Master Biologie Moléculaire et Cellulaire 'BMC',
Université Paris Cité - *UFR Sciences du Vivant*

Parcours : **Biologie et Développement Cellulaires 'BDC'**
http://www.master2bdc.fr/
Fiche de Projet de Stage de M2, 2025-2026

Unité INSERM ou CNRS ou Université : Inserm u1016 – CNRS UMR8104 – Université Paris Cité **Intitulé Equipe :** From Gametes to Birth **ED d'appartenance :** BioSPC **Responsable de l'Equipe :** Daniel VAIMAN	**Responsable du Stage : Julie COCQUET** **Contacts** Adresse : Institut Cochin – 24 rue du Faubourg St Jacques, Paris 14ème Email : **julie.cocquet@inserm.fr** Tel : 01 44 41 23 10 X : @JulieCocquet https://institutcochin.fr/en/research-project/epigenetic-regulation-during-spermatogenesis

Titre du projet : Establishment of male gamete epigenome & its impact on the progeny

Résumé du Projet de Stage (en 300 mots maximum, mots clés en gras)

Approximately one in ten men suffers from **infertility** most often resulting from an abnormal spermatogenesis. The cause, whether genetic or environmental, remains often unknown, with ~50% of male infertility defined as 'idiopathic'. **Spermatogenesis** is a fascinating multi-step cell differentiation process associated with a **highly dynamic genetic program and extensive chromatin change**s. Our group studies spermatogenesis at the **gene and the chromatin levels** to identify and characterize key regulators of male germ cell (epi)genetic program and thus better understand the causes of male fertility.

We are particularly interested in characterizing **male gamete epigenome** in health and disease. Indeed it is now well-known that, upon fertilization, the sperm cell contributes to the embryo with more than its DNA: epigenetic information (chromatin "code", non-coding RNAs, DNA modifications, etc.) is also transmitted to the embryo and **can affect embryo development and offspring health, in case of deregulation of genetic or environmental orig**in. A better characterization of i) the molecular mechanisms controlling the establishment of paternal gamete epigenome and ii) its impact on the progeny is therefore crucial.

To address these questions, we combine in vivo and in vitro models and use molecular and cell biology, biochemistry and reproductive biology techniques. In particular we perform large-scale ('omics) analyses such as transcriptomics, epigenomics and proteomics.

The proposed M2 research project will consist in i) studying **histone modifications** relevant for male germ cell differentiation and retained in sperm epigenome, and ii) investigating **mouse models** with abnormal spermatogenesis, resulting from a genetic defect and/or environmental exposure. Experiments include cell sorting, CUT&Tag, IP/pull down, western blots and immunofluorescence.

The M2 student will be trained in state-of-the-art techniques in molecular and cellular biology, including (epi)genomic analyses by members of the host group. He/she will also benefit from the scientifically dynamic environment of the host team and the Institut Cochin.

Publications de l'équipe relatives au projet de stage (max 5)

-Coulée M et al. (2025) Chromatin environment-dependent effects of DOT1L on gene expression in male germ cells. Commun Biol. doi: 10.1038/s42003-024-07393-x. PMID: 39875559

- Blanco et al. (2023) DOT1L regulates chromatin reorganization and gene expression during sperm differentiation. *EMBO Rep*. 2023 doi: 10.15252/embr.202256316. PMID: 37099396

- Gobé et al. (2023) Generation and Characterization of a Transgenic Mouse That Specifically Expresses the Cre Recombinase in Spermatids. *Genes*. doi: 10.3390/genes14050983. PMID: 37239343

- Blanco M, **Cocquet J*** (2019) Genetic Factors Affecting Sperm Chromatin Structure. *Adv Exp Med Biol*. doi: 10.1007/978-3-030-21664-1_1. PMID: 31301043.

- Champroux A, **Cocquet J***, Henry-Berger J, Drevet JR, Kocer A* (2018) A Decade of Exploring the Mammalian Sperm Epigenome: Paternal Epigenetic and Transgenerational Inheritance. *Front Cell Dev Biol*. doi: 10.3389/fcell.2018.00050. PMID: 29868581