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Impedimetric detection of telomerase activity in cancer cells

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Over the last decade, an increasing number of researchers have focused on developing rapid techniques based on biosensor technology for the detection of various human health related conditions. The use of this technology helps to detect early signs of the disease, such as cancer, in a short period of time with high efficiency. The number of cases diagnosed with this condition is increasing throughout the years due to the unhindered growth of abnormal cells partially caused by an enzyme called telomerase. This enzyme activates and elongates telomeres at the end of the chromosomal DNA, which causes cancer cells to become immortal. Telomerase is present in the vast majority of cancer types, therefore, serves as a biomarker. In this work, we developed a DNA biosensor using self-assembled monolayer technique for detection of telomerase activity in cancer cells. Specifically, we used a robust miniature DNA gold electrode as the sensing platform for the capacitive detection of enzyme binding and DNA elongation processes by telomerase utilizing electrochemical impedance spectroscopy. We measured changes in the capacitance when the surface was exposed to telomerase and to a DNA elongation inhibitor. Also, we studied how heat-shock affects the enzyme activity using charge transfer resistance as the sensing parameter. This system provides advantages in terms of simplicity, efficiency and cost of electrode design and will have a tremendous impact on the biomedical science, filling the absence of methods that can detect telomerase in a direct readout at the point-of-care location using lab-on-a-chip technology.

Biography

Diana C Diaz Cartagena is pursuing her PhD at University of Puerto Rico, Rio Piedras Campus. She works at Dr. Cabrera's laboratory, a laboratory with interest in "Electrochemistry, interfaces and nanotechnology". Her research project is focused on "developing a biosensor".

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