**Biological dose estimation for proton and carbon ion treatment plans using the GATE platform**

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**Background:** One of the challenges in hadrontherapy is the evaluation of the biological dose. Treatment Planning Systems should optimize treatment beams by considering the biological dose prediction in addition to the physical dose.

**Material and methods:** We have developed and tested a tool for the GATE platform (www.opengatecollaboration.org), the BioDoseActor, to estimate the biological dose for different ion beams (including protons and carbon ions). This estimator is currently based on precomputed databases of alpha and beta survival parameters from mMKM and NanOx biophysical models for the Human Salivary Gland (HSG) cell line.
We validated the BioDoseActor for:
- passive scattering HIMAC 320 MeV/n carbon ion beam line, in water, using the HSG cell line. For this study, we evaluated the influence of the step limitation and the StepFunction parametrization;
- active scanning beam line at MedAustron, for both proton and carbon ion treatment plans of head and neck cancer patients.

**Preliminary results:** We reproduced the physical dose distribution for the HIMAC and MedAustron beams. Then, we calculated the biological dose for different patient treatment plans.
We also provided guidelines to adapt the StepFunction parameters to minimize the computing time while keeping high precision results.
GATE is now able to compute the biological dose at voxel scale. We aim to extend the survival fraction coefficient databases to other cell lines in the objective to further validate the BioDoseActor for other clinical treatment plans.