3D microfluidic and biosensing models to study prostate cancer metastasis

Proposers

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Introduction

Prostate cancer (CaP) is the most common cancer in Europe, with up-to 20% of men developing metastatic disease and ultimately dying. Besides the social impact and patients' quality of life decay, the large number of affected subjects and the long and costly treatment are a major economic burden. This proposal aims at developing innovative nanotechnology-based tools for a better characterization of the disease and its progression using rare cells from blood (i.e. CTCs-circulating tumor cells and CAMLs-cancer-associated macrophage-like cells) as biomarkers.

Partner 1

INL is devoted to the development of nanotechnologies in the medical area, among others. The nanomedicine group has been developing biomimetic systems and has extensive experience in analyzing cellular crosstalk. Moreover, the extensive research in magnetoresistive biosensing of INL's nanodevices group has been successfully optimized and tested for distinct biomedical applications.

Partner 2

The group at INESC-MN has expertise in micro and nanofabrication and the application of these technologies to electronic, biological and biomedical devices. This partner has a wide experience and knowledge (over 10 years) on the development of platforms based on sensors including chips microfabrication and electronic systems.

Project outline/goal

Cancer-associated macrophage-like cells (CAMLs) and circulating tumor cells (CTCs) have recently been reported to circulate in the blood of CaP patients, and to interact with each other, hinting a role for CAMLs in cancer cell dissemination. To study this interaction, 3D microfluidic devices containing two interconnected chambers with integrated biosensors and a microchannel mimicking a vascular interface will be developed by microfabrication. CTCs will be cultured with or without CAMLs and/or chemical stimuli and cell viability, proliferation and migration monitored along time. The resulting findings will ultimately open new avenues for personalized disease characterization and therapy.

Student profile

Profile sought: preference, but not limited, to students with a background in Biomedical/Biological Engineering, Engineering or Physics, with an interest in exploring complex advanced microsystems for practical applications.