Public Abstract

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Title:Natural and Synthetic Materials for the Regeneration of Osseous Tissue

Bone is a complex tissue regulated through many complex pathways. Bone is an extremely difficult tissue to replicate. Many synthetic solutions have been investigated, however none have come close enough to natural bone to not cause further problems in the future, especially with biocompatibility. Natural solutions tend to have higher biocompatibility, but cannot withstand the stresses placed on it by surrounding bone. We investigated the use of a natural hydrogel to fill bone defects. We used chitosan as the gel polymer crosslinked with disodium phosphate and genipin. The disodium phosphate helps induce bone deposition, but form very weak bonds. The genipin helps to strengthen the gel and are non-bioactive and biocompatible. Despite this these gels were very weak, but could be strengthened through the alteration of the kinds of crosslinks and the ratios of the crosslinks within the gel. We were not able to achieve the mechanical stability we were looking for. Studies were performed to test the mechanical strength and cell proliferation and mineralization. The unaltered chitosan was unfavorable when it comes to cell adhesion and the cells were dying before they had a chance to proliferate or mineralize. Nano-fibers may be able to be integrated into the gel to improve mechanical stability and the concentration of genipin can be increased to improve cell adhesion. With these improvements the gel has the potential to be used in many applications within and outside of the orthopedic world.