Sensor Array for Physiological Characterization of Cells (#6890)

Multi-modality sensor for physiological characterization of living tissues and cells

Georgia Tech inventors have developed a multi-modality sensor for physiological characterization of living tissues and cells. In this invention, a single sensing pixel as part of a sensor array can be used to sense in a variety of modes. Cells can be characterized in multiple ways at the same time and in real-time to achieve a comprehensive overall characterization of cellular physiological behavior changes in response to stimuli. The multi-modality sensor array can be implemented with standard, low-cost complementary metal oxide semiconductor (CMOS) technology, which provides ease of fabrication, low power consumption, and ubiquitous utility. The sensing modalities available for the multi-modality sensor array chip include voltage recording, electrical impedance mapping, optical detection with shadow/opacity imaging or bioluminescence sensing, pH/acidity sensing, and thermal/temperature monitoring. The chip provides multi-modality sensing since at least two modalities can be performed at the same time and can be used to measure multiple physiological signals from a single cellular sample.

Benefits/Advantages

- Provides multiple ways to analyze cell cultures in real time simultaneously
- Utilizes standard, low-cost CMOS technology, which provides ease of fabrication and low power consumption
- Enables several sensing modes for a same sample at the same time and in real-time

Potential Commercial Applications

- Analysis of cell cultures
- Large-scale drug screening
    - Characterization of potency and toxicity
- Pharmaceutical industry
- Personalized medicine
    - Determination of patient-specific treatments
    - Pathogen screening for epidemic disease detection

Background/Context for This Invention

Researchers continuously pursue a better understanding of the physiological behaviors of living cells and tissues in order to further advance the frontiers of bioscience and biotechnology. The physiological

behaviors and responses of wide-type and genetically modified cells and tissues are currently tested using cell-based assays. However, cells are highly complex systems with numerous molecules operating in hundreds of pathways to maintain their proper functions, phenotypes, and physiological behaviors. With such a high level of complexity, the cells often undergo concurrent multiple physical responses when subjected to external biochemical stimuli or physiological condition shifts. Accurate characterization of these changes is difficult using conventional sensing technology. Consequently, there is a need for new technologies that enable multiple physiological cellular characteristics to be measured

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More Information

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Publications

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/sensor-array-physiological-characterization-cells

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot