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Radiosensitization of high-Z compounds by medium-energy 160 kV vs. high-energy 6 MV X-rays for radiation therapy: Theoretical, in vitro and in vivo studies of platinum compounds activating glioma F98 cancer cells S. LIM, A. PRADHAN, S. NAHAR, M. MONTENEGRO, R. BARTH, R. NAKKULA, C. TURRO, The Ohio State University — Energy dependence of X-ray irradiation of high-Z compounds for enhanced radiosensitization is explored thoeretically and via in vitro and in vivo experiments. The cell killing ability of medium-energy X-rays from 160 kV source are found to be more effective than 6 MV X-rays in activating high-Z contrast agents. Results are presented for a newly synthesized Pt compound, Pyridine Terpyridine Pt(II) Nitrate ([Pt(typ)(py)]) and carboplatin in treating F98 rat glioma. In-vitro results show considerable reduction in cell viability for radiosensitized cells irradiated with a 160 kV irradiator. Cells treated with 6 MV LINAC radiation find little variation with radiation dose. Maximum dose enhancement factors (DEFs) and minimum cancer cell survival fractions correspond to 50-200 keV range, and fall rapidly at higher energies. Theoretical calculations of photoelectric absorption vis-a-vis total scattering demonstrates this energy dependence. However, in vivo studies of rats treated with [Pt(tpy)(py)] had a severe negative neurotoxic response, confirmed by histopathological analysis. But subsequent in vivo studies using carboplatin showed very positive results in the treatment of F98 glioma bearing rats and potential clinical radiation therapy.

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