide range of biomedical applications, particularly in bone tissue engineering. These membranes must have adequate morphological characteristics to effectively stimulate bone regeneration, while also satisfying some important properties, namely, biocompatibility, hydrophilicity and sometimes biodegradability. [1] This comparative study focused on the development of hybrid membranes with the aim of creating a supportive environment for cell attachment and proliferation in a new bone tissue. The synthesis of these hybrid membranes involves the incorporation of bioactive glass particles into natural polymeric matrices such as collagen or gelatin using tape casting technology. The bioactive glass stimulates bioactivity and tissue regeneration within the membranes, while the natural polymeric matrix provides a biocompatible and flexible structure for the cells. These hybrid membranes have the potential to be used in various biomedical fields, such as tissue engineering, wound healing, drug delivery, and dental restoration. The methodology comprises the selection of appropriate biomaterials for membrane development; the preparation of the slurry that will undergo tape casting processing; the production, drying, and crosslinking of the membranes. The resulting composite membranes exhibit a combination of properties, including particle/matrix adhesion, morphology, and porosity, crucial requirements for a hybrid membrane that will be used as a scaffold in bone tissue engineering. [2] Based on this study, it was possible to determine the composition and parameters of the most suitable processes for obtaining hybrid membranes. It is concluded that the morphology of the membranes is influenced by all these parameters, with a more pronounced effect on the type of material present in the composition. Overall, bioactive glass/natural polymer hybrid membranes represent promising biomaterials with immense potential for advancing biomedical technologies and improving patient outcomes. Additional research will be carried out to optimize the biological properties of membranes and explore applications in the area of controlled release of therapeutic agents to meet the individual needs of patients and increase the effectiveness of treatment in bone tissue engineering.

Keywords: Bioglass; Natural Polymers; Biomaterials; Tape casting; Bone Regeneration; Tissue Engineering.

References

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