Open Field PET: Towards Simultaneous Brain Imaging and Behavioral Response Studies in Laboratory Rats

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Abstract:
High resolution small animal PET has the potential to play an important role in understanding the molecular basis of cognition and behavior under normal and pathological conditions. However, the routine use of anesthesia imposes three crucial limitations: (i) it perturbs the neurological parameters of interest, including blood flow, receptor occupancy and neurotransmitter release, (ii) it precludes the study of neurochemical responses to sensory stimuli that require the animal’s conscious attention and (iii) it prohibits the recording of behavioral responses. This presentation will describe our progress towards the development of Open-Field PET – a technique that makes it feasible to image the brains of awake, unrestrained rats in a conventional microPET scanner while simultaneously delivering controlled stimuli via an operant conditioning chamber and recording the animal’s behavioral outputs. Results of recent pilot studies demonstrating the utility of the technique will be presented and possible avenues for hypothesis testing in models of reward-driven learning and drug addiction will be explored.