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# (I) Novel cancer treatment in a FLASH –development towards reducing side effects of cancer therapy using X-rays, electrons and protons at TRIUMF

*Tuesday 7 June 2022 13:15 (30 minutes)*

Over the last half century, cancer has remained a major cause of death in Canada and worldwide. Although therapy-induced cure rates have gradually improved for some cancers and early detection has improved survival for others, cancer is still among the most straining healthcare burdens.

Radiotherapy has contributed to improvements in treatment through technological advances and refinements of dose fractionation and is currently responsible for approximately 80% of all non-surgical cancer cures. However, about half of patients treated with radiotherapy are not cured, creating a significant unmet need for continued improvement to therapeutic options.

Recent enthusiasm in the radiotherapy community surrounding the concept of FLASH radiotherapy, delivering large doses of radiation as a single dose at ultra-high rates, is founded on the enormous potential impact of FLASH on radiotherapy cure rates and improved quality of life for patients.

The current interest in FLASH was catalyzed by recent publications reporting a significant increase in the therapeutic index compared with conventional radiotherapy. The key observation driving further research is that, in FLASH, normal tissue damage is reduced whilst tumour control is maintained, enhancing the therapeutic index. Obviously, if borne out in clinical trials, FLASH radiotherapy would be a momentous step forward in radiotherapy, providing opportunity for improvement in response, cure rates, access to treatment, treatment capacity and healthcare economics.

While the FLASH radiation concept has generated significant interest, advancing the data is somewhat limited by the availability of suitable accelerator systems and comparability of existing experimental data. Many groups are pursuing FLASH radiation research with a plethora of sources and models with mixed results, making interpretation of the precise conditions in which FLASH-mediated normal tissue sparing occurs difficult. Together with its partners, TRIUMF possesses unique expertise, technology and capabilities to conduct comprehensive and systematic studies to investigate the FLASH phenomena using protons, photons and electrons in a single biomedical reference environment. Dedicated infrastructure for generating FLASH-relevant dose rates has recently been commissioned or is under construction at TRIUMF. The key technical cornerstones of this campaign, as well as dosimetry and early biological results will be presented.

**Author:** GOTTBERG, Alexander (TRIUMF (CA))

**Presenter:** GOTTBERG, Alexander (TRIUMF (CA))

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