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SOL-GEL DERIVED MANGANESE-RELEASING BIOACTIVE GLASS AS A THERAPEUTICAL APPROACH FOR BONE TISSUE ENGINEERING

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Bioactive glasses (BG) have been highlighted in tissue engineering, due to their high bioactivity and biocompatibility, being potential materials for bone tissue repair. Its composition is variable and quite flexible, allowing the incorporation of therapeutic metallic ions, which has been regarded as a promising approach in the development of BG with superior properties for tissue engineering. These ions can be released in a controlled manner during the dissolution process of the glass, having the advantage of being released at the exactly implant site where they are needed, thus optimizing the therapeutic efficacy and reducing undesired side effects in the patient. Among several ions that have been studied, Manganese (Mn) has been shown to favor osteogenic differentiation. Besides, this ion is also a cofactor for several enzymes involved in remodeling of extracellular matrix, presenting an important role in cell adhesion. Therefore, it is very important to study the Mn role in the BG network and its influence on the glass bioactivity. In this context, new bioactive glass compositions derived from the 58S (60%SiO2-36%CaO-4%P2O5, mol%) were synthesized in this work, using the sol-gel method, by the incorporation of Mn into their structure. FTIR and Raman spectra showed the presence of typical BG chemical groups, whereas the amorphous structure typical of these materials was confirmed by XRD analysis, which also indicated that the Mn incorporation in the glass network was well succeeded, as its precursor did not recrystallize. The role of Mn in the glass network was also evaluated by XPS. The influence of Mn on carbonated hydroxyapatite layer formation after different periods of immersion of the BG powder in Simulated Body Fluid was evaluated using zeta potential, SEM, EDS and FTIR, whereas the controlled ion release was measured through ICP-OES. MTT assay revealed that Mn-containing BG showed no cytotoxic effect on cell culture. All these results indicate that incorporating Mn in bioactive glass is a potential strategy to obtain superior materials for tissue engineering. Acknowledgments: The authors gratefully acknowledge financial support from CNPq, CAPES and FAPEMIG/Brazil