MATERIALS AND BIOLOGY TEAM, LCMCP

The Materials & Biology team (chemists, biologists, biophysical chemists, and physicists) focuses on **biomimetic biomaterials**, from their fundamental aspects associated with the physical chemistry of biopolymers up to their **clinical applications**. Association of **nanomaterials and inorganic particles** is used to obtain composites and/or hybrids—for the development of dedicated environments for 2D and 3D cell culture. Both biochemical and physical cues are being developed to modulate the **cell-materials interactions**.

PERMANENT STAFF


Thibaud Coradin


Francisco Fernandez


Bernard Haye


Christophe Hélary


Sylvie Masse


Gervaise Mosser


Léa Trichet

ENGINEER

Kakar, Alshaba
Research engineer

Supervisors: Léa Trichet (LCMCP) and Francisco M. Fernandes (LCMCP)

I am working on the development of tubular material made of collagen type I to respond to the vascular and tracheal clinical challenges. These porous biomaterials are fabricated by ice-templating and topotactic fibrillogenesis and their structure and biological responses are analyzed.

PHD STUDENTS

Villerabel, Léna
PhD student - 1st year

Supervisors: Christophe Hélary (LCMCP) and Carole Aimé (Pasteur, ENS)

Perfusion of 3D-printed, macroporous and cellularized dense collagen hydrogels to model the healthy and fibrotic skeletal muscle

My project aims to develop an in vitro 3D tissue model to study Duchenne muscular dystrophy (DMD). The 3D printing of dense collagen permits to generate an extracellular matrix possessing the properties of the healthy or pathological muscle extracellular matrix (ECM). These ECMs will be cellularized by normal or DMD muscle cells and perfused in a microfluidic chips to reproduce physiological conditions. Once cellularized, this model will allow the study the pathophysiology of DMD.

Bouabdabdallah, Minaine

PhD student - 2nd year

Supervisor: Francisco Fernandes (LCMCP), Léa Trichet (LCMCP) and Makoto Miyara (CIMI)

Development of immunoactive biomimetic collagen constructs for airway transplantation

My project aims at developing a pro-regenerative biomimetic material to replace trachea and accelerate its regeneration.The strategy relies on the encapsulation of cytokines inside biomimetic macroporous and highly concentrated type I collagen constructs. Optimzed cytokine release is expected to favor the stimulation of regulatory T cells involved in tissue repair.

Devernois, Enguerran

PhD student - 2nd year

Supervisors: Thibaud Coradin (LCMCP) and Fatiha Nothias (IBPS)

Mixed hydrogels and particles for nerve regeneration

My project aims at synthesizing and processing chitosan-based biomaterials for application in nerve repair. Their physical and chemical properties will be studied, and the biological responses of different relevant cell types to these materials will be studied. They will ultimately be evaluated in vivo as promotors of axonal growth.

Blaga, Daniel

PhD student - 2nd year

Supervisor: Francisco Fernandes (LCMCP)

Bioprinted dense collagen matrices as structural and functional building blocks for new miniaturized tissue models

My research project aims to develop the first example of a bioprinted dense collagen matrix able to act both as a host material and a microfluidic device, for skin-on-a-chip applications. By using a new collagen formulation compatible with the 3D printing process at high concentrations (coacervates), I focus on designing constructs with optimal properties able to interact with human dermal fibroblasts, to reproduce the architecture and function of the native human skin.

Mbitta Akoa, Daline

PhD student - 3rd year

Supervisor: Thibaud Coradin (LCMCP) and Anne Poliard (Faculté dentaire de Montrouge)

Silicon-delivering cellularized biomaterials for dental repair

My project aims to study the role of silicon on dental tissue formation. As such, I prepare materials combining collagen, the main protein in dentin, and different silicon-releasing phases. These materials are used as hosts for dental stem cells to study the impact of silicon on their behaviour in vitro (differentiation, protein expression) and mineralization.

Martinier, Isabelle

PhD student - 3rd year

Supervisors: Francisco M. Fernandes and Léa Trichet (LCMCP)

Biomimetic collagen tubular constructs for vascular and tracheal grafting

My project is to provide new collagen-based materials for surgical applications in the context of clinical vascular and tracheal replacement, along with fundamental studies of the physico-chemistry of collagen. I use this knowledge to optimize the fabrication of biomimetic materials, based on ice templating and topotactic fibrillogenesis, which ensure structural, compositional and biological properties close to those of native tissues.

Komiyama, Katsuya

PhD student - 3rd year

Supervisors: Francisco M Fernandes (LCMCP) and Clémence Sicard (ILV, UVSQ)

Macroporous hydrogels for phytoremediation-inspired water treatment

My research is to prepare bioinspired macroporous hydrogels, through ice-templating, capable of reproducing a part of the functions of actual living Plants (Phragmites Australis). Biodegradation-capable bacteria are encapsulated in the macroporous hydrogels in order to combine their biodegradation activity and the capillary transport induced by the materials porosity.

POSTDOCTORAL RESEARCHERS

Fuzier, Camille

Postdoc

Supervisors: Gervaise Mosser, Francisco M. Fernandes, Thibaud Coradin and Christophe Hélary (LCMCP)

Biomimetic skin-like materials

I am working on biomimetic skin-like materials for a confidential industrial partner (and that's about all I'm allowed to say...)

Oliveira Formoso, Sergio

Postdoc

Supervisors: Niki Baccile and Christophe Hélary (LCMCP)

Investigating the potential of glycolipids for complex wound healing applications

The project focused on studying the cytotoxicity of these novel compounds as naïve drugs to understand their effects in cell metabolism, proliferation, cytokine secretion and genetic changes for a novel approach for complex wounds; with the aim to incorporate these molecules into novel carriers and materials for regenerative medicine purposes.

https://lcmcp.upmc.fr/site/matbio-en/