In vivo tumor imaging in mice using a state-of-the-art clinical PET/CT in comparison with a small animal PET and a small animal CT.

The aim of this prospective study was to assess the feasibility of a state-of-the-art clinical PET/CT scanner for in vivo tumor imaging in mice in comparison to a small animal PET scanner and a small animal CT scanner. Seventeen female NMRI nude mice bearing a subcutaneous transplanted murine mammary carcinoma (EMT6) on the right hind limb were examined using a clinical PET/CT scanner (biograph Sensation 16), a dedicated small animal PET scanner (MOSAIC system), and a dedicated small animal CT scanner (MicroCAT II). 18F-fluoroazomycin arabinoside (18F-FAZA) was used as PET tracer for imaging of regional tumor hypoxia. The examination of tumor-bearing mice using a state-of-the-art clinical PET/CT scanner, a dedicated small animal PET scanner and a dedicated small animal CT scanner revealed good image quality and allowed the evaluation and correlation of molecular/metabolic alterations of cancers with anatomical/morphological findings. The tumor lesions showed a 1.89 +/- 0.6 higher mean tumor-to-background ratio +/- SD for the dedicated small animal PET scanner than the PET from the clinical PET/CT scanner (P<0.001). The mean tumor-to-background ratio of the PET of the clinical PET/CT scanner showed a high correlation with the mean tumor-to-background ratio of the dedicated small animal PET scanner (r2 = 0.92). The tissue hypoxia in the
subcutaneous transplanted EMT6 tumors did not correlate with the tumor volume. Clinical PET/CT scanners are widely available and could contribute not only to human clinical routine examinations, but also to tumor research in animals. The molecular/metabolic information is reduced when imaging small tumors of mice with clinical PET/CT scanners due to the low spatial resolution and sensitivity of the PET scanners. The examination of small tumors in mice should be reserved to research centers with small animal PET/CT scanners because they provide promising hope to achieve accurate measurement of activity concentration. For tumor research in humans and animals using clinical PET/CT scanners, PET scanners with a higher spatial resolution and a higher sensitivity will be highly promising, but will be in competition to PET/MRI.