Boron neutron capture therapy (BNCT) is a binary treatment modality that requires selective accumulation of a compound containing boron-10 in a tumor and neutron irradiation of the tumor zone. Preferential absorption of slow neutrons by boron-10 nuclei releases energetic, short-range, high-LET alpha and lithium-7 particles, which can kill boron-10-laden tumor cells while sparing boron-poor tissues. A FDA-sanctioned (phase I/II) clinical trial of *p*-boronophenylalanine-mediated BNCT for glioblastoma multiforme is underway using the Brookhaven Medical Research Reactor. During BNCT, radiation dosimeters are positioned on the patient's skin surface at four locations. Lithium-7 enriched LiF, thermoluminescent dosimeters indicate gamma absorbed dose, and gold wires measure thermal neutron flux. Average absorbed doses (Gy) at different body locations were computed using the BNCT treatment planning software (brain) and the Monte Carlo neutron and photon transport code (other tissue or organ). These were then normalized to the results of the dosimetry. Adopting the 1990 recommendations of the International Commission on Radiological Protection (ICRP 60), effective dose (sieverts, Sv) can be calculated to provide an estimate of the radiation risk of BNCT. The radiation-weighting factor 20 (ICRP 60) was attributed to the high-LET components of the radiation field relative to the factor 1 for its low-LET components. The effective doses to 38 patients averaged 1.0 Sv (range 0.6 to 1.9 Sv). Irradiation of the brain accounted for 60% of the average effective dose. The carcinogenic and mutagenic potential of these doses will be discussed.

This work was supported by the DOE contract # DE-AC02-76CH00016.