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Abstract

Improving Cancer Outcomes through Electrochemical Biosensing of Early Diagnosis/Prognosis Biomarkers in Human Biopsies †

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† Presented at the 5th International Symposium on Sensor Science (I3S 2017), Barcelona, Spain, 27–29 September 2017.

Published: 29 November 2017

Cancer is the second leading cause of death after cardiovascular diseases and responsible for over 8 million deaths worldwide. Although substantial progress has been made in the prevention and treatment of different cancer types, its incidence and prevalence is increasing in recent years. Therefore, the development of efficient, simple, quantitative and disposable devices with short response times, low cost, and that are suitable to perform decentralized and reliable determination of early diagnosis cancer biomarkers could help to reduce cancer mortality due to its detection at early stages, when the disease can be efficiently treated and cured in more than 90% of cancer patients.

Within this context, the main characteristics of novel biosensing scaffolds for the determination of cancer related-miRNAs [1–3] and autoantibodies [4] against tumor associated antigens (TAAs), relevant biomarkers considered for both early diagnosis and prognosis, will be presented. The developed methodologies, based on the coupling of attractive bioreceptors and bioassay formats, functionalized magnetic microcarriers, and electrochemical detection at disposable transducers, have demonstrated practical applicability for the accurate determination of the endogenous concentration of the target analytes in solid (fresh and FFPE breast human tissues) and liquid (human serum from colorectal and ovarian cancer patients) biopsies.

The developed easy handling single- or multiplexed platforms, readily applied to the determination of other biomarkers, provided results in agreement with conventional methodologies but with lower cost and in remarkably shorter times. These interesting features make them suitable alternatives in the implementation of user-friendly and affordable devices, particularly attractive to perform routine determinations in both clinical and basic research settings to improve cancer diagnosis and prognosis.

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