Nuclear Seminar

Science in a melting pot—TRIUMF's efforts to advance the field of isotope production

Dr. Paul Schaffer, TRIUMF, Canada

Monday

September 29

2 P.M.

Rm 124 NSH

With the imminent shutdown of some of the world's largest isotope production reactors and the number of small (<24 MeV) cyclotrons approaching 1000 machines in over 70 countries around the globe, the time is ripe to establish accelerators as a viable source of radionuclides. TRIUMF seeks to address looming shortages of important single photon- (SPECT) and positron emission- (PET) clinical isotopes such as Tc-99m and to demonstrate the production of promising new applications for isotopes including Zr-89, Ga-68, Y-86 and Sc-44 that are of increasing interest to chemists, biologists and medical researchers. Isotopes both for diagnostics of a variety of diseases and for the treatment of cancer are being studied.

Typically, Tc-99m is made available via a generator through the decay of Mo-99, which originates from nuclear reactors. Canada has played a pivotal role in the Mo-99 supply with a capacity of producing 80% of the world's demand from the (Chalk River) NRU reactor. This reactor is scheduled to cease isotope production activity in 2016 and an alternative production method is needed. TRIUMF, in collaboration with other Canadian institutions is leading the effort to produce Tc-99m directly on small cyclotrons via the Mo-100(p,2n) reaction. Recent successes have seen 10 Ci (370 GBq) of Tc-99m produced in a single 6 hr irradiation on a 300 μA TR19 cyclotron at the BC Cancer Agency, enough to supply a city similar in size and geography to Vancouver, British Columbia.

In addition to large-scale production of radiometallic isotopes using solid target materials, research at TRIUMF seeks to investigate the use of liquid targets to produce research quantities of Zr-89, Ga-68, Sc-44 and Y-86 in order to increase their availability. With this new approach, we hope to open the door for the development of novel PET tracers and an accelerated investigation of the match of the physical half-life of an isotope and the pharmacokinetic profile of new targeting vectors to which it is attached. To date, mCi (MBq) quantities of Ga-68, Zr-89, Sc-44, Y-86, and Cu-61 have been demonstrated.

Finally, a brief discussion will ensue on TRIUMF's efforts to apply our Isotope Separation On-Line (ISOL) for the isolation of radiotherapeutic isotopes at the ISAC facility at TRIUMF. Progress on the isolation of At-211 (via Rn-211 decay) and Ac-225 will be presented. Both At-211 and Ac-225 are alpha-emitting isotopes with the potential to treat micro-metastases and/or monocellular malignancies such as leukemia. TRIUMF seeks to demonstrate and enable clinical trials with these and many other potentially useful radiotherapeutic isotopes available through its existing science program.

Refreshments served prior to the seminar in Rm 124.

Notre Dame Science
Department of Physics