Production of Positron-Gamma Emitters for Multiplexed PET (mPET) Imaging

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ABSTRACT: We investigate the production and use of positron-gamma emitter isotopes of interest for enabling multiplexed PET (mPET) imaging of at least two radionuclides. The radioisotopes ^{60}Cu ($T_{1/2}$ = 23 min), ^{52m}Mn ($T_{1/2}$ = 21 min) and ^{94m}Tc ($T_{1/2}$ = 53 min) can be used to label molecules of high clinical and preclinical interest. These radionuclides were produced by bombardment on target foils of natural Nickel, Chromium and Molybdenum respectively, using a 10 MeV proton beam from a linear accelerator. After activation, the foils were analyzed by a Ge spectrometer. The activity generated was in agreement with the expected cross-sections and the isotopes present in the samples. Finally, two foils activated with ^{94m}Tc were imaged in a small-animal PET scanner together with a mouse injected with ^{68}Ga-DOTATOC. The mPET acquisition and reconstruction software made it possible separating both images: ^{68}Ga-DOTATOC biodistribution in the mouse and ^{94m}Tc in the foils. These results show the feasibility of production of these isotopes with moderate energy proton beams, as well as the possibility of using these isotopes for mPET.

Key Words: PET, multi-isotope PET, mPET, isotope production, proton-gamma emitter