Contribution ID: **28** Type: **Oral**

Extraction chromatography method for the separation of 155Tb from radionuclide impurities for primary standardisation, nuclear data measurements and SPECT imaging

Thursday, 2 May 2019 15:10 (20 minutes)

Radioisotopes of terbium (149, 152, 155, 161Tb) have been identified as a potential theranostic quartet for use in nuclear medicine. Any such radiopharmaceutical based on the radioisotopes would be required to have a low (< 0.1 %) level of radionuclidic impurities, therefore it is crucial that chemical separation techniques are developed to ensure these thresholds are met while maintaining a high yield of the terbium radioisotope.
155Tb ($t_{1/2}$ = 5.32 d) offers promise as an imaging tracer in single photon emission computed tomography (SPECT), with initial pre-clinical studies indicating excellent image quality even at low doses. The administration of 155Tb prior to a therapeutic terbium isotope would give a theranostic pair with identical chemical properties; this is particularly advantageous as it facilitates the application of personalised medicine.
155Tb prepared by high-energy proton spallation at the CERN ISOLDE and MEDICIS facilities contains radioactive 139Ce16O following on-line mass separation, plus possibly stable zinc and/or gold impurities depending on the employed collection foil. A highly efficient radiochemical purification method has been developed using ion-exchange and extraction chromatography resins in two column separation steps to successfully isolate 155Tb with a chemical recovery of 95 % and an isotopic purity exceeding 99.9%.
155Tb sources collected at CERN and chemically purified at NPL have been used at NPL for activity standards, nuclear data measurements and quantitative SPECT imaging to underpin future clinical use of this radioisotope.

Primary authors: Dr IVANOV, Peter (NPL); Mr WEBSTER, Ben (National Physical Laboratory; University of Surrey); Dr ROBINSON, Andrew (NPL); COLLINS, Sean (NPL); ARINC, Arzu (NPL); Mr FENWICK, Andrew (NPL); FERREIRA, Kelley (NPL); PELLS, Sophia (NPL; University of Manchester); Dr THIERRY STORA, Thierry (CERN); Dr JOAO PEDRO RAMOS, Joao (CERN); ULLI KÖSTER, Ulli (ILL)

Presenter: Dr IVANOV, Peter (NPL)

Session Classification: Methods for production of novel radioisotopes for theranostics

Track Classification: Methods for production of novel radioisotopes theranostics