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Enhancement of X-ray Energy Deposition via Heavy Element Sensitization in Biological Environments SARA LIM, ANIL PRADHAN, SULTANA NAHAR, ROLF BARTH, The Ohio State University — Energy (dose) deposition by low vs. high energy x-rays (LEX & HEX), approximately E $\sim$ 100 keV and E $>$ 1 MeV respectively, was studied in biological matter sensitized with heavy elements (high-Z or HZ) to improve radiation therapy of cancer. Computations and simulations show that LEX interact favorably with HZ sensitizers by depositing more dose than HEX. LEX photons effectively photoionize deep inner electronic shells and release cell-killing Auger electrons near malignant cells embedded with HZ atoms. HEX photons predominantly Compton scatter with little interaction, even with HZ elements. Monte Carlo simulations show that in comparison to unsensitized tissue, LEX irradiation of HZ-sensitized models resulted in up to a factor of 2 increase in dose deposition relative to HEX. To validate the studies, *in vitro* experiments were performed using 2 distinct cancer cell types treated with Pt-based sensitizers, then irradiated with a LEX 160 KV x-ray source and a HEX 6 MV LINAC employed in radiation therapy. The experiments support numerical simulations, and demonstrate several factors lower survival of HZ-sensitized cells irradiated with LEX compared with HEX [1].

[1] Lim, S. N. Heavy Element Radiosensitization in X-ray Therapy. Thesis. Ohio State University, 2014

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