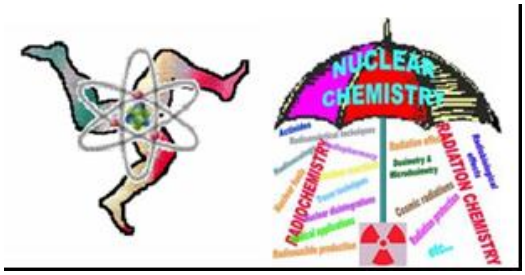

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Reactor Production of Cu-64 by (n,p) reactions on Zn targets in Dhruva Research Reactor for radiopharmaceutical studies

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64Cu is an unique radionuclide, as it undergoes transmutation through three different routes, namely, electron capture (41%), - (40%) and positron emission (19%), and hence is suitable for both PET imaging and targeted therapy. The high specific activity 'no carrier added'(N.C.A) grade 64Cu producible from (n,p) reactions on Zn target in medium flux nuclear reactor, is an attractive option to avail the radionuclide, for studies requiring high specific activity product.

N.C.A grade 64Cu was produced by neutron irradiation of 1 g zinc foil target (48.63% in 64Zn) sealed in Cadmium shield and encapsulated in standard aluminum container at a neutron flux of ~5.6×1013 n.cm-2.s-1 for 3 days. Irradiated Zn foil was dissolved in 5ml 10M HCl inside a 100 mm thick lead-shielded processing facility with provisions for remote handling. The concentration of resultant clear solution was adjusted to 0.1M with respect to HCl and 1% Ascorbic acid was added to it. The solution was passed through an anion exchange column (Dowex 1×8; 50-100 mesh). 64Cu is retained on the column while the bulk Zn is washed off. Further after washing the column free of ascorbic acid and radioactive Zn, 64Cu is eluted out using a mixture of 3M HCl and H2O2 solution as eluent. The eluate fraction collected was heated to expel H2O2 and reduce the volume. 64Cu radioactivity content and its radionuclide purity were ascertained by -ray spectrometry using HPGe detector coupled to a 4K multichannel analyser system (MCA). Appropriately diluted aliquots of the processed 64CuCl2 solution were measured for 1h, for this purpose. The 1345 keV characteristic photopeak of 64Cu and 511 keV annihilation peak were recorded in the gamma spectra.

Radioactivity measured from various batches produced, yielded comparable activity at the end of irradiation. Under the stated conditions of irradiation, 185 MBq 64Cu was separated from solution containing 1 g Zn. Radionuclide purity of greater than 99.9% was achieved through radiochemical separations.

Separated 64Cu was evaluated by labeling with MIBI and DOTA ligands. Labeling efficiency of 99.9% was achieved with MIBI and bio-evaluations in mice showed approximately 4-5% uptake in myocardium. However, large uptake in liver and kidneys were also seen for 64Cu-MIBI, which necessitates further studies to explore if any suitable 64Cu complexes for myocardial studies could be identified.

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