

▶ New PET Radiopharmaceuticals: Clinical Applications and Pharmaceutical Quality Assurance

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Clinical PET has grown rapidly over the last 15 years, but has been almost exclusively based on ¹⁸F-FDG. However, the situation is changing, with wider use of other ¹⁸F labelled tracers developed in academic settings, plus the entry of several commercial products. In addition, other positron emitting radionuclides are being introduced.

Academic tracers. ¹⁸F-fluoride produces high quality bone scans. There has been great interest in ¹⁸F-FLT as a marker of cell proliferation, however there have been problems in validating it as a biomarker. ¹⁸F-fluoromethylcholine and ¹⁸F-fluoroethylcholine make the results obtained with ¹¹C-choline in prostate cancer more widely available [1].

Commercial tracers. Last year we saw the licensing of two ¹⁸F-labelled amyloid agents, Florbetapir (AmyVid) and florbetaben (NeuraCeq), with a third agent, flutemetamol (Vizamyl) likely to be available soon [2]. At present, these three tracers will compete for an uncertain market in ruling out Alzheimer's disease (AD). However, they could become more important in the future as therapies for AD are developed. Fluciclatide is a marker of angiogenesis (new blood vessel formation) which is a target of some anticancer drugs. Fluciclovine (FACBC) is a synthetic amino acid which shows promise for imaging of prostate cancer [1]. Cardiac PET imaging is expanding with flurpiridaz [3] and BFPET for perfusion, CardioPET for fatty acid metabolism, and LMI-1195 for adrenergic innervation.

Other radionuclides. Longer lived positron emitting radionuclides such as ¹²⁴I and ⁸⁹Zr are showing promise, particularly for antibody labelling [4]. Generator produced ⁸²Rb is becoming more widely used for myocardial perfusion imaging. A range of tracers labelled with generator produced ⁶⁸Ga are under evaluation, most notably ⁶⁸Ga-DOTATOC/DOTATATE and ⁶⁸Ga-anti-PSMA [5].

Quality assurance. Maintaining pharmaceutical quality is a challenge with short lived positron emitters. However, changes in practice are raising the standards. Many tracers are now prepared with single use disposable sterile cassettes on computer controlled synthesisers [6].

Conclusion. After many years of growth based on the single tracer FDG, PET is broadening its portfolio with new tracers and new indications. Logistical challenges remain in provision of a range of tracers but these are being overcome. Safety and efficacy remain the primary objectives.

References:

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