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We use this protocol and it's working

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Micro-PET CT procedures for brain imaging of rats

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ABSTRACT

Micro-PET CT procedures for brain imaging of rats

MATERIALS

Clinical grade 18F-FE-PE2I was obtained from the hospital radiopharmacy at UZ Leuven

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1 A range of PET radiotracers and radioligands (“radiopharmaceuticals”) can be used to image biochemical flux and receptor density in rodents. PET radiopharmaceuticals are administered in very low ‘tracer’ doses to avoid pharmacological effects, the specific activity of the tracer must be carefully evaluated to ensure this assumption is met.

2 Typically rats are anaesthetised throughout the scanning process. Commonly this is with isoflurane (as described here), but other regimes may be necessary depending on the biological system to be studied. Whether animals are anaesthetised throughout the entire period of tracer uptake depends on both the relation of the tracer with the biological system being studied and the quantitation method used

3 For studies of the rat brain, full length dynamic scanning allows a range of quantitative approaches to be compared. Typically rats are anesthetized in a warmed chamber before transfer to a warm mat for tail vein cannulation. Catheters are best constructed in-house using pharma-grade tubing of low diameter, to allow optimum length to be determined to allow injection when the animal is in the imaging cell in the PET scanner. Catheter needles are typically 23G or larger. Catheters should be checked for integrity immediately before scanning using sterile saline solution. Heparin may be added, though if the time between cannulation and injection is minimised this is optional

4 The tail is cleaned with an ethanol wipe and warmed before a lateral vein is cannulated (this should be visible). In rats, the potency of the line can be confirmed by withdrawing a small amount of blood before reinjection. Cannulated animals must be placed in the specialised imaging cell before transfer to the scanner. Imaging cells differ between manufacturer, however temperature and respiration are usually monitored and this must be confirmed before scanning is implemented

5 Syringe activities before injection should be measured in a dose calibrator, and residues after injection measured in the same way – importantly the exact time

of measurement should be recorded. All equipment should be set to the same time.

6 Typically the scan will be started before radiotracer is injected. Injection should be done over 20-30 seconds and the beginning and end of injection recorded, though if backpressure is felt this indicates the cannula is no longer potent and the injection should be abandoned. For this reason, syringe pump use requires additional validation. At the end of injection, the catheter should be removed if possible to allow measurement of residue. For quantitative scans, the catheters are not flushed.

7 Dynamic PET images should be acquired for long enough to allow kinetic modelling. This depends on the radiotracer but times of 90-120 min are not uncommon. The brain should be at, or close to, the center of the field of view.

8 After PET scanning, a CT image should be acquired for attenuation correction. The CT field of view must be equal or larger to the PET field of view.