AbstractID: 13375 Title: Assessing the potential of Cerenkov radiation for in vivo imaging of tumor hypoxia

Purpose: To assess whether *in vivo* optical imaging using Cerenkov radiation can (a) produce results that are comparable to those from microPET tumor imaging, and (b) provide information that facilitates future dual-tracer imaging experiments. **Method and Materials:** (a) Subcutaneous tumors were established by injecting HT-29 human colon adenocarcinoma cells into the shoulders of 4 nude mice, and were grown until they reached a volume of $1cm^3$. 200 microCi of ^{18}F-EF5 was injected via intraperitoneal injection, and 3 mice were imaged using microPET, whilst the other was imaged in an IVIS Spectrum. Images were acquired immediately and 1 hour following injection on both machines, using acquisition times of 10mins (PET) and 2mins (IVIS). (b) A mathematical model of the Cerenkov emission spectrum was developed and used to predict the ability of Cerenkov imaging to resolve signals from different tracers. **Results:** (a) In the initial PET and IVIS images, the tracer signal was confined to the region of the gastrointestinal region and there was no accumulation in the tumor. After 1 hour, both sets of images showed similar biodistribution throughout the body, along with uptake in the tumor. (b) The model predicted that different radionuclides can be distinguished through an energy-dependent red-shift in their emission spectra, leading to higher intensity signals in the optical spectrum. **Conclusion:** We have shown that ^{18}F-EF5 Cerenkov imaging of subcutaneous tumors can be performed optically. More specifically, our results show that the biodistribution and tumor uptake observed using this technique is in agreement with the microPET data. Our modeling suggests that the spectral differences between radionuclides, coupled with the differences in decay rates between tracers labeled with different radioisotopes, could be used to develop techniques for separating signals from two tracers for surface-level tumors, thus potentially allowing multiple aspects of tumor biology to be imaged simultaneously.