AbstractID: 7424 Title: Causes of inhomogeneities of intratumoral FDG uptake

Objectives: It has been shown previously that in some xenograft tumor models increased 18-FDG uptake corresponds to hypoxia, rather than active cell proliferation or increased blood flow. This finding could have multiple implications on the utility of FDG PET for patient tumor delineation. In this study we investigate the factors affecting FDG uptake in human xenograft tumor models.

Methods: Six nude rats were inoculated with the following human tumor cells: HT-29 (colon adenocarcinoma), FaDu (SCCHN) and A549 (NSCLC). When the tumors reached 20-25mm in diameter, the animals were injected with 18-FDG, pimonidazole, and bromodeoxyuridine. 1hr post injection animals were imaged using a dedicated animal PET scanner. Then the animals were injected with Hoechst33342 and sacrificed. Tumors were immediately dissected, frozen and sectioned. One section from each tumor was placed onto a phosphor plate for autoradiography. The statistical analysis of association between FDG uptake and microenvironmental markers was then performed on a pixel-by-pixel basis.

Results: All tumors in the study had extensive necrosis well intermixed with viable tumor tissue, making it impossible to outline and exclude necrosis from the analysis. Typically, hypoxia was forming bands about 100μm wide at the interface between viable tissue and necrosis. Since animal PET images have much poorer resolution, it was impossible to establish any relationship between hypoxia and FDG uptake in PET images. Statistical analysis of the autoradiography data demonstrated positive pair wise correlations between 18F-FDG uptake and all of the markers administered.

Conclusions: For the tumor models studied here, necrosis and viable tissue were well mixed. When analyzed across the whole tumor section, FDG uptake was positively correlated with Pimonidazole, bromodeoxyuridine and Hoechst. This finding suggests that for the larger tumors with complicated morphology it is necrotic fraction that plays crucial role in forming FDG uptake rather than any of the microenvironmental parameters considered.