

Master in Molecular and Cellular Biology

Cell Biology, Development and Stem Cells Track

M2 Stem Cell Biology

Introduction

The biology of stem cells and their therapeutic applications is a rapidly expanding field in life sciences. These immature cells have two cardinal properties: self-renewal and differentiation, making them fundamental units for tissue development, homeostasis and repair. What are stem cells, where are they and how are they controlled in time and space are major issues in basic biology, oncology and regenerative medicine. Stem cell biology also raises important questions in ethics, philosophy and humanities.

The aim of this program is to provide students with a high level of theoretical and practical training in the field of stem cell biology. The teaching is based on lectures given by French and international specialists and a unique practical workshop allowing to observe and manipulate different types of stem cells (pluripotent stem cells, blood, neural and muscle progenitors, and intestinal organoids). The objective is to provide students with the fundamental knowledge to understand the logic of stem cells and the clinical, ethical and legal issues involved.

Education

The 'Stem Cell Biology' course is based on a set of specialization courses (30 ECTS), both theoretical and practical, as well as on an internship in a host laboratory in France or abroad (30 ECTS). This program is taught entirely in English. The 30 ECTS of teaching corresponding to the first semester of M2 allow students to master the concepts and methods. This period includes four teaching units:

- **UE Stem Cell Biology** (MU5BM216, 12 ECTS)
Theoretical teaching is provided in the form of scientific seminars. These conferences cover multiple themes in stem cell biology:
 - the biology of embryonic stem cells
 - pluripotency and reprogramming (natural and induced)
 - the biology of adult stem cells (hematopoietic, muscular, neural, mesenchymal, epithelial and intestinal)
 - stem cell niches
 - cancer stem cells
 - origin and evolution of stemness
 - stem cells, cell therapy and biotechnologies,
 - modeling of stem cell biology: mathematical and bioinformatic approaches,
 - regulatory and philosophical issues.This teaching is supported by a practical workshop allowing students to observe and test the potential of different types of stem cells: adult progenitor cells (hematopoietic, neural, intestinal and muscle) and murine embryonic stem cells.
- **UE Scientific analysis** (MU5BM051, 6 ECTS)
Students will defend a recent article in the field of stem cell biology. The objective is to allow students to acquire a critical mind on the scientific literature and to learn how to present a scientific subject (context of the research subject, experimental methodology, analysis and interpretation of the results, ...).
- **UE Scientific project** (MU5BM091, 6 ECTS)
Students will design a scientific research project (about 15 pages) and will defend it in front of the committee. The theme chosen by the student will necessarily be in line with the subject of the internship carried out in the host laboratory. The important points concerning the scientific project are the originality, the scientific relevance and the feasibility of the project.
- **UE Opening** (6 ou 2 x 3 ECTS)
Students will choose one (6 ECTS) or 2 (3 ECTS) units of teaching proposed by the master department 'Molecular and Cellular Biology' (BMC).
- **UE Laboratory internship** (MU5BMSO3, 30 ECTS)
The internship is carried out in a host team under the direction of a supervisor and in consultation with the teaching staff. The lists of host teams and internship proposals for M2 students are posted on the Moodle platform, which is only accessible to students enrolled in the BMC master. If students choose an internship not included in this list, an agreement from the teaching staff is required. The internship lasts six months, outside the periods occupied by the courses described above.

Audience

This course is accessible for students enrolled in science, medicine and pharmacy, as well as for students from the Grandes Ecoles. In-depth knowledge in the fields of cell biology, development and molecular biology is required. For SU students, the validation of the M1 teaching unit 'Introduction to stem cell biology' (MU4BM169) is recommended.

Opportunities

This course is designed to train high-level specialists in the field of stem cell biology and regenerative medicine. It thus offers students the possibility of working in academic or applied/translational research. This training also allows students to move into other professions such as scientific development or consulting.

Scientific committee

Charles Durand (Professor, SU), Thierry Jaffredo (Research director, CNRS), Vincent Mouly (Research director, CNRS), Claire Francastel (Research director, Inserm), Nathalie Spassky (Research director, Inserm), Aline Stedman (Associate professor, SU), Elisa Negroni (Researcher, AFM) and Pierre Joanne (Associate professor, SU).

Application

Applications are processed through the dedicated website of Sorbonne Université:

<https://sciences.sorbonne-universite.fr/formation/candidatures-et-inscriptions/master>

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For more information +

📌 : Molecular and Cellular Biology Web site

<https://sciences.sorbonne-universite.fr/formation/offre-de-formation/masters/master-biologie-moleculaire-et-cellulaire-bmc>

📌 : Cell Biology, Development and Stem Cells Track web site

<https://sciences.sorbonne-universite.fr/formation/offre-de-formation/masters/master-biologie-moleculaire-et-cellulaire-bmc/m2-parcours-1>