Evaluation of p53 biosensor for use in early non-invasive detection of cancer

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Abstract

Delayed detection is a primary reason for the high mortality rate of cancer patients, and this supports the imperative need for an easy, fast and innovative way to detect biomarkers to improve early disease detection. In this study, biosensors for the p53 biomarker, present in different types of cancer and in the saliva of head and neck cancer patients, were constructed and analyzed in vitro. Biosensors were fabricated using gold interdigitated microelectrodes functionalized with biofilms containing the antibody p53 and applied for antigen detection. The antibody was functionalized on the gold surface previously modified with 11 mercaptoundecanoic acid/n-hydroxysuccinimide/n-(3-dimethylaminopropy)-n'-ethylcarbodiimide using the SAM's method [1]. The films fabrication was monitored by optical microscopy and contact angle. The detection method involved electrical impedance spectroscopy. Samples were prepared with cells expressing the p53 protein (p53+), MCF-7, to be compared against control cells (p53-), Saos-2. Capacitance measurements were performed with several sensing units, some of which were immersed in p53+ while others were immersed in p53. The measurements were performed in the exact same conditions for all the samples using an electronic tongue [2]. The temperature was controlled with a dry bath. A change in the electrical response was observed for sensors containing the antibody p53 in the presence of the antigens and the control cells solution. The main results demonstrate the good discrimination among samples with different concentrations and controls. This suggests the use of biosensors as a promising tool for early detection of cancer in a non-invasive, fast and portable way.

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References

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