Grapheal: Therapeutics and diagnostics of chronic wounds

Grapheal is a spin-off project of the Institut NÉEL. This startup company, currently in the creation phase, aims to develop innovative solutions for treating people with chronic wounds. Typically, chronic wounds are deep skin injuries that do not heal after 4-6 weeks. Large populations are at risk, including diabetics (whose numbers are rapidly rising around the world) as well as the elderly. The recent epidemic of chronic wounds is a major concern, as they are the leading source of necrosis, which can unfortunately lead to amputations. Such wounds are the cause of more than half a million amputations each year worldwide.

The Grapheal company aims at reducing this number by introducing a series of innovative approaches based on the introduction of a novel material. The company’s mission is to put on the market a range of “smart” dressings that will allow patients and health-care providers to better monitor and manage chronic wounds. The envisioned benefits are considerable: gains in wellness, reduced pain, increased efficiency for medical and nursing staff, and lower hospitalization costs.

Our innovation involves a composite system, a “dressing” (also called a “bandage”) incorporating a flexible electronic film of graphene, a novel material that has been developed at the Institut NÉEL over the past ten years. The dressing consists of a homogeneous monolayer of medical-grade graphene that is transferred and stabilized on a biocompatible polymer film. Graphene is a single atomic layer of graphite, pure carbon with the thickness of a single atom, i.e. a fraction of a nanometer. First isolated 15 years ago, graphene has shown significant potential for application in many fields, including nanoelectronics, mechanics, optics and more recently nanomedicine. In our process, graphene is produced by Chemical Vapor Deposition, a technique deriving from growth methods used in nanoelectronics technologies, involving natural gas (methane) as the source of carbon.

The originality of the technology to be developed by the startup lies in the integration of minute amounts of graphitic (i.e. sp²-hybridized) carbon in the form of a continuous single-atom-thick layer directly integrated on the surface of a plastic film, which in turn is integrated directly on the surface of the dressing. Thus, the graphene layer is applied directly to the open wound. Diagnostic action: The ultimate single-atom thickness makes the electrical resistivity of graphene highly sensitive to the physicochemical environment. As a result, the graphene film plays the role of an “on-board” detector platform via a transistor-like electric field effect. This makes it possible to measure parameters specific to the wound, allowing remote monitoring of important physiological parameters.

Our products are intended for hospital use in the first instance, but later will concern home-hospitalization and may ultimately be sold in pharmacies. This Startup project benefits from transfer of technology from the Institut NÉEL’s academic research. The project was supported by a three-year maturation program of LINKSIUM, the Grenoble-Alpes SATT (Société d’Accélération du Transfert de Technologies). This support has allowed us to protect our Intellectual Property and to validate the technology, to develop prototypes, to carry out first in-vitro tests and animal in-vivo trials, and to create a proof of concept product. The project is backed by three patents which protect specifically the concept and the technology of graphene dressings.

Grapheal has been nominated for the I-Lab 2018 Innovative Technology Companies Competition and it won the Audience Award for the Most Innovative Startup at the 2017 MEDFIT Congress for medical technologies.

CONTACT
Vincent Bouchiat
vincent.bouchiat@neel.cnrs.fr
PhD student: Antoine Bourier

FURTHER READING...
Patent applications WO2016142400 and WO2016142401

www.grapheal.fr