

Master 2 Reproduction et Développement Stage de recherche 2024-2025

Stage proposé par

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Site internet : [CelHD lab](http://CelHD.lab)

Directeur du Laboratoire ou de l'Unité : Thierry Jaffredo

Intitulé de l'équipe d'accueil : *C. elegans* Heredity and Development

Prénom et NOM du Responsable de l'équipe : Vincent Galy

Résumé du thème de recherche de l'équipe (une dizaine de lignes maximum)

Mitochondria are essential organelles with their own genome, the mitochondrial DNA (mtDNA). They are responsible not only for energy production but also for various signalling pathways. Like the other cells, oocytes and sperm have their own mitochondria and mtDNA, and after fertilization the zygote contains both maternal and paternal mtDNA. However, in most species including humans and worms only the maternal mtDNA is inherited. We want to understand how this highly conserved mode of transmission is regulated at the molecular level and what would be the consequences of bi-parental or paternal inheritance on the individuals as well as on their progeny over several generations.

Titre du projet de stage :

Prénom, NOM, téléphone et adresse e-mail du Responsable du stage:

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Projet de stage : (une vingtaine de lignes maximum)

Mitochondria are organelles known as the powerhouse of the cell and are also essential in several signaling pathways (apoptosis, calcium signaling...). Mitochondria have their own genomes and mitochondrial mutations are associated with a broad spectrum of severe human diseases with complex modes of transmission due to the possible coexistence of several type of mitochondrial genomes, threshold effects and the **uniparental maternal heredity**. Using the nematode *C. elegans* model system, we discovered that **sperm** mitochondria are rapidly degraded in the zygote by an **autophagy** process named **allophagy**. Although several contributing factors have been identified, the marks allowing the specific recognition of the sperm mitochondria remain elusive.

The objective of your internship will be to identify and characterize mitochondrial proteins involved in sperm mitochondria **degradation**. The laboratory recently identified 7 proteins potentially acting in the sperm mitochondria elimination. You will validate their involvement in sperm mitochondria elimination using RNAi experiments and/or mutants and the quantitative measurement of sperm mitochondria stability. Beyond that, you will complete the phenotypical characterization of the most interesting candidates, taking advantage of our expertise and unique toolbox and set of methods. You will conduct immunofluorescence and live imaging on our dedicated dual-cam spinning-disk microscope as well as PCR mtDNA detection experiments in order to identify proteins acting as marks on sperm mitochondria. Your work will therefore shed light on new allophagy factors and provide molecular knowledge on how sperm mitochondria are recognized for their degradation.

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Even though the strict uniparental inheritance of the mitochondrial genomes is widely observed among metazoan, the molecular mechanisms sustaining this mode of heredity are poorly known. Your work will contribute to identify proteins acting as a mark and may serve to prevent sperm mitochondria degradation as well as test the impact of their stabilization on the development and on the next generations.

Techniques mises en œuvre par le stagiaire :

Immunofluorescence, PCR, RNAi, live imaging, worm genetics

Publications du Responsable de stage au cours des 5 dernières années :

- Cailloce J, Husson F, Galy V, **Merlet J.** 2023. An antibody free approach to probe the presence of poly-ubiquitin chains on *C. elegans* sperm derived organelles after fertilization. **microPublication Biology**. [10.17912/micropub.biology.000972](https://doi.org/10.17912/micropub.biology.000972).
- Cailloce J, Husson F, Zablocki A, Galy V, **Merlet J.** 2023. Fast and easy method to culture and obtain large populations of male nematodes. **MethodsX**. 11:102293. doi:[10.1016/j.mex.2023.102293](https://doi.org/10.1016/j.mex.2023.102293).
- Rubio-Peña K, Al Rawi S, Husson F, Lam F, **Merlet J** and Galy V. Mitophagy of Polarized Sperm-derived Mitochondria After Fertilization. (2021) **iScience** 24(1): 102029. doi:[10.1016/j.isci.2020.102029](https://doi.org/10.1016/j.isci.2020.102029)
- **Merlet J**, Rubio-Peña K, Al Rawi S, Galy V (2019) Autophagosomal Sperm Organelle Clearance and mtDNA Inheritance in *C. elegans*. **Adv Anat Embryol Cell Biol**; 231:1-23. doi: 10.1007/102_2018_1. doi: [10.1007/102_2018_1](https://doi.org/10.1007/102_2018_1)

Autres informations:

Etudiants actuellement en thèse ou en M2 dans l'équipe d'accueil. Pour chaque étudiant indiquez le nom du responsable de thèse, l'année du début de la thèse et l'Ecole Doctorale de rattachement

- Romina Cerjani, Master 2 BMC Rennes-1 Janv. Juillet 2024. Resp stage: J. Merlet. -
- Valentine Melin, Thèse depuis Oct. 2022. ED515 Complexité du Vivant Resp. Thèse : V. Galy

Etudiants ayant préparé ou soutenu leur thèse ou leur M2 dans l'équipe d'accueil au cours des six dernières années. Pour chaque étudiant indiquez le nom du responsable de l'étudiant, l'année du début de la thèse et de fin de la thèse, l'Ecole Doctorale de rattachement et le devenir de l'étudiant.

Etudiantes en M2 :

- Justine Cailloce, Master 2 BMC Rennes-1 2019-20. Resp stage: J. Merlet.
- Bibi Binali, Master 2 BMC Rennes-1 2020-21. Resp stage: V. Galy
- Valentine Melin, Master 2 BMC Rennes-1 2021-22. Resp stage : V. Galy Aujourd'hui : en thèse dans l'équipe
- Amélie Roudeilla, Master 2 Gene, Cell, Development 2022-23 (Univ. Paris Saclay) Resp : J. Merlet

Thèse soutenue :

- Justine Cailloce, 2020-2023 Bourse de thèse concours ED515. Resp. J. Merlet et V. Galy

Cette proposition de stage s'adresse-t-elle spécifiquement à un étudiant scientifique, médecin ou vétérinaire ou bien est-il ouvert à tous les profils ?

Etudiant Scientifique

Ce sujet peut-il donner lieu à une thèse ?

Oui