IMPEDANCE-BASED SENSORS FOR CELL CULTURES MONITORING

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Background

Nowadays, techniques for cell culture monitoring are represented by different types of assays but unfortunately, in general time- and cost-expensive and destructive for the sample. So, an increasing attention has addressed the development of techniques able to quantitatively monitor processes related to cell cultures possibly including real-time features and high specific sensitivity. In this regard, impedance-based monitoring represents a valid technique, in which electrochemical sensors are capable of providing real-time quantitative feedback on physiological processes.

Objectives

In the first part the goal is to realize a complete system able to measure impedance while performing mechanical conditioning on myoblasts, thus to realize a platform able to dynamic cell monitoring. In the second part the aim is to realize a sensor able to perform impedance measurements to monitor growth and differentiation of Caco-2 cells.

Methodologies

For the first part, ink-jet printed interdigitated sensors are realized using carbon ink and crosslinked poly ε-caprolactone (PCL) (**Fig. 1A**).

In the second part, interdigitated sensors are realized with an aerosol 3D printer using carbon ink on Kapton® MT substrate (**Fig.1B**).

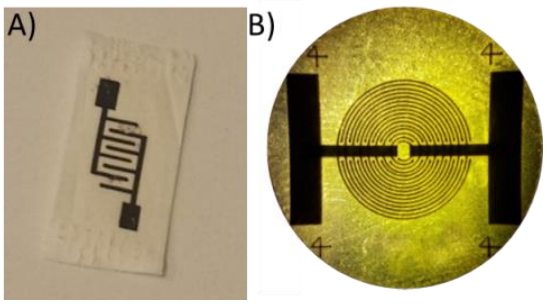

Fig.1: Impedance-base sensors. A) Sensor for myoblast monitoring. **B)** Sensor for Caco-2 monitoring

Expected Results and Impact

Concerning myoblasts, the results validated the overall methodology by using myoblasts as testing cell lines. Successfully performed experiments confirmed the possibility to use the provided solution for cell adhesion (differences in impedance magnitude between pre- and post-seeding) and cell concentrations evaluation. Moreover, the results allowed us to detect specific frequency ranges that in future works could be used to develop a dedicated wireless portable electronic device for continuous monitoring of cell impedance for specific cell cultures.

Concerning Caco-2 cells, the results validated the overall methodology and successfully performed experiments confirmed the possibility to use the provided solution for cell differentiation evaluation by recording an increase of impedance magnitude.

This two projects represented a good alternative to measure adhesion, growth and differentiation of cells.