

Title of the thesis	Development and improvement of a PER ifusion chamber for the analysis of hormonal secretions of Islets Langerhans and evaluation of the metabolism of the cell
Acronym	PERIL
Reference number	019

Hosting institution	Employer
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Thesis information	
Keywords	engineering, instrumental innovation, biomedical, metabolism, diabetes
Abstract	Type 1 diabetes is an autoimmune disorder that causes destruction of insulin-producing α -cells, which are specific human pancreas endocrine glands. Exogenous insulin is often required to treat the disease. The study of pancreatic hormonal secretions (insulin, glucagon, somatostatin) is a necessary prerequisite for the development of new cellular therapies. The laboratory for translational research on diabetes (INSERM U1190) in collaboration with the Energy Environment Research Centre and FabLab of IMT Lille Douai have developed a perfusion chamber that allows in vitro measurement of the hormonal secretion of islets of Langerhans (IL) subjected to secretagogues. Perifusion systems has been transposed and can therefore be used as an excellent test for quality control of an IL preparation. This technique is operational but still very manual so it's necessary to make changes in the perfusion system in order to obtain numerous parameters such as oxygen consumption for example. In a context where this therapy is likely to expand (clinical treatment of type 1 diabetes by allograft recognized by the French health insurance in 2021), it appears imperative to perfect a dynamic evaluation test of IL that can meet scientific and clinical expectations. The aim of this project is to develop a perfusion chamber that combines the fineness of analysis of hormonal secretions with the, integration of physiological measurements during a cellular stimulation experiment. In order to carry out this project, it is necessary to bring together several skills, such as engineering, metrology, biological knowledge of the islets of Langerhans and clinical expertise. The use of digital tools and equipment to optimize the design and

	<p>manufacture of a new perfusion chamber that is more functional and scalable with the addition of parameters is essential. The FabLab of IMT Lille Douai will support the design of new perfusion chamber prototypes and the flow and pressure calculations applied within the reaction chambers. These chambers will be made using the complete chain of design, from 3D drawing (SOLIDWORKS of Dassault System) to laser cutting and 3D printing. Laboratory U1190 will contribute its expertise by isolating IL from human and murine pancreas and performing physiological stimulation tests. The PhD student will be jointly supervised by a tutor from each laboratory and will carry out this work at the IMT Lille Douai and at the Faculty of Medicine in Lille.</p> <p>The doctoral student will be able to benefit from the help of the engineering students of the IMT Lille Douai through student projects. The aim of this work will be to provide medical teams and research laboratories with a tool to measure, in a known environment, the hormonal secretions of a pancreatic cell preparation and to determine the factors that can influence their physiological regulation. This work may lead to the submission of a patent. This strong collaboration between clinical research and engineering will allow the development of new ways for exploration in the therapeutic treatment of diabetes.</p>
<p>Expected profile of the candidate</p>	<p>Master's or engineer training in biotechnology, chemistry, biology, pharmacy and process engineering with a highly recommended research component, the candidate must have skills in at least two of the following fields: biotechnology engineering, 3D modelling, modelling of parts and assembly by specialized software (SOLIDWORKS, ...), 3D printing design and manufacturing, microsensor ,...</p> <p>The candidate will have to demonstrate curiosity and sense of observation, versatility, rigour and organization, He/she will also need to be motivated to participate in the school's or external engineering training courses and to invest in pedagogical coaching activities.</p>
<p>Application procedure & Eligibility criteria</p>	<p>The application procedure and eligibility criteria are detailed on the European doctoral programme PEARL website www.pearl-phd-lille.eu. The funding is managed by the I-SITE ULNE foundation which is a partnership foundation between the University of Lille, Engineering schools, research organisms, the Institut Pasteur de Lille and the University hospital.</p> <p>The application file will have to be submitted before March 31, 2021 (10:00 AM - Paris Time) and emailed to the following address : international@isite-ulne.fr.</p>
<p>Net salary and Lump Sum</p>	<p>A net salary of about €1,600 + €530 per month to cover mobility, travel and family costs.</p>