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PII: S0956-5663(18)30069-1
DOI: <https://doi.org/10.1016/j.bios.2018.01.056>
Reference: BIOS10249

To appear in: *Biosensors and Bioelectronics*

Received date: 31 October 2017
Revised date: 23 January 2018
Accepted date: 25 January 2018

Cite this article as: Shikha Sharma, Julia Zapatero-Rodríguez, Rahul Saxena, Richard O'Kennedy and Sudha Srivastava, Ultrasensitive Direct Impedimetric Immunosensor for Detection of Serum HER2, *Biosensors and Bioelectronics*, <https://doi.org/10.1016/j.bios.2018.01.056>

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Ultrasensitive Direct Impedimetric Immunosensor for Detection of Serum HER2

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Abstract

Assesment of human epidermal growth factor receptor 2 status is a key factor prompting definitive treatment decisions that help in reducing mortality rates associated with breast cancer. In this article, highly sensitive and low-cost impedimetric immunosensor using single-chain fragment variable antibody fragments was developed for quantitative detection of human epidermal growth factor receptor 2 from serum employing gold nanoparticle-modified disposable screen-printed carbon electrodes. The gold nanoparticles facilitate fast electron transfer and offer a biocompatible surface for immobilization of small antibody fragments in an oriented manner, resulting in improved antigen binding efficiency. The single-chain fragment variable antibody fragment-modified screen printed immunosensor exhibits wide dynamic range of 0.01–100 ng mL⁻¹ and detection limit of 0.01 ng mL⁻¹. The advantages offered by this platform in terms of high sensitivity, broad dynamic range and low-cost demonstrates great potential for improved monitoring of human epidermal growth factor receptor 2 levels for the management of breast and other cancers.

Keywords: Breast cancer; Epidermal growth factor receptor 2 (HER2); Electrochemical; Immunosensor; Recombinant scFv antibodies.

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