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Injectable bone-graft substitute for in vivo tissue regeneration

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We have demonstrated that using growth factors we can induce the proliferation of human primary osteoblasts but it isn't enough to form new bone that need also the differentiation of the proliferated osteoblasts [1]. Being these two steps regulated by different pathways and different stimuli, in the same work we have found the combination of a proliferating growth factor (FGF2) with a differentiating stimulus (1,25Vit D3) as an optimal solution. With the aim to develop an injectable medicated scaffold which speeds bone formation in sinus lift augmentation, in bony void and in fracture repair, we have tested in vitro osteoblasts' behavior in a 3D jelly collagen model (1mg/ml) using soluble native collagen prepared from rat tail tendons [2]. We have seen an osteoblasts' Rho-kinase mediated contraction of the collagen that causes an approach of bone fragments within a week of culture with the formation of a fibrous bone tissue within 3 weeks of culture. FGF2 addition to the collagen fastened this result by increasing cell proliferation rate while the addition of 1,25Vit D3 to collagen at a concentration of 0,1 mg/mL that shows at HPLC analysis a release of 0,26 mcg/ml/day during the incubation time studied, favors the mineralization of the new formed tissue that shows also increased tensile strenght. We think that this combination of factors could be used in vivo to accelerate bone growth and fracture healing.

References

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Key words

Bone, tissue regeneration, 3D organ culture, growth factors, collagen, injectable graft.