



Department of Physics

CBAMP

Ph.D. Dissertation Defense

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Comparative Pharmacokinetics, Biodistribution and Dosimetry of ^{212}Pb (alpha-emitter) Labeled Antibody vs Peptide vs Small Molecule

DATE: Friday, April 21, 2023

TIME: 2 pm

PLACE: SE 319

Dissertation Advisor: Dr. Th. Leventouri

Targeted radionuclide therapy has attracted worldwide attention as a reliable treatment modality in combination with other well established traditional cancer treatments. Alpha particle emitters have been actively pursued in pre-clinical and clinical research trials as a systemic cancer treatment regimen in the past three decades. These have a high relative biological effectiveness (RBE) due to their high linear energy transfer (LET). However, for therapeutic purposes, there is not be a simple and clear understanding of the mechanism of action as well as their uptake and biodistribution in human body in order to have precise dosimetry calculations.

In this study, a compartmental model is used to estimate the dosimetry calculations based on the fitted measured biodistributions for ^{212}Pb α -emitter in a pre-clinical stage and then translate those to human bodies. It decays to ^{212}Bi via β emissions with 60.6 mins half-life that eventually decays to stable ^{208}Pb via α and γ decays.

For peptide carriers, rats and mice data of commonly used radionuclides (^{131}I , ^{166}Ho , ^{153}Sm , ^{177}Lu) labeled peptide (DOTATATE) were used to find an average biodistribution of the IV injected DOTATATE compounds. For antibody carriers, ^{111}In and ^{212}Pb labelled trastuzumab in mice data were used. For small molecules, ^{188}Re -HEDP data collected from mice was utilized. Mean absorbed doses to organs at risk and tumor were calculated using the averaged biodistribution data of each carrier. Simulation Analysis and Modeling version 2.0 (SAAM II) was done to fit the activity-time curves for the measured post injection activity data over up to 128 h. Then, the organs' absorbed doses were calculated via MIRD scheme. Results will be presented.

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