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Intracellular glucose sensing

To study energy production in individual cancer cells, nanopipettes were developed to measure glucose levels in single cells with temporal and spatial resolution. The nanopipettes were functionalized as glucose nanosensors by adhering Glucose Oxidase (GOx) covalently to the tip so that the interaction of glucose with GOx resulted in a catalytic oxidation of **β**-D-glucose to D-gluconic acid, which could be measured as a change in impedance due to drop in pH of the medium at the nanopipette tip. Calibration studies showed a direct relationship between impedance changes at the tip and glucose concentration in solution. The glucose nanosensor quantified single cell intracellular glucose levels in human fibroblasts and the metastatic breast cancer lines MDA-MB-231 and MCF7 and revealed that the cancer cells expressed reproducible and reliable increases in glucose levels compared to the non-malignant cells. Because the tip diameter is so small (100 nm), the nanopipette make a really small incision on cell membrane keeping its viability during and after measurements have being taken. Then, if necessary, nanopipettes can be used to repetitively measure glucose levels in the same cells with minimal effects on cell function, providing an approach to compare changes in glucose transport to match the changes in energetics of cancer cells with changes in proliferative or metastatic state. It is possible to employ the platform as a diagnostic tool to distinguish cancer cells from non-malignant cells in heterogeneous tissue biopsies.

Biography

Raphael Ap Sanches Nascimento has completed his PhD. He is an Adjunct Professor and also faculty in Department of Physics- Federal University of Lavras (UFLA). He has published more than 10 papers in various journals and serving as Reviewer of International *Journal of Medical Imaging*.

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