AbstractID: 4365 Title: TLD-100 Measurement and Assessment of Internal Mouse Dosimetry during Micro-CT Analysis

Purpose: Because Micro-CT utilizes ionizing radiation for image formation, radiation exposure during imaging is a concern. The objective of this study is to quantify the radiation exposure delivered during a Micro-CT scan and to assess potential therapeutic effects associated with this radiation dose in a murine cancer model.

Materials and Methods: Radiation exposure was measured using calibrated thermoluminescent dosimeters (TLD-100) irradiated during a typical Micro-CT scan protocol. TLD calibration curves were generated with a Cs-137 irradiator. TLD's were implanted into a euthanized mouse and was imaged with Micro-CT. TLD's were removed post–scan and analyzed. Internal exposures were converted to dose in water. A C57BL/6 mouse lung tumor model derived by IV injection of 400,000 B16F10 murine melanoma cells was assessed for survivability and potential therapeutic effects due to absorbed radiation doses during Micro-CT imaging.

Results: A single Micro-CT scan dose of 7.8±0.5 cGy was achieved when using a lucite anesthesia support module and a dose of 9.2±0.6 cGy with out the use of the anesthesia module. TLD data was validated using an ion chamber, providing measured radiation exposures of 8.1±0.4 cGy and 9.7±0.5 cGy with and with out the anesthesia module, respectively. Internal TLD analysis demonstrated an average mouse organ absorbed dose of 7.3±0.6 cGy.

Conclusions: Survival analysis demonstrated a mean survival of non-treated control animals of 29±2 days, with animals receiving up to five sequential Micro-CT studies surviving a mean of 30.5±1.5 days (total estimated dose of 39±2.5 cGy).The calculated cell survival fraction for a 9.2 cGy Micro-CT scan was 99.25%. Therefore, negligible therapeutic effect from the radiation exposure delivered during Micro-CT analysis was observed in the animal model investigated.