

# $^{52g}$Mn – a new PET tracer for preclinical in vivo neuroimaging

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**TITLE: $^{52g}$Mn – a new PET tracer for preclinical *in vivo* neuroimaging**

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**ABSTRACT BODY:**

**Abstract Body: Introduction**

$Mn^{2+}$ is a $Ca^{2+}$ analogue that can be taken up and transported by neurons in activity-dependent manner. It also crosses synapses and has been used for *in vivo* MRI of neural tracts. However, the element's toxicity limits its applications [1].

To overcome the problem we propose the radionuclide $^{52g}$Mn as a PET neuronal tract tracer. We evaluated two methods of tracer preparation and were able to visualize known neural pathways in a rat brain avoiding toxic effects.

**Methods**

$^{52g}$Mn was produced by proton irradiation of $^{nat}$Cr and isolated from excess Cr by either *i)* a combination of liquid-liquid extraction [2] and solid phase extraction on AG1x4 from 96:4 v/v EtOH: 12M HCl [3] or *ii)* three successive solid phase extractions against AG1x8 from 95:5 v/v EtOH:12M HCl with elution in 0,1M HCl and drying in between each extraction [4]. Both *i* and *ii* were prepared for injection in saline, buffered with 10mM sodium ascorbate (pH 6,5). Metallic impurities were quantified by ICPOES.

Rats were stereotactically injected with app. 170 kBq of $^{52g}$Mn (prepared by *i*) to the right ventral tegmental area (VTA) or dorsolateral striatum (DLS) (n=4). PET and MR images (T2W) were acquired 24h later. Another 4 rats were injected to the VTA with the decayed solution. All the animals underwent a rotameter test 4 weeks after the injection. Their brains were used for tyrosine hydroxylase (TH) staining.

With formulation *ii* 12 rats were injected to the VTA with 20±5 kBq and scanned at 24h. They underwent the rotameter test 3 days, 2 weeks or 4 weeks (n=4) post-injection. The brains were used for TH- and H&E-staining.

**Results**

Formulation *ii* contained less impurities than *i* with a specific activity of 28 (*ii*) vs. 7,5 (*i*) GBq/μmol and 0,8 (*ii*) vs. 4,5 (*i*) ng Cr/MBq. Moreover, *ii* omitted extractants: $C_6H_6$, TOA, and $NH_4OH$.

Independently of the preparation method $^{52g}$Mn was transported along the mesolimbic and nigrostriatal pathways after injection to the VTA. Its highest amounts were found in the right ventral pallidum and in the nucleus accumbens. Following injection to the DLS the direct and indirect striatonigral pathways were visible in PET images. Autoradiograms confirmed the distribution of the tracer.

3 rats injected with formulation *i* rotated more to the ipsilateral than to the contralateral side in the rotameter test, indicating an imbalance of the motor control system. TH-staining revealed a dopaminergic lesion in those animals. However, there were no signs of toxicity after injections of the decayed solution, neither in the animals treated with *ii*. There was also no difference between the ipsi- and contralateral side of the H&E-stained brain tissues indicating no inflammation.

**Conclusions**

Our data show that $^{52g}$Mn traces neural pathways allowing visualization with PET. By using preparation method *ii* toxicity effects are avoided. In the future, imaging neural activity with $^{52g}$Mn may be possible.

**References**

[1] Inoue T, Majid T, Pautler RG, Rev Neurosci 2011, 22(6): 675-694.

[2] Lahiri S, Nayak D, Korschinek G. Anal Chem 2006, 78:7517–21.
[3] Pietrzyk D, Fritz J. Atomic Energy Commision USA 1960; IS-337.
[4] Graves SA et al. Accepted as a poster at WMIC 2015, Control ID: 2230875.

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