Functional manganese enhanced MRI reveals deep brain regions in response to odorant stimuli in small animal

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Title:

Functional Manganese Enhanced MRI Reveals Deep Brain Regions In Response to Odorant Stimuli In Small Animal

Authors & affiliations:

Benoist Lehallier[a], Gérard Coureaud[b], Olivier Rampin[c], Benoist Schaal[b], Yves Maurin[c], Jean-Marie Bonny[a]

[a] *UR370 QuaPA, INRA, F-63122 Saint-Genès-Champanelle, France*

[b] *CNRS-CESG, Dijon, France*

[c] *UR 1197 NOeMI, INRA, F-78350 Jouy-en-Josas, France*

benoit.lehallier@clermont.inra.fr

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words.)

This study addresses the functional mapping of deep brain regions activated by odours in rats. For this purpose, manganese-enhanced MRI (MEMRI) was chosen. This method uses manganese (Mn) as an exogenous contrast agent (1). Manganese, a calcium analogue, is recruited by activated neurons and then slowly eliminated. This allows stimulations to be performed on conscious animals and images to be subsequently acquired under anaesthesia. Image contrast depends on intra-neuronal Mn concentration, and so reflects neuronal activity throughout the stimulation period. However, a major drawback of this technique is the toxic effect of manganese, which may alter locomotor behaviour and/or olfactory perception. First, we defined the maximal manganese dose that provided a good contrast in fMRI studies while simultaneously preserving normal behaviour in animals when Mn was injected into nostrils (2). Also, Mn remanence prevents control and activation state images being obtained in a single-subject experiment. Images have to be acquired through multi-subject studies and spatial variation of Mn concentration assessed by groupwise image comparison. We have developed an original image processing sequence comprising (i) a semi-supervised brain segmentation method based on fast adjustment of an average three-dimensional brain model obtained from 20 manual segmentations and (ii) an iterative algorithm normalizing images in both spatial and intensity dimensions, independently of an *a priori* image target. Preliminary results obtained from large cohorts of rats indicate that the association of an optimal dose preserving olfactory perception, of an image processing chain for segmentation and normalization and a voxelwise statistical test for comparing means, will highlight deep brain regions involved in odour processing.

1. Van der Linden A. *et al.*, *NMR in Biomedicine*, 20, 522-545 (2007)
2. Lehallier B. et al., Manganese-enhanced fMRI in olfaction: optimisation of Mn dose with minimal deleterious effects upon odour induced behaviour in rats. XIX *Ecro Congress (*2009)

	Oral presentation
x	Poster presentation