Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Essential Role of Low-Energy Electrons in the Biological Effectiveness of Advanced Radiation Treatment Modalities MOHAMMAD REZAEE, Johns Hopkins University School of Medicine — Advances in radiotherapy are to improve the therapeutic ratio by delivering a higher radiation dose to tumor versus normal tissues. This can be achieved by either high-LET beam or highly modulated delivery techniques of low-LET beam. Biological impact of the radiations initiates from the formation of various cellular DNA lesions by energy deposition into DNA (direct effect) and its surrounding molecular environment (indirect effect). Increase in LET and dose reduces the contribution of indirect effect due to the recombination of reactive species, hence DNA lesions are mainly induced by the direct effect. Low-energy electrons (LEEs, <20eV) are the most numerous species responsible for the induction of DNA damage from the direct effect. LEEs have high RBE due to two physical characteristics: they have very short range in biomatter and high inelastic interaction cross-section with biomolecules. These cause the formation of multiple lesions confined within a range of a few biomolecules (clustered lesions), which are difficult to be repaired by cellular repair processes. With these unique properties, LEEs can achieve modulation of RBE and improvement of therapeutic radio, if their distribution can be controlled at the molecular level.

Mohammad Rezaee
Johns Hopkins University School of Medicine

Date submitted: 14 Jan 2020 Electronic form version 1.4