VALIDATION OF SPM ANALYSIS OF VISUAL ACTIVATION IN RAT BRAIN PET STUDIES

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Introduction: Statistical parametric mapping (SPM) is used to detect subtle activity changes in brain not requiring a priori assumptions about the expected activations. We adapt the methodology for analyzing rat brain positron emission tomography (PET) scans.

Materials and Methods: Twelve female Wistar rats (250-270 g) were injected with 2-deoxy-2 [18F] fluoro-D-glucose (FDG). Animals were exposed to two visual paradigms: Group A (N=8) ambient light condition and Group B (N=4) positioned in front of a stroboscopic lamp with left eye covered. Rats were scanned with a dedicated PET. The brain was cut into 20 Âum sections for autoradiography. For the SPM analysis reconstructed image sets were realigned, and a brain mask was applied to all registered scans. Resulting images were smoothed with a gaussian kernel and anaIyzed with the SPM2b software.

Rerults: Statistically significant higher metabolism was found in Group B (left superior colliculus and bilateral auditory area). Statistically significant lower metabolism was found in the bilateral amygdala in Group B. Autoradiography confirmed higher metabolism in superior colliculus in Group B.

Discussion: Significant hyperactivation appeared in the left superior colliculus as expected. This is accordance with the autoradiography and with previous literature. Unexpected results in auditory cortex can be attributed to the sound produced by the stroboscopic device. Metabolic changes in the amygdala have been previously described, associated to different mood states.

Conclusions: We demonstrated the feasibility SPM techniques for the analysis of small animals PET scans. This approach presents significant advantages over region of interest-based quantitative analysis in exploratory studies or when subtle differences are involved.