POLYMER COATING ENHANCES AFFINITY OF BONE MARROW-DERIVED MSCS TO BONE

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INTRODUCTION.

Bone remodeling is a process orchestrated by two types of cells: osteoblasts and osteoclasts. The reduction in osteoblastic activity results in the progressive bone loss, which could be amended by introduction of osteoblast progenitor cells (OPCs). Bone targeted OPCs delivery can potentially increase the efficiency of cell therapy and result in alleviation of such conditions as osteoporosis.

MATERIALS AND METHODS.

We have synthesized and tested *in vitro* a novel polymer which shows high affinity to bone tissue and could be used to deliver OPCs to the site of bone injury or lesion.

The primary active sites of the polymer are bisphosphonate functional groups that target hydroxyapatite molecules (HA) on the bone surface. NHS groups on the other end of the molecule allow polymer to bind to the cell surface components. As a result, polymer acts as a high affinity coat linking cells to the bone surface. In this study we have used mesenchymal stem cells (MSCs) as a model for OPCs.

The polymer was mixed with the MSCs at various concentrations for varying times to determine binding rates, number of binding sites per cell, stability of the binding, and cell viability. The polymer was not shown to be cytotoxic by cell viability assay (MTT) and does not affect further differentiation into osteocytes.

Polymer functionalized cells were incubated with bone fragments for varying times to determine the stability of cell-bone binding.

CONCLUSIONS.

The polymer coated cells were shown to be stably attached to bone fragments for at least 2 hours, confirming the bone targeting potential of the polymer. Our next step will be to test this approach in rat model of osteoporosis to determine its actual performance *in vivo.*