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PRESS RELEASE
12 April 2017

Cellical: cellulose microfibrils and bioactive medical devices

The Laboratory of Pulp and Paper Science and Graphic Arts (LGP2) coordinates the Cellical project, which revolves around the use of cellulose microfibrils in the design of bioactive surgical devices for soft tissue repair.

Launched in October 2015, with a planned duration of 42 months, the Cellical ANR project is run by LGP2 and features a number of partners: the Centre de Recherches sur les Macromolécules Végétales (CERMAV), the Centre Technique du Papier (CTP), Sofradim Production (Medtronic Covidien), Tembec Innovation, Joseph Fourier University's Department of Molecular Pharmacochemistry (UJF-DPM) and the University of Lille 2 (UL2-INSERM).

The use of cellulose in the medical field is nothing new. Regenerative medicine already makes use of bacterial cellulose, both in external treatments (wound dressing, particularly for burns) and internal applications (in cartilage tissue, bone marrow transplants, blood vessel replacement, etc.). Plant cellulose, meanwhile, is commonly used as an excipient at a microscopic scale.
The development of nanometric research on cellulose (microfibrils and nanocrystals) opens the door to other applications. In 2012, on the back of a thesis presented by Nathalie Lavoine, LGP2 laid the foundations for the use of cellulose in the extended and controlled release of medication. Another PhD student based at the laboratory, Megan Smyth, is currently working on growing cell tissue using nanocellulose.

Cellulose microfibrils (CMF) are considered to be some of the highest value-added products that can be obtained from biomass. The increasing degree of interest they are now attracting is primarily due to their excellent mechanical and barrier properties. The Cellical project focuses on their use in the development of a new class of biobased and biocompatible substrates that enable the controlled release of active molecules, so as to improve the medical devices employed in the surgical repair of soft tissue.

The Laboratory of Pulp and Paper Science and Graphic Arts (LGP2) is a joint research unit (UMR 5518) run by the CNRS, Grenoble INP and the Agefpi. It is home to three teams: Biorefinery: chemistry and eco-processes – Multiscale biobased materials – Surface functionalization through printing processes. The research conducted by LGP2 strives to meet society's expectations when it comes to sustainable development (green chemistry, clean processes, recycling, biobased materials, renewable energy) and traceability & safety (functional materials, smart paper and packaging). ***http://pagora.grenoble-inp.fr/research/***

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Soft tissue repair devices are among the most commonly used medical devices. Representing an annual market of €3 billion, with annual growth of 8%, they are used primarily in the repair of ventral and inguinal hernias. And yet, infectious complications remain a key problem for surgeons and health authorities: they increase medico-social costs due to the need for additional surgery or other medical treatment, reduce quality of life and, most of all, shorten life expectancy, particularly in the case of oncological surgery. There is therefore clear demand for a solution that makes it possible to locally control the release of antiseptics in order to limit infectious complications, not to mention analgesics to reduce post-operative pain. Various drugs and antiseptics will be selected and affixed (through grafting or absorption) to the CMF that are deposited on medical devices or used alone to repair soft tissue.

Initially, this work will focus on the pre-treatment of biomass, cellulose in particular, so as to obtain high-quality grades of CMF. In parallel, active bioconjugates will be prepared using innovative synthesis processes involving oligosaccharides and the active molecules selected. The new CMF-based medical devices will then be produced in the form of demonstrators to illustrate the release of the molecules studied. The idea behind Cellical is to develop biomass (in conjunction with an industrial partner and a start-up) for the manufacture of soft tissue repair systems (a manufacturer and a university laboratory) using CMF functionalised with new bioactive molecules (a technology centre and three university laboratories). After just over a year, the project is advancing steadily, driven by the unwavering commitment of its partners, with numerous visits taking place to the Sofradim Production, LGP2 and Tembec Tartas sites.

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Photo: P17_cellical-visite-lgp2.jpg

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