Sample Processing device to integrate a Magnetoresistive Platform for the Stroke Patients stratification

Proposers

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Introduction

Ischemic stroke is a leading cause of death and disability in developed countries. Thrombolytic therapy with recombinant tissue plasminogen activator (rtPA) remains the only pharmacological treatment effective in acute ischemic stroke. However, rtPA is tightly restricted in its therapeutic window (< 4.5 hours from stroke onset) and is linked to severe side effects – a severe hemorrhagic transformation (HT). Around a quarter of patients with ischemic stroke arrive at the hospital within the first three hours, but only 25% of these patients finally receive thrombolytic therapy. Researchers have found some biomarkers related to severe HT with high relevance for stroke patient's stratification. Adding this information to a point-of-care (POC) diagnostic/prognostic tool will facilitate patient classification enabling a more efficient therapy. As we are dealing with a medical emergency, time is a critical point for stroke diagnosis. Therefore, an accurate and fast device is vital to define the most appropriate treatment. A sample preparation device will benefit the detection system to decrease the time of the measurement. In this case, the blood sample will be processed from the beginning on-chip, avoiding the variability caused by the operator, and the time-consuming steps related to the sample pre-treatment (e.g. centrifugation steps).

Partner 1

INESC Microsistemas e Nanotecnologias (INESC-MN) is a private, non-profit R&D Institute belonging to the INESC group of Research Centers. INESC-MN has 4 principal missions, centered on the cleanroom infrastructure: world-class research and development, advanced formation, micro and nanofabrication service and intellectual property, technology transfer and start-up formation. The MR biochip platform used in this project has been developed at INESC MN and INESC ID (Lisbon) over the past 10 years.

Partner 2

The International Iberian Nanotechnology Laboratory (INL) is the first International Intergovernmental Organisation (IGO) in Europe focused on Nanosciences and Nanotechnology and it counts on Spain and Portugal as a member. INL is focused in four main areas: health, safety in environmental and food control, energy and nanoelectronics. The Nanodevices group involved in this project has the biosensor-core know-how, and have been exploring the potential of a Magnetoresistive Platform on the detection of relevant clinical biomarkers.

Project outline/goal

The main motivation of this project is not merely restricted to the detection of all panel of biomarkers by using a magnetoresistive (MR) biochip platform but also related to the sample processing. The present project proposes to develop a simple and autonomous microfluidic

device capable to process a patient sample without requiring any pre-treatment (e.g. Plasma separation by using centrifugation or other standard techniques) together with the components necessary for the measurement (e.g. Magnetic Nanoparticles). The validation of the device will be validated by using patient samples related to different disease states and cross-validated with a standard technique.

Student profile

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