A Geant4-DNA simulation of human cancer cells irradiated with helium ion beams

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Background: Accurate modeling of human cancer cells and their irradiation by various particle beams to induce DNA damage is essential to help improve radiation therapy.

Material and Methods: The Geant4-DNA toolkit allows the simulation of cancer cell geometries, which can be combined with the modeling of the physical, physicochemical and chemical stages of water radiolysis after irradiation, to predict direct and non-direct DNA damage, such as single and double strand breaks. In recent years, new data have shown that certain tumor types would be most amenable to treatment with helium ion beams, which may represent an attractive trade-off between the use of proton or carbon beams.

Preliminary results: In this study, Geant4-DNA is used to quantify early DNA damage in human cancer cells upon irradiation with helium ion beams as a function of linear energy transfer (LET). The results of the Geant4-DNA simulations are then compared to experimental data.

[1] W. G. Shin *et al.*, Cancers 2021, 13(19), 4940