



Looking for a master student M1 (4 months, beginning april 2024) Biomimetism and Regenerative Medicine (BRM) team @ INSERM U1292 Biosanté

Biomaterials for the regenerative medicine of stem cells

Context

Our team has developed over the years a layer-by-layer film that can reproduce some aspects of the extracellular matrix (ECM), in particular the stiffness and the ability to present growth factors to cells in a matrix-bound configuration. Moreover, we have developed a process to fabricate these biomimetic films at high content, enabling to conduct high content studies on cell adhesion and differentiation [1]. To date, we have demonstrated that cell adhesion and differentiation are closely related [2], [3] and a study of different growth factors on early cell adhesion and BMP-signaling has been performed [4], as well as a proof-of-concept with drugs [5].

Project description

This internship aims to study the differentiation potential of mesenchymal stem cells as a function of the bioactivity and rigidity of the biomaterials. The objective of the project is to understand how the presentation of the growth factors, combined to the matrix rigidity influences the cell differentiation into bone, cartilage or fat. To this aim and using the biomaterials, you will perform a study of the expressed transcription factors of the stem cells at different time points to understand the differentiation time of the cells.

This project is situated in the field of regenerative medicine, where a proper control of the tissue differentiation could lead to the development of new treatments. These treatments aim to address pathologies related to the regulation of bone tissue, particularly osteoporosis and obesity.

Profile

We are looking for an enthusiastic master student with a formation in biology, biomedical engineering, biotechnology or similar. You will be working in a multidisciplinary working environment (biomaterial scientists, bioengineer) and in a close interaction with a PhD student. You will be part of a dynamic & international research team organizing weekly seminars. Working language is mainly French but the team meeting are in English.

Related Publications

- [1] P. Machillot *et al.*, "Automated Buildup of Biomimetic Films in Cell Culture Microplates for High-Throughput Screening of Cellular Behaviors," *Adv. Mater.*, vol. 30, no. 27, p. 1801097, 2018, doi: 10.1002/adma.201801097.
- [2] L. Fourel *et al.*, " β 3 integrin-mediated spreading induced by matrix-bound BMP-2 controls Smad signaling in a stiffness-independent manner," *J. Cell Biol.*, vol. 212, no. 6, pp. 693–706, Mar. 2016, doi: 10.1083/jcb.201508018.
- [3] A. Valat *et al.*, "Interplay between integrins and cadherins to control bone differentiation upon BMP-2 stimulation," *Front. Cell Dev. Biol.*, vol. 10, p. 1027334, 2022, doi: 10.3389/fcell.2022.1027334.
- [4] A. Sales *et al.*, "Differential bioactivity of four BMP-family members as function of biomaterial stiffness," *Biomaterials*, vol. 281, p. 121363, Feb. 2022, doi: 10.1016/j.biomaterials.2022.121363.
- [5] Valia Khodr, L. Clauzier, P. Machillot, A. Sales, E. Migliorini, and C. Picart, "Development of an automated high-content immunofluorescence assay of pSmads quantification: proof-of-concept with drugs inhibiting the BMP/TGF β pathways," *bioRxiv*, Dec. 2023, doi: <https://doi.org/10.1101/2023.12.14.571626>.

Supervisor(s): BRM (Dr. Catherine Picart and Irene Arnaldos Pérez)

Laboratory: Inserm U1292 Biosanté (INSERM/CEA/UGA), équipe mixte de recherche CNRS EMR 5000 BRM [Laboratoire Biologie et Biotechnologie pour la Santé - Équipe Biomimétisme et Médecine Régénératrice \(BRM\) \(biosante-lab.fr\)](https://www.biosante-lab.fr)

Contact for your application:

Please send to catherine.picart@cea.fr; irene.arnaldosperez@cea.fr :

-your CV

- a motivation letter

- 2 names of referees

-the transcript of your grades for the two last years of studies (2021/2022 and 2022/2023 or different)