AN IMAGE-BASED SKELETAL CANINE MODEL FOR PRE-CLINICAL EVALUATIONS OF OSTEOSARCOMA MOLECULAR RADIOTHERAPY

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No canine computational phantoms currently exist as needed for internal organ dosimetry from pre-clinical trials of therapeutic radiopharmaceuticals. In humans, only two broad classes of anatomic phantoms have been developed: stylized (MIRDOSE-3, OLINDA), and voxel phantoms. The voxel based phantoms are anatomically more accurate being derived from image segmentation of either CT or MR images of human anatomy.

The objective of this study was to construct a 3D computational phantom of the large dog based on whole-body multi-slice CT data. A female hound-cross underwent whole-body contrast-enhanced CT scanning at 2-mm slice thickness. On completion of the scan, the dog was euthanized and the entire skeleton was harvested for subsequent microCT investigation. The CT data was imported into the computational software 3D-Doctor® and used to create a polygon mesh phantom of the entire animal. All the major organs and bones were semi-automatically segmented and tagged to the CT slices. The phantom was then imported into the Rhinoceros® software and transformed into a Nonuniform Rational B-Splines (NURBS) surfaces phantom, allowing easy alteration of the phantom to simulate dogs of smaller or larger stature. The canine phantom was then re-voxelized using an in-house MATLAB® routine and is thus ready for radiation transport calculations of photon and beta-particle organ dosimetry.

Completion of this phantom will help us to assess photon dose throughout the various radiosensitive organs of the dog phantom during targeted radiopharmaceutical therapy trials. The model will later be complemented by a detailed microstructural model of trabecular spongiosa and bone marrow tissues.