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Target Drug Delivery of Pamidronate Nanoparticles for Enhancing Osteoblastic Activity in Osteoporosis

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Abstract : Nanoparticles (NPs) that target bone tissue were developed using PLGA–mPEG (poly(lactic-co-glycolic-acid)–polyethylene glycol) diblock copolymers by using pamidronate as a bone-targeting moieties. These NPs are expected to enable the transport of hydrophilic drugs. The NP was prepared by in situ polymerization method, and their in- vitro characteristics were evaluated using dynamic light scattering, transmission electron microscopy (TEM) and in phosphate-buffered solution. The bone targeting potential of the NP was also evaluated on in-vitro pre-osteoblast MCT3E1 cell line using ALP activity, degree of mineralization and RT-PCR assay. The average particle size of the NP was 101.6 ± 3.7nm, zeta potential values were negative (-25±0.34mV) of the formulations and the entrapment efficiency was 93± 3.1 % obtained. The moiety of the PLGA–mPEG–pamidronate NPs exhibited the best apatite mineral binding ability in-vitro MCT3E1 pre-osteoblast cell line. Our results suggested that the developed nanoparticles may use as a delivery system for Pamidronate in bone repair and regeneration, warranting further evaluation of the treatment of bone disease.

Keywords : nanoparticle, pamidronate, in-situ polymerization, osteoblast
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