INJECTABLE HYBRID SYSTEM FOR STRONTIUM LOCAL DELIVERY TO PROMOTE BONE REGENERATION

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In bone tissue regeneration strategies, injectable bone substitutes are very attractive since they can be applied with minimally invasive surgical procedures and can perfectly fill irregular defects created in cases of trauma, infection or tumor resection. These materials must combine adequate mechanical properties with the ability to induce new bone formation. Incorporating strontium (Sr) in bone substitute biomaterials may be a strategy to achieve high Sr concentrations, not in a systemic but in a local environment, taking advantage of the osteoanabolic and anti-osteoclastic activity of Sr, for the enhancement of new bone formation. In this context, the aim of the present work was to evaluate the response of a Sr-hybrid injectable system for bone regeneration, designed by our group, consisting of hydroxyapatite microspheres doped with Sr and an alginate vehicle crosslinked in situ with Sr, in an *in vivo* scenario. Two different animal models were used, rat (Wistar) and sheep (Merino Branco) critical sized bone defect. Non Sr-doped similar materials (Ca-hybrid) or empty defects were used as control. Sr-hybrid system led to an increased bone formation in both center and periphery of a rat critical sized defect compared to a non Sr–doped similar system, where new bone formation was restricted to the periphery. Moreover newly formed bone was identified as early as one week after its implantation in a sheep model. After eight weeks, the bone surrounded the microspheres, both in the periphery and in the center of the defect. Most importantly, the hybrid system provided a scaffold for cell migration and tissue ingrowth and offered structural support, as observed in both models. The effective improvement of local bone formation suggests that this might be a promising approach for bone regeneration, especially in osteoporotic conditions.

Keywords: bone regeneration, strontium, in vivo models

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