Purpose: Initial imaging results with the novel positron emission tomography (PET) tracer Mn-52 in phantoms are reported. This project aims to develop and characterize Mn-52 as a PET tracer, and to compare results with manganese-enhanced magnetic resonance imaging (MEMRI).
Methods: Mn-52 was produced by irradiating natural chromium foil (0.5 mm nominal thickness) with protons (12.5 MeV, 2 μA, 60 min). After 10 hours decay, foil was dissolved in aqueous HCl and placed in phantoms for imaging in a Focus 120 microPET scanner. Energy spectra were acquired by varying the scanner photon energy acceptance window. PET images were acquired with and without surrounding non-radioactive water, with multiple energy windows. A sample of the dissolved foil solution was measured in a gamma-spectrometer to measure the produced activity.
Results: Irradiation produced approximately 6.1 MBq Mn-52, with 27 kBq Mn-54. microPET energy spectra feature significantly higher singles count rates at energies above and below the 511 keV positron annihilation peak (compared with F-18 or Ge-68) which are attributed to cascade photons from Mn-52 decay. Phantoms appear clearly in Mn-52 PET images, with background structure in images attributed to cascade coincidences, amplified by attenuation correction. Background is reduced or eliminated with tighter energy windows (450-600 keV) than are used for standard F-18 imaging at our centre (350-750 keV). Scanner dead time correction was below 4% with 3.2 MBq Mn-52 at the centre of the scanner field of view.
Conclusions: Mn-52 is a potentially valuable PET tracer, with some challenges to achieving good quantification. Future work will include testing cascade coincidence correction methods, additional phantom imaging for resolution and image quality, and in vivo imaging studies to characterize and compare with MEMRI.