Colloquium

From Isotopes to Images: Transition Metal Positron Emitters in Nuclear Medicine

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Rm 118 NSH

The increase in use of radioisotopes for medical imaging and therapy has led to the development of novel routes of isotope production. For example, the production and purification of longer-lived position emitting radiometals has been explored to allow for nuclear imaging agents based on peptides, antibodies and nanoparticles. These isotopes (^{64}Cu, ^{89}Zr, ^{86}Y) are typically produced via irradiation of solid targets on smaller medical cyclotrons at dedicated facilities. Our group has focused on the production of these isotopes along with other research radionuclides (^{55}Co and ^{52}Mn). We have also set up a distribution program to ship these isotopes to other sites in the US and Canada. In particular, ^{89}Zr ($t_{1/2}$ = 3.3 d) is ideally matched to image the biodistribution of intact antibodies (immunoPET). The use of monoclonal antibodies (mAbs) as molecular targets for tumor cells is a very rapidly expanding pharmaceutical area. They are produced for selective targeting of tumor cells and intended for use as therapeutics, either alone or conjugated to additional therapeutic drugs. Thus, immuno-PET is an attractive non-invasive tool for patient screening, assessing target expression, antibody accumulation in tumor lesions and normal tissues and in vivo mAb characterization. As an example, our group has focused on the use of radiolabeled Trastuzumab and Pertuzumab for imaging of HER2 expression in preclinical models and more recently, in a clinical trial.

Recently, isotope harvesting from heavy ion accelerator facilities has also been suggested. The Facility for Rare Isotope Beams (FRIB) will be a new national user facility for nuclear science to be completed in 2020. Radioisotopes could be produced by dedicated runs by primary users or may be collected synergistically from the water in cooling-loops for the primary beam dump that cycle the water at flow rates in excess of hundreds of gallons per minute. A liquid water target system for harvesting radioisotopes at the National Superconducting Cyclotron Laboratory (NSCL) was designed and constructed as the initial step in proof-of-principle experiments to harvest useful radioisotopes in this manner.

This talk will provide an overview of isotope production using both dedicated machines and harvesting from larger accelerators typically used for nuclear physics.

Refreshments @ 3:30 in 202 NSH

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