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Targeted delivery of bisphosphonate nanoparticles for diagnosis and therapy of bone disorders

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Bone has a poor blood supply, which generally consequences in low uptake of therapeutic agents thus necessitating the use of high drug dosage. Bisphosphonates (BPs) have a high affinity to hydroxyapatite and hence are widely used in the treatment of bone disorders. Biodegradable nanoparticles (NPs) due to their submicron size and biocompatibility have great potential to be used for therapeutic purposes. Thus, we hypothesize that a targeted delivery mechanism based on BP NPs conjugated to the therapeutic agent will lead to enhance bone uptake. We have engineered a unique biodegradable PEG based bisphosphonate nanoparticle (NPs) bearing two functional surface groups: (1) primary amine groups for covalent attachment of a dye/drug (e.g. NIR dye Cy 7 or doxorubicin); (2) bisphosphonate groups for targeting and chelation to bone hydroxyapatite. We have shown the ability of these novel BP NPs to target primary and secondary bone cancer and have demonstrated the potential use of doxorubicin conjugated BP NPs in the treatment of OS. These doxorubicin-conjugated BP NPs, due to their high affinity to Ca^{+2} ions, enable the delivery of doxorubicin directly to the tumor. In addition, their potential use in the treatment of other bone disorders is demonstrated.

Biography

Grinberg Igor is currently pursuing Postdoctoral research under the supervision of Professor Shlomo Margel, at the Bar-Ilan Institute of Nanotechnology and Advanced Materials, Bar-Ilan University, Israel. He received his BSc (2002), MSc (2007), and his PhD (2011) in Biology and Life Sciences, at Bar-Ilan University. His work involves the development of the chicken embryo model as well as *in vivo* (small animal) models for investigating various types of nanoparticles for various medical applications.

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