ABSTRACT BOOK

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“BRITE
(Biomarkers of Radiation In The Environment):
Robust tools for risk assessment”

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GENETIC EFFECTS: DNA RADIATION DAMAGE AND REPAIR

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DNA response to radiation involves complex pathways of its damage and repair underlying the radiosensitivity of cells and relative biological effectiveness of irradiation.

Recent progress in development of laser-based particle acceleration technologies offers exciting opportunities for medical application of ultrafast particle bunches in cancer radiotherapy. The advantage of laser-generated ultrafast electron beams for biological and clinical application is obvious, since they have monoeenergetic spectral profile and less lateral spread than other laser-driven ions. The dose delivery of laser-generated ultrafast electron beams is also highly instantaneous and occurs faster than many biochemical reactions.

The aim of our work was to study the molecular-genetic effects of laser-generated ultrashort electron radiation in vitro. The dose-rate effect of ultrashort electrons was demonstrated based on the distribution analysis of DNA breaks in human blood cells. It was shown that the formation of DNA DSBs activates DNA-PK dependent pathway of DSBs repair. Moreover, our preliminary results show that laser-generated ultrafast electron beams effectively induce de novo DNA copy number variations in human whole blood culture.

The data obtained can help to develop the well-controlled, reliable energetic laser-driven ion beams of very high quality that can meet medical requirements with respect to physical parameters, performance and radiobiological effectiveness and therefore represent a viable alternative in an advancing state-of-the-art for radiotherapy.

PRACTICALITIES OF MAINSTREAMING BIOMARKER USE – A CANADIAN PERSPECTIVE

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This paper discusses the use of biomarkers within the environmental protection framework that has evolved since the Canadian Nuclear Safety Commission (CNSC) was given a broad mandate for the protection of the environment in 2000. Since then, changes in the Canadian Environmental Assessment Act have also resulted in the CNSC taking on new responsibilities in environmental assessment as well as licensing. Unique insights have also been obtained through the Environmental Effects Monitoring (EEM) requirements of the Metal Mining Effluent Regulations. Altogether, the Canadian nuclear sector now has over a decade of experience in the use of biological evidence for decision-making.