PURIFICATION OF RADIONUCLIDES FOR NUCLEAR MEDICINE

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Alpha and beta emitting radionuclides are becoming increasingly important in targeted radioimmunotherapy. The purity of the radionuclide required for use in a human is extraordinarily high, especially with respect to the presence of long-lived parents. Often times, the separations must be carried out in a relatively short period of time because of the short half-life of the desired radionuclide. To achieve these goals, a number of highly efficient separation systems must be utilised. This presentation will describe novel systems for the rapid separation of ^{67}Cu, ^{90}Y, ^{188}Re, ^{212}Bi, ^{213}Bi, and ^{223}Ra.

To achieve the high-levels of decontamination required of radionuclides used in radioimmunotherapy, we have utilised combinations of ion exchange (IX) and novel extraction chromatographic (EXC) resins. The objective of each separation system is to remove by many orders of magnitude the parent isotopes and to reduce the concentrations of stable, sometimes adventitious impurities, to low levels. The latter objective is particularly important to achieve a high degree of bonding of radionuclide onto a monoclonal antibody.

The purification of ^{212}Bi (60.6 minute half-life) furnishes a good example of the level of purity that we have achieved using tandem combinations of EXC and IX resins. Bismuth-212 was separated from its daughters, ^{212}Pb, ^{224}Ra, ^{228}Th and ^{232}U at the 50 mCi level. The resultant ^{212}Bi decayed to background in a few days indicative of high purity.

Another example of extraordinary removal of parent nuclide from daughter nuclide and subsequent purification of daughter from stable elements is the preparation of ^{90}Y. Strontium-90 was removed from ^{90}Y by >10^9. The purified ^{90}Y uptake by monoclonal antibodies was close to 100%.

This presentation will describe the detailed flowsheets utilised to achieve the above results.