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# Pva-bg58s-cl-based Barrier Membranes For Guided Tissue/bone Regeneration Therapy

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**Abstract :** Periodontitis is an infectious disease of multifactorial origin, which originates from a periodontogenic bacterial biofilm that colonizes the surfaces of the teeth, resulting in an inflammatory reaction to microbial aggression. In the absence of adequate treatment, it can lead to the gradual destruction of the periodontal ligaments, cementum and alveolar bone. In guided tissue/bone regeneration therapy (GTR/GBR), a barrier membrane is placed between the fibrous tissues and the bone defect to prevent unwanted incursions of fibrous tissues into the bone defect, thus allowing the regeneration of quality bone. Currently, there are a significant number of biodegradable barrier membranes available on the market. However, a very common problem is that the membranes are not bioactive/osteogenic, that is, they are incapable of inducing a favorable osteogenic response and integration with the host tissue, resulting in many cases in displacement/expulsion of the membrane, requiring a new surgical procedure and replacement of the implant. Aiming to improve the bioactive and osteogenic properties of the membrane, this work evaluated the production of membranes that integrate the biocompatibility of the hydrophilic synthetic polymer (polyvinyl alcohol - PVA) with the osteogenic effects of chlorinated bioactive glasses (BG58S-Cl), using the electrospinning equipment (AeroSpinner L1.0 from Areka) which allows the execution of spinning by high voltage and/or blowing in solution and with a high production rate, enabling development on an industrial scale. In the formulation of bioactive glasses, the replacement of nitrates by chlorinated molecules has shown to be a promising alternative, since the chloride ion is naturally present in the body and, with its presence in the bioactive glass, the biocompatibility of the material increases. Thus, in this work, chlorinated bioactive glasses were synthesized by the sol-gel route using the compounds tetraethyl orthosilicate (TEOS), calcium chloride dihydrate and monobasic ammonium phosphate with pH adjustments with 37% HCl (1.5 or 2.5) and different calcination temperatures (500, 600 and 700 °C) were evaluated. The BG-58S-Cl powders obtained were characterized by pH, conductivity and zeta potential x time curves and by SEM/FEG, FTIR-ATR and Raman tests. The material produced under the selected conditions was evaluated in relation to the milling procedure, obtaining particles suitable for incorporation into PVA polymer solutions to be electrospun (D50 = 22 µm). Membranes were produced and evaluated regarding the influence of the crosslinking agent content as well as the crosslinking treatment temperature (3, 5 and 10 wt% citric acid) and (130 or 175 oC) and were characterized by SEM/FEG, FTIR, TG and DSC. From the optimization of the crosslinking conditions, membranes were prepared by adding BG58S-Cl powder (5 and 10 wt%) to the PVA solutions and were characterized by SEM-FEG, DSC, bioactivity in SBF and behavior in cell culture (cell viability, total protein content, alkaline phosphatase, mineralization nodules). The micrographs showed homogeneity of the distribution of BG58S-Cl particles throughout the sample, favoring cell differentiation.

**Keywords :** barrier membranes, chlorinated bioactive glasses, polyvinyl alcohol, tissue regeneration.
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