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Testing the efficiency of a hybrid nanoparticulate drug delivery system for use in bone regeneration with distraction osteogenesis

Lamees Nayef, Juan S Rendon, Reggie C Hamdy and Maryam Tabrizian
McGill University, Canada

A hybrid nanoparticulate drug delivery system (DDS) consisting of a liposomal core coated with alternate layers of alginate and chitosan was developed by our group for the purpose of delivering Bone Morphogenetic Protein 7 (BMP-7), a growth factor that accelerate the growth of bone, for use in a surgical bone regeneration procedure called distraction osteogenesis (DO). The nanoparticulate DDS's efficiency was tested first by ensuring that after its injection, it is retained at the injection site (target site for desired bone growth). Infrared emitting quantum dots were encapsulated into the liposomal core of the device to make it fluorescent; then the nanoparticles were injected into a rat model of distraction osteogenesis. The rats were imaged using preclinical whole body *in vivo* optical imaging. Fluorescent emissions remained at the site of injection for at least 7 days showing that significant amounts of the nanoparticles are retained at the target for that period. *Ex vivo* imaging of clearance organs of the injected rats confirmed that nanoparticles were retained at the target and did not escape to the blood system. The results confirmed that the nanoparticles are efficient at remaining at the target and therefore likely to be efficient at delivering its drug to the treatment site. Further preliminary tests of the efficiency of the nanoparticle at delivering different doses of BMP-7 are currently conducted to further confirm the device's efficiency in accelerating bone regeneration.

Biography

Lamees Nayef is a PhD student at the Biomedical Engineering Department in McGill University working on optimizing DDSs for bone regeneration and testing their efficiencies *in vivo*.

lamees.nayef@mail.mcgill.ca