Title: Immature cancer cell discrimination using combined high frequency Electromagnetic Fields and dielectrophoresis forces.

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Summary

The SUMCASTEC project aims to isolate and neutralize brain cancer stem-like cells (CSC) using electromagnetic stimulation[1]. We present the main results on identifying and isolating CSCs from others differentiated cells using a combined dielectrophoresis approaches with high frequency (MHz range) cell sensing thanks especially developed lab-on-chip (LOC) cell sensors.

Abstract

Glioblastoma (GBM) is one of the most frequent and the most aggressive tumor of the central nervous system. About 240,000 brain tumor new cases were diagnosed over the worldwide; the majority are GBMs with an incidence of 3–4 per 100 000 persons per year [2]. Medulloblastoma (MB) is the most common malignant pediatric brain tumor [3]. Despite the progress of new treatments, the risk of recurrence, morbidity, and death remains significant. Hence, the dark prognosis of these diseases, especially for GBM, is primarily due to the recurrence of tumor, which can be resistant to conventional treatments closely linked to the existence of very immature and undifferentiated cells, as cancer stem-like cells (CSC) [3].

Conventional markers for normal stem cells as CD133, CD44, OCT-4, SOX2, pSTAT3 and NANOG are currently used and combined to have clues of CSC occurrence. However, CSCs subpopulation are very rare in tumors and their isolation often requires enriching them in specific culture medium followed with functional test to established with certainty the diagnosis. Such strategy is really time consuming and makes the results longer. Consequently, alternatives cell analysis methods are required to get around this issue in order to efficiently discriminate and identify undifferentiated cancer cell populations from the whole heterogeneity that occurs in the tumor biopsies.

High frequency dielectrophoresis might be one of them. Hence, this study discusses about the significant correlation between dielectrophoresis signatures in the UHF frequency domain we have established related to own CSC biological specificities [4-5]. Especially, we will discuss about how relevant the UHF signatures vs the conventionally measured ones in the kHz range are. Such new physical marker can be used to isolate CSC from others cells and applied to characterize various patient tumors. Original lab on chip concepts to exploit such physical properties will be also introduced.

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