Master 2 internship in Radiobiology: Establishing in vivo models for radiation-induced normal tissue toxicity to examine the FLASH sparing effect

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The World Health Organization predicts a severe increase in the global incidence and mortality of cancer in the coming decades. Radiation therapy (RT) continues to play an important role in cancer treatment and is incorporated in over 50% of cases. One emerging radiotherapy technique that has recently gained attention is FLASH radiotherapy (FLASH-RT). With FLASH radiotherapy, the radiation is given using ultra-high dose rates (UHDR) of 40-100 Gy/s. This results in the FLASH-RT being delivered within 0.1 second, compared to minutes in the conventional mode of radiotherapy. Delivering this radiotherapy instantaneously resulted in decreased normal tissue toxicity while maintaining equal tumour control, which together is labeled the 'FLASH effect' (1,2). Since the rediscovery of the FLASH effect in 2014 (1) at Institut Curie, research has focused on both understanding its underlying mechanism and on identifying the beam parameters required for FLASH, together with establishing the margins that preserve the FLASH sparing effect. Parameters including dose per pulse, average dose rate and fractionation have been examined to some extent (3,4). However, this research is incomplete, and other parameters have either not been examined or have been studied inadequately. Without a clear identification of the margins to maintain the FLASH sparing effect, the therapeutic benefit may be lost during clinical translation. **To examine the margins of maintaining the FLASH sparing effect, it is necessary to establish early and late responding radiation-induced toxicity models, which will be the focus of this project.**

Radiation biology itself is extremely multidisciplinary, encompassing biology with physics and radiochemistry. Our team therefore works at the crossroads of these fields and consists of biologists, radiobiologists, physicists and radiation oncologists. In addition, close collaborations are established with both physicists and radiochemists at CHUV, Lausanne, Switzerland.

We are seeking a student who is particularly motivated by **multidisciplinary research**, eager to explore new techniques, willing to work **in vivo**, curious to approach research projects from a multidisciplinary point of view and comfortable with communication in **English**. This internship project is part of establishing in vivo models for radiation-induced normal tissue toxicity to examine the FLASH sparing effect, supporting translation to the clinic. **The project will mainly include in vivo studies with possible histological analysis and/or FACS analysis, and contribution to multiple publications in the field of FLASH radiotherapy.**

Required skills:
We are looking for an intern with **strong motivation** to engage in multidisciplinary research. **Willingness to work in vivo is required**, and scientific curiosity and a prominent English level is highly valued. Internship reimbursement will be provided.

References:

1. Favaudon V, Caplier L, Monceau V, Pouzoulet F, Sayarath M, Fouillade C, et al. Ultrahigh dose-rate FLASH irradiation increases the differential response between normal and tumor tissue in mice. Sci Transl Med. 2014;

2. **Sesink A**, Becerra M, Ruan JL, Leboucher S, Dubail M, Heinrich S, et al. The AsiDNA™ decoy mimicking DSBs protects the normal tissue from radiation toxicity through a DNA-PK/p53/p21-dependent G1/S arrest. NAR Cancer. 2024;6(1).
3. Grilj V, Zayas AV, **Sesink A**, Devanand P, Repáraz D, Paisley R, et al. Average Dose Rate is the Major Temporal Beam Structure Parameter for Preserving Murine Intestines With Pulsed Electron FLASH Radiation Therapy. Int J Radiat Oncol Biol Phys [Internet]. 2025 Oct 1 [cited 2025 Oct 7];123(2). Available from: https://pubmed.ncbi.nlm.nih.gov/40319927/
4. **Sesink A**, Geyer R, Devanand P, Böhlen TT, Soutter L, Moeckli R, et al. Decrease in dose per fraction impairs the FLASH sparing effect in murine intestine model [Internet]. 2025. Available from: http://biorxiv.org/lookup/doi/10.1101/2025.08.27.672569