Contribution ID: **133** Type: **not specified**

Production and Chemical Separation of No Carrier Added (nca) Lutetium-177.

Lutetium-177 dotatate gained FDA approval for use in certain neuroendocrine tumors, opening the door for research looking at other avenues of radiopharmaceutical use. With a half-life of 6.647 days and average \beta - particle range in soft tissue of ~670 μm, ^{177}Lu has promise for other therapy applications. Another benefit of ^{177}Lu is that it produces low energy gammas (113 keV, 208 keV), suitable for imaging purposes, allowing biodistribution and excretion kinetics to be monitored. Lutetium-177 can be produced as carrier added (ca) and no carrier added (nca) from enriched ^{177}Lu or ^{176}Yb, respectively by two production routes:
^{176}Lu(n,⍰)^{177}Lu,
^{176}Yb(n,⍰)$^{177}Yb \rightarrow$β-^{177}Lu.
The later requires separation of Lu from the Yb target following irradiation. The ORNL High Flux Isotope Reactor (HFIR) with a max thermal neutron flux of 2.1x1015 n•cm-2 •s-1 (85 MW) is ideally suited to produce high specific activity ^{177}Lu. Separating nca ^{177}Lu is a complex process because it requires separating micro amounts of ^{177}Lu from macro amounts of ^{176}Yb and they are both part of the lanthanide series. The best method of separation will be tested from previous work to come up with a method that will cut down on waste, time, and improve the overall radio-purity of ^{177}Lu.

Funding Agency

Research sponsored by the U.S. Department of Energy, Office of Nuclear Physics, Isotope Program

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Presentation Type

Poster

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