

Abstract

# Impedimetric Lectin-Based Biosensors for Cancer O-glycobiomarkers <sup>†</sup>

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**Abstract:** This work gathers and presents three lectin-based impedimetric biosensors for the selective detection of specific aberrant cancer-associated O-glycans, namely STn, Tn and T antigens. These truncated glycans are well-established pan-carcinoma biomarkers that are synthesized by tumour cells during protein glycosylation. Glycoproteins carrying these aberrant glycans are then secreted into the blood stream, where they can be detected as cancer biomarkers. Detection of aberrant O-glycoproteins in serum can be successfully performed by using lectin biosensors, as lectins show high selectivity towards particular glycan structures. Lectins are immobilized on the sensor surface, maintaining intact their binding ability towards the glycans present in the sample. For these three biosensors, *Sambucus nigra* agglutinin, *Vicia villosa* agglutinin and *Arachis hypogaeae* agglutinin were used as biorecognition elements, with specificity for STn, Tn and T antigens, respectively. The binding event between each lectin and the corresponding aberrant O-glycan was monitored by electrochemical impedance spectroscopy, measuring the increase in the biosensor's impedance after incubating the samples. The increase in impedance was related to the lectin-glycan complex formation. The performance of the developed biosensors, prepared on screen printed gold electrodes, was evaluated, namely in what concerns selectivity, sensitivity, limit of detection, reproducibility and robustness. Furthermore, a thorough validation was carried out by analyzing serum samples from cancer patients and from healthy donors. Results showed that the three biosensors could efficiently discriminate between controls and patients. Moreover, by analyzing the same samples with the different biosensors, distinct glycosylation profiles could be observed.

**Keywords:** cancer; biomarkers; aberrant O-glycans; lectins; biosensors



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