AbstractID: 1336 Title: Absorbed Fractions for Skeletal Dosimetry of Alpha Particles

Alpha particle dosimetry is currently a topic of interest in nuclear medicine. Absorbed fractions for alpha particles in skeletal dosimetry are currently found in ICRP Publication 30. Their methodology consists of simplistic planar models and generally energy independent values for a limited set of source/target combinations. Consequently, models that relate the microanatomy and histology of skeletal tissues are needed for improved dosimetry. In this study, chord-based models have been developed using range/energy relationships and chord length data, obtained by Whitwell (cancellous bone) and Beddoe (cortical bone), for modeling the anatomy and dosimetry in skeletal tissues. In the cancellous bone, active (red) and inactive (yellow or adipose) marrow were modeled with variations in the fat fraction. In cortical bone, transverse chord lengths were used to develop a cylindrical geometry representative of individual osteons. In each model, the endosteum was also included as both a potential source and target tissue. Absorbed fractions were found to vary as a function of energy, cellularity (cancellous bone) and bone site. Energy variations demonstrated differences as high as 90% in some source/target combinations. In cortical bone, variations in bone site did not show large absolute differences in absorbed fraction, while such variations were evident within cancellous bone. Significant differences, as high as 90%, were seen for source/target combinations that included active or inactive marrow. Use of the absorbed fractions developed in this model will aide in more accurate dosimetry of therapeutic alpha emitters.
* This work is by grants R01 CA 96441 (NCI), and DE-FG07-02ID14327 (DOE).