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## Using Gate to predict clonogenic alteration in radiosensitization studies

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As part of the european project RXNanoBRAIN, the image-guided radiation therapy and the radiosensitization by Gadolinium and Bismuth hybrid nanoparticles are investigated for the treatment planning of the glioblastoma brain tumor. In this context, we performed Gate Monte Carlo simulations to assess the deposited dose in clusters of Bismuth-Gadolinium nanoparticles in U251 glioblastoma cells. Ionization process, created secondary particles and their maximal range were analyzed in the presence of nanoparticles. We also studied the mount of ionization into cells nucleus in presence or absence of nanoparticles. In parallel, we performed biological experiments, including

DNA damage assessment by immunofluorescence technique and clonogenic assay (from 0 up to 10 Gy). Then, biological and numerical results were compared and we observed that radiosensitization was not due to a DNA damage increase. We also propose a general prediction model taking into account the nanoparticle concentration and the planed deposited dose in water. Further biological alterations in these condition are currently investigated to better understand the radiosensitization process to include it into a more biological dosimetry model.

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