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Production, Quality Control, and Biodistribution Studies of 141ce-Edtmp as a Potential Bone Pain Palliation Agent

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Abstract : Cerium-141 [T1/2 = 32.501 days, Eβ (max) = 0.580 (29.8%) and 0.435(70.2%) MeV, Eγ=145.44 (48.2%) keV] possesses radionuclidic properties suitable for use in palliative therapy of bone metastases. 141Ce also has gamma energy of 145.44 keV, which resembles that of 99mTc. Therefore, the energy window is adjustable on the Tc-99m energy because of imaging studies. 141Ce can be produced through a relatively easy route that involves thermal neutron bombardment on natural CeO2 in medium flux research reactors (4–5×1013 neutrons/cm2•s). The requirement for an enriched target does not arise. Ethylenediamine tetramethylene phosphonic acid (EDTMP) was synthesized and radiolabeled with 141Ce. Complexation parameters were optimized to achieve maximum yields (>99%). The radiochemical purity of 141Ce-EDTMP was evaluated by radio-thin layer chromatography. The stability of the prepared formulation was monitored for one week at room temperature, and results showed that the preparation was stable during this period (>99%). Biodistribution studies of the complexes carried out in wild-type rats exhibited significant bone uptake with rapid clearance from blood. The properties of produced 141Ce-EDTMP suggest applying a new efficient bone pain palliative therapeutic agent to overcome metastatic bone pains.

Keywords : bone pain palliative, cerium-141, EDTMP, radiopharmaceutical
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