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Overview of PET radionuclide production methods.

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Positron Emission Tomography (PET) Imaging requires radiolabelled materials (biomarkers) incorporating radionuclides that decay by positron emission.
They are largely neutron deficient and are made with a charged particle accelerator usually a cyclotron.
The most important radionuclides are 18F, 11C, 15O and 13N although an increasing interest is being seen in the radio metals in particular 68Ga 64Cu and 89Zr.
In order to achieve useable production yields of any radionuclide certain criteria have to me met especially the nuclear reaction cross sections at the charged particle energies available with a typical PET cyclotron with a proton energy of 10 to 20 Mev.
Available charged particle beam current will determine the intensity of the charged particle irradiation and hence the number of useful nuclear reactions achieved.
However many other factors come into play in the practical use of cyclotrons and their associated targets to achieve radionuclide intermediates suitable for incorporation into PET biomarkers.
The two most important radionuclides used in the Medical applications of PET are fluorine-18 and carbon-11 and aspects of their effective production will be discussed in detail.
Reference will be made to the methods of production of the other less widely used PET radionuclides without significantly overlapping with other presentations at this meeting.

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