Public Abstract

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Graduation Term:SS 2016

Department:Chemistry

Degree:PhD

Title:Gold-Coated Lanthanide Phosphate Nanoparticles for Targeted Radiotherapy

The success of a targeted radiotherapy system depends on its ability to carry and deliver its radioactive payload to a specific site. Lanthanide phosphate nanoparticles are highly stable in a variety of solvents. By conjugating different sized polyethylene glycol (PEG) linkers to the gold-surface of the nanoparticles it is possible to alter the in vivo biodistribution. The nanoparticles are synthesized by the co-crystallization of orthophosphate and lanthanide metal ions and gold-coated by reduction of NaAuCl_4 with sodium citrate. The nanoparticles retain >95% of the ^{177}Lu after two weeks in milli-Q water, phosphate buffered saline, and fetal bovine serum. The ability to adjust the biodistribution has been demonstrated by altering the PEG length from 800 Da to 5000 Da and the utilization of clodronate liposomes in a murine model. Eighty-five percent of the injected dose (ID) of nanoconjugates with the 800 Da PEG linker accumulated in the lung in 1 hour and 55% ID remained in the lung 24 hours post injection in clodronate treated mice. Control mice showed 50% ID in the lung at 1 hour and 24 hours post injection. Approximately fifty percent ID of the 5000 Da labeled nanoconjugate accumulated in the lung in 1 hour in both control and clodronate treated mice. These values dropped to 30% and 13% at 24 hours in clodronate and control mice, respectively. Future experiments will target nanoparticles specifically to cancer cells using antibodies in a murine model of metastatic lung disease.