Early diagnosis/monitoring of bladder cancer at the point of care: exploring the liquid biopsy

Proposers

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Introduction

Bladder cancer is one of the most common cancers worldwide, has a high recurrence rate and requires lifelong surveillance, making it one of the most expensive malignancies. The current gold standard methods for its detection and monitoring have well-known limitations. Thus, novel methodologies to early identify and characterize various bladder cancers and their true biological potential are urgently needed. Liquid biopsy holds great potential in transforming cancer management while biosensor platforms are emerging as extremely sensitive tools for the detection and monitoring of clinical relevant molecules and disease markers.

Partner 1 Speciality

INL is devoted to the development of nanotechnologies in the medical area, among others. The diagnostic tools and methods group has experience with microfluidic isolation of rare cancer cells from different cancer patient body fluids and well as phenotypic characterization of the isolated cells. Moreover, the extensive research in magnetoresistive biosensing of INL's nanodevices group has been successfully optimized and tested for distinct biomedical applications.

Partner 2 Specialty/Suitability

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 magnetoresistive sensors including chips microfabrication and electronic systems.

Project outline/goal

Analysis and characterization of material shed from tumors into body fluids, the so-called liquid biopsies, allow early diagnosis, evaluation of disease progression and treatment response in real-time. Urine-based liquid biopsies are expected to represent a major breakthrough for bladder cancer patient monitoring, overcoming high morbidity and costs associated to multiple tumor resections. However, highly sensitive technologies are necessary to isolate and detect tumor-associated material due to its scarcity. This project's goal is to develop nanotechnology-based tools for selective single cancer cell and/or tumor marker detection, quantification and characterization in urine, combining the great potential of microfluidics with integrated magnetoresistive sensors to produce a point-of-care, portable and fast diagnostic tool that could be used to assess bladder cancer patients at the primary care level.

Student profile: *Profile sought: preference, but not limited, to students with a background in Biomedical engineering, biology or medicine with an interest in Physics, Devices, and Micro and Nanofabrication.*