AbstractID: 6713 Title: Noninvasive evaluation of early radiation-induced pulmonary inflammation via [11C]-PK11195 based PET imaging

Purpose:
To determine the feasibility of using [^{11}C]-PK11195-based PET imaging to study radiation-induced pulmonary inflammation *in vivo* and to validate the molecular imaging results by histology.

Method and Materials:
Female adult C57BL/6J mice were used. The lower portion of the right mouse lung (RLL) was locally irradiated with a 5mm-diameter customized collimator in a ^{137}Cs gamma-ray irradiator. Radiographic imaging was employed for irradiation collimation alignment. The radiation doses were measured using Gafchromic EBT film. The irradiated mouse was imaged at 7 days after local irradiation. PET imaging was performed in a dedicated small animal PET scanner. Each mouse received 0.3 mCi of [^{11}C]-PK11195 *via* injection through the tail vein. A dynamic imaging protocol was used for each scan with a total duration of 30 minutes. Raw images were reconstructed and analyzed by 3D OSEM. Immediately after imaging, the mouse was euthanized and the lung was inflated and fixed in 10% formalin for 48 hours before paraffin embedding. 5 μm thick slices were cut for hematoxylin & eosin staining and histological images were acquired with a Zeiss light microscope.

Results:
The average dose in the locally irradiated lung region was 19.2Gy, while the total body dose was 3.9 Gy due to gamma ray leakage through the collimator. Tomographic slices in coronal and transaxial sections of the mouse lung showed significant PK11195 accumulation in RLL, while the other regions remained normal. Histologic images from different lung portions demonstrated that only RLL showed significant infiltration of macrophages and neutrophils, which agrees with the noninvasive imaging data.

Conclusion:
This study demonstrates the noninvasive evaluation of early radiation-induced pulmonary injury in a mouse model. Since [^{11}C]-PK11195 is approved for clinical use, this technique may see potential applications in monitoring early molecular events of radiation-induced pulmonary injury and assessing the efficacy of new treatment strategies.