

## AbstractID: 8927 Title: Improving the Efficacy of a Radionuclide Targeting Agent by Simulating its Pharmacokinetics

**Purpose:** Radionuclide therapy aims to deliver therapeutic doses to a tumor while sparing normal tissues by selective retention of a radionuclide carrying agent in the tumor. We determined how varying tumor and body clearance rates affect the dose delivered to a tumor.

**Method and Materials:** Organ pharmacokinetics were adapted from a model targeting agent while tumor kinetics were simulated. The dosimetry of the normal organs and a tumor in the head-and-neck region was found by using MIRD software, OLINDA 1.0. The tumor percent-injected-dose (%ID) was assigned an instantaneous value of 10, 5, 4, 3 and 1% while the tumor and body washout times were varied over three orders of magnitude: 1, 0.1, and 0.01. Using 1Gy total body dose as the limit, the tumor dose for each simulation was determined.

**Results:** For each tumor ID%, the most important kinetic parameter was tumor washout time. Delivering at least 50 Gy to a tumor when the tumor washout time was 1 did not depend on body washout time but did require that the tumor %ID was greater than 3%. In order to deliver at least 50 Gy when the tumor washout was 0.1 and body washout was 0.01, the tumor %ID needed to be greater than 3%. The greatest increase in tumor dose for each scenario was seen when the body washout was simulated at 0.1 and the tumor washout time was increased from 0.1 to 1.

**Conclusions:** A fast body washout allows for more permissible injected activity and delivered dose. In this experiment, it was possible to achieve meaningful therapy even at a sub-optimal tumor %ID's because fast body washout and slow tumor washout permitted favorable residence times within the body and tumor. When considering the pharmacokinetics of a targeting agent, the tumor kinetics influences therapy more than fast body clearance.