Grenoble Alliance for Integrated Structural & Cell Biology

GRAL MSc RESEARCH SCHOLARSHIP 2020-2021

RESEARCH INTERNSHIP PROPOSAL

Institute / Group

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Research Project Title

Nucleoid organisation and dynamics of the radioresistant bacterium, *Deinococcus radiodurans*, in response to extreme irradiation

Description of the project

In bacteria, genomic DNA is compacted several orders of magnitude by nucleoid-associated proteins in order to fit into a confined region of the cell named nucleoid, and yet must remain accessible to the DNA replication, repair and transcription machinery. At present, bacterial nucleoid organisation is still only poorly understood in part because of its small size (< 1µm3). Among bacteria, *Deinococcus radiodurans*, a well-known radioresistant non-pathogenic coccus, is particularly well suited for studying nucleoid organisation and dynamics because it is a relatively large bacterium that displays an outstanding ability to survive very high doses of DNA-damaging radiation. The main objective of this internship is to explore nucleoid organisation and dynamics in *D. radiodurans* in response to irradiation (UV light and γ-radiation) using 3D conventional spinning-disk imaging of live cells. Membrane and DNA dyes or engineered strains expressing labelled nucleoids-associated proteins will be used to follow the changes in DNA compaction and nucleoid shape after exposure to UV- or γ-radiation. In parallel, the bioenergetic state of the cells and in particular the levels of respiration will be measured using an O2 electrode and flow cytometry, to follow cell recovery. This project requires a background in microbiology and cell imaging, and a basic understanding of cell metabolism.

Keywords

Nucleoid, radioresistance, bacteria, 3D cell imaging, cell bioenergetic

Relevant publications of the team

Floc'h K, Lacroix F, Servant P, Wong YS, Kleman JP, Bourgeois D, Timmins J. (2019). Cell morphology and nucleoid dynamics in dividing *Deinococcus radiodurans*. Nat Commun. 2019 Aug 23;10(1):3815.

Timmins J, Moe E. (2016). A Decade of Biochemical and Structural Studies of the DNA Repair Machinery of *Deinococcus radiodurans*: Major Findings, Functional and Mechanistic Insight and Challenges. Comput Struct Biotechnol J. 2016 Apr 7;14:168-176.