

Bio-silica and bio-polyphosphate: applications in biomedicine (bone formation)

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Bio-silica represents the main mineral component of the siliceous sponge skeletal elements (spicules), while bio-polyphosphate (bio-polyP), a multifunctional polymer existing in microorganisms and animals acts, among others, as reinforcement for pores in cell membranes. These natural inorganic bio-polymers which can be readily prepared, either by recombinant enzymes (bio-silica and bio-polyP) or chemically (polyP), are promising materials/substances for the amelioration and/or treatment of human bone diseases and dysfunctions. It has been demonstrated that bio-silica causes *in vitro* a differential effect on the expression of the genes *OPG* and *RANKL*, encoding two mediators that control the tuned interaction of the anabolic (osteoblasts) and catabolic (osteoclasts) pathways in human bone cells. Since bio-silica and bio-polyP also induce the expression of the key mediator *BMP2* which directs the differentiation of bone-forming progenitor cells to mature osteoblasts and in parallel inhibits the function of osteoclasts, they are also promising candidates for treatment of osteoporosis.

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