**Master 2 internship project**

**Year 2025-2026**

**Laboratory/Institute:** Laboratory of Chemistry and Biology of Metals **Director:** V. Artéro

**Team:** Proteomics for Metals, Immunology and Toxicology **Head of the team:** T. Rabilloud

**Name and status of the scientist in charge of the project:** S. Candéias, Research Director

**HDR: yes X no ☐**

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**Program of the Master’s degree in Biology:**

**x** Microbiology, Infectious Diseases and Immunology **☐** Biochemistry & Structure

**x** Physiology, Epigenetics, Differentiation, Cancer **☐** Neurosciences and Neurobiology

**Title of the project:**

**Effects of sex-hormones and obesity on the cellular response to ionizing radiation**

Objectives (up to 3 lines):

Understand how the presence of sex-hormones and/or leptin, one of the hormones of obesity, affects primary human cells and their response to low and high doses of ionizing radiation.

Abstract (up to 10 lines):

Ionizing radiation induces genotoxic stress in exposed cells. If mis-repaired, these DNA lesions can lead to cellular transformation and cancer. To avoid this detrimental fate, irradiated cells develop a DNA-damage response (DDR) coordinated by ATM and p53, which may include an inflammatory aspect, depending on the dose of radiation and the cell lineage. Activation of the DDR results in the modulation of expression of numerous genes involved in cell death/survival, cell cycle, DNA repair, redox balance and inflammation to ensure that only repaired cells are allowed to survive and prevent cancer development. Epidemiology studies have shown that radiation-induced cancer risk is higher in women who had their first menstruations at an early age and are overweighted. We are currently addressing this question in an EU-financed project. This internship would contribute in this project by analyzing the effects of sex-hormones and leptin on human primary fibroblasts and endothelial cells, and how these factors modulate their radiation-response.

Methods (up to 3 lines):

Cell culture and cellular biology (viability assays, proliferation and cell cycle analysis, redox assays, immunolabelling …)

Molecular biology (RT-qPCR) and biochemistry (western blots, cytokine quantification) approaches.

Up to 3 relevant publications of the team:

1 - High-dose radiation induces an early and transient, ATM-dependent inflammatory response in primary human endothelial cells. C Rouichi, E Chartier-Garcia, J Ravanat, I Testard and SM. Candéias. 2025. Radiation Research, *in press*.

2 - Bystander signals from low- and high-dose irradiated human primary fibroblasts and keratinocytes modulate the inflammatory response of peripheral blood mononuclear cells. Testard I, Garcia-Chartier E, Issa A, Collin-Faure V, Aude-Garcia C, Candéias SM. J Radiat Res. 2023. 64(2):304-316. PMID: 36680763. Free article.

3 - Label-Free Direct Mass Spectrometry Analysis of the Bystander Effects Induced in Chondrocytes by Chondrosarcoma Cells Irradiated with X-rays and Carbon Ions. Gilbert A, Payet V, Bernay B, Chartier-Garcia E, Testard I, Candéias SM, Chevalier F. Front Biosci (Landmark Ed). 2022. 27(9):277. PMID: 36224025 Free article.

Requested domains of expertise (up to 5 keywords):

We are looking for a motivated candidate with a solid background in cellular biology, signaling and inflammation to work in a small team on this exciting project.

Prior experience in cell culture/cell biology and RT-qPCR required.

Experience in western blots a plus