INPhINIT
"la Caixa" Fellowship Programme

IBEC
Institute for Bioengineering of Catalonia

EXCELENCIA SEVERO OCHOA

IBEC participates in INPhINIT, "la Caixa" Doctoral Fellowship Programme with a set of stimulating PhD projects and excellent research groups to host the fellows

Biosensors for bioengineering

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Development of an integrated LSPR platform for in situ detection of cytokines associated with insulin resistance in T2D (Type 2 diabetes mellitus)

The Biosensors for Bioengineering group is focused in a new line of research that has become of extreme importance in the last years. The idea is to integrate biosensor technology and nanotechnology with stem cell research and with tissue engineering. Engineered tissues are integrated with biosensing technology to obtain microdevices for detecting cellular responses to external stimuli, monitoring the quality of the microenvironment (e.g., metabolites, nutrients), and supporting diverse cellular requirements.

This research on 3D-functional engineered tissues is expected to develop knowledge of tissue construction and their functions and relation with some human diseases. Integration of fully functional tissues with microscale biosensor technology allowed us to obtain "organs-on-a-chip". These chips could be used in pharmaceutical assays and could be a step toward the ultimate goal of producing in vitro drug testing systems crucial to the medicine and pharmaceutical industry.

Job position description

The aim of this PhD project is to design and fabricate a high sensitive multiarray of LSPR sensors to be integrated with a practical microfluidics platform. This system will be applied in the ultrasensitive detection and real-time monitoring of some cytokines; TNF-a, IL6, IL8; product of the cellular responses to external stimuli. The monitoring of this biomarkers, play an important role in the insulin resistance and related metabolism associated with T2D disease.

The plasmonics nanostructure fabrication's study, will involve the implementation of different techniques such a Hole colloidal lithography (HCL) and E-Beam lithography to find the best scenario to develop a friendly procedure, with the highest sensitive and cost-effective sensing platform. As well, the PhD student will develop and design a microfluidics platform that can be able to perform high-throughput analysis in flow, quantifying simultaneously the biomarkers previously cited on medium, adding calibration and control points

This research opens new avenues in the on-line monitorization of biomarkers helping to understand biological phenomena related to the diabetes and could open the doors into the screening of a variety drugs and treatments that could highly reduce cost and time compared to corresponding animal experiments.