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Enhancement of X-ray dose absorption for medical applications SARA LIM, SULTANA NAHAR, ANIL PRADHAN, ROLF BARTH, ROBIN NAKKULA, ERICA BELL, The Ohio State University — Nanoparticles and compounds containing heavy element (high Z or HZ) could greatly increase the tumoricidal efficacy of X-radiation therapy via radiosensitization. This occurs because low energy X-rays can effectively ionize the inner shells of HZs, resulting in increased emission of damaging, high linear energy transfer (LET) electrons. To develop a comprehensive theoretical background to this process, numerical computations and Monte Carlo simulations using Geant4 for X-ray energy absorption and dose deposition in tissues were carried out at various energies. The enhancement in X-ray dose absorption due to HZ radiosensitization were determined. An absorption ratio, η, was developed to quantitatively compare radiosensitization by various broadband X-ray energies and HZ sensitizer concentrations. *In vitro* experiments with the F98 rat glioma and B-16 mouse melanoma models were performed using platinum-based compounds to substantiate the computations and simulations. These results show that X-ray energies in the range below 100 keV are most efficient in achieving both the required penetrative depths and deposition of energy. Several issues regarding sensitizer concentration and chemotherapeutic efficacy as they relate to radiosensitization must be addressed

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