Unité Mixte de Recherche UMRE008/U1274
Stabilité Génétique, Cellules Souches et Radiations
Directeur : Stéphane MARCAND
Directrice adjointe : Françoise PFLUMIO

PhD position to study the regulation of Rad51 filaments in homologous recombination

A fully funded PhD position is available in the team "Laboratoire de Radiobiologie Génétique et Moléculaire", headed by Éric Coïc, at the JACOB institute, CEA, Fontenay-aux-Roses, FR. Our team focuses on elucidating the molecular mechanisms that govern homologous recombination (HR) in yeast (https://jacob.cea.fr/drf/ifrancoisjacob/Pages/Departements/IRCM/Equipes/LRGM.aspx). HR is a major pathway for the accurate repair of DNA double-strand breaks and single-stranded DNA gaps, as well as for the restart of stalled or collapsed replication forks. A key step in HR is the formation of Rad51 nucleoprotein filaments on the single-stranded DNA generated by these breaks. We showed in yeast that a strict control of these filaments is essential to prevent HR from inducing chromosomal rearrangements. In humans, the functional homologs of the control proteins are tumor suppressors. Thus, the control of HR appears to be as important as the HR mechanism itself. Our project involves the use of newly developed molecular tools that will provide unprecedented insight into the mechanisms governing these regulatory pathways. Notably, we will employ a functional fluorescently tagged version of Rad51 protein first developed by our collaborators A. Taddei (Institut Curie), R. Guérois and F. Ochsenbein (I2BC, Joliot, CEA). This major advance will enable us to visualize the effects of regulatory proteins on DNA repair dynamics following various types of DNA damage using live-cell microscopy. We have also developed highly accurate structural models of control protein complexes in association with Rad51 filaments. We will use a multidisciplinary approach based on genetics, molecular biology, microscopy, biochemistry, protein structure and AI-designed peptide inhibitors to understand the function of Rad51 filament formation regulators.

Applicants should hold a Master's degree obtained within the last two years or be expected to graduate in 2026. The ideal candidate will have a solid background in genetics, molecular biology, structural biology, or biochemistry, with interest in genome stability and DNA repair. Candidates are expected to be curious, motivated, and eager to develop their research skills, able to work both independently and collaboratively in a team. Strong communication skills, including clear scientific writing and effective presentations, are highly valued. A good practice of English is required and French is not required, but basic knowledge or willingness to learn is a plus.

Our group is located at the CEA center of Fontenay-aux-Roses located 10 km from the center of Paris (easily accessible by public transportation using the Metro line 13 and the Tram T6). The institute provides state-of-the art facilities and an excellent scientific environment with a highly interactive group of researchers in the field of DNA damage, genome stability, and cancer.

To apply: e-mail to laurent.maloisel@cea.fr and eric.coic@cea.fr :
- Your CV
- Your Motivation letter explaining your background and interests in DNA repair
- A short summary of your MSc research
- A copy of your university diploma
- The contact of two references

Maloisel L *et al*., PloS Genetics (2023) *Rad51 filaments assembled in the absence of the complex formed by the Rad51 paralogs Rad55 and Rad57 are outcompeted by translesion DNA polymerases on UV-induced ssDNA gaps*.
Ma E *et al*., Nature Communications (2025) *A large C-terminal Rad52 segment acts as a chaperone to Form and Stabilize Rad51 Filaments*.
Dupont C *et al*., Submitted *Structural and functional insights into the Rad51 paralog complexes Shu and Rad55-Rad57 in association with Rad51 in homologous recombination*.