

AbstractID: 5728 Title: Impact of Heterogeneous Activity Distributions on the Tumor Absorbed Dose Distribution for an in-vivo Colorectal Cancer Model

Purpose: To compare the heterogeneous uptake distribution of intact and domain deleted monoclonal antibodies with simulated activity distributions used to derive the dosimetric impact of heterogeneous uptake.

Method and Materials: A total of 4 tumors with approximate masses of 0.1 g (~5mm diameter) and 0.5 g (~10mm diameter) were chosen for this study. Tumor activity distributions were reconstructed in 3D using serially sectioned LS174T tumors grown on the flank of athymic nude mice. The mice received an injection of either ^{177}Lu -PA-DOTA-HuCC49 or ^{177}Lu -PA-DOTA-HuCC49dCH2 monoclonal antibody. Simulated distributions of similar dimensions were created for comparison. All distributions were normalized to 100 uCi/g uptake and convolved with dose point kernels for a short range (I131) and a long range (Y90) isotope. Compared were radial profiles for activity density and dose rate, mean dose and tumor central dose.

Results: The activity distributions are much more erratic for tumor uptake compared to the simulated distributions. There is also variation in minimum and maximum activity density between tumors. The simulated distributions under-estimated the tumor size dependence of the average dose for both isotopes by about 10%. The central dose for the small tumor were overestimated for Y90 and bracketed for I131. The central dose for the larger tumors was under-estimated for both isotopes.

Conclusion: The simulated distributions did not well represent the large variation in uptake observed in tumors. Compared to the simulated distributions, dose due to Y90 performed better for the 0.5 g tumors, but worse for the 0.1 g tumors and dose due to I131 performed better for the 0.5 g tumors and similar for the 0.1 g tumors. The heterogeneity of uptake in tumors are not well represented by a single simulated distribution because of the wide variation in local uptake

Conflict of Interest (only if applicable):