AbstractID: 10534 Title: Comparison of Neutron Doses to a Water Target Exposed to a 10 MeV Neutron Beam: Foil Activation Method vs. Monte Carlo Simulations

We developed a mouse dosimetry model for neutron beam, and compared the calculated and simulated neutron doses for a water target (mouse) exposed to a 10 MeV neutron beam. We also estimated the longitudinal neutron dose profile for the water target. A water bottle (a simulated mouse, 6 cm x 1.3 cm radius) was exposed to a flux of 10 MeV neutrons produced via the d(d, n)He reaction using the Tandem accelerator at Triangle Universities Nuclear Laboratory at Duke University. An estimation of the neutron flux was obtained by neutron activations of two sets of aluminum and gold activation foils. One foil of each type was placed at the front and back sides of the water target. The flux was then calculated based on gamma spectroscopy of the irradiated foils using HPGe detectors. A Monte Carlo (MC) simulation based on FLUKA2008 code , was also used to estimate the 10 MeV neutron dose for the same geometry. The highest neutron flux measured using the activation technique was ($8.538x10^{6}$ +/- $6.89x10^{4}$) $n.cm^{-2}.s^{-1}$ at the front end of the target. Using neutron kerma factors from ICRU data tables, the calculated dose rate to a water target at the location of the foil was (1.890+/- 0.015) $Gy.hr^{-1}$. Using the data from the MC simulation, the calculated neutron dose to the front end of the water target was (1.870 +/- 0.001) $Gy.hr^{-1}$. The dose calculated using the foil activation technique was in good agreement with the MC results. The slight discrepancy in the measured flux was likely the result of the closer position of the activation foils to the neutron source than the water bottle target, and also absorption within the activation foils. Assuming these results are in good agreement, we estimated the dose profile for the simulated mouse.