Development of a DNA-based Electrochemical Biosensor for monitoring immunotherapy Responses

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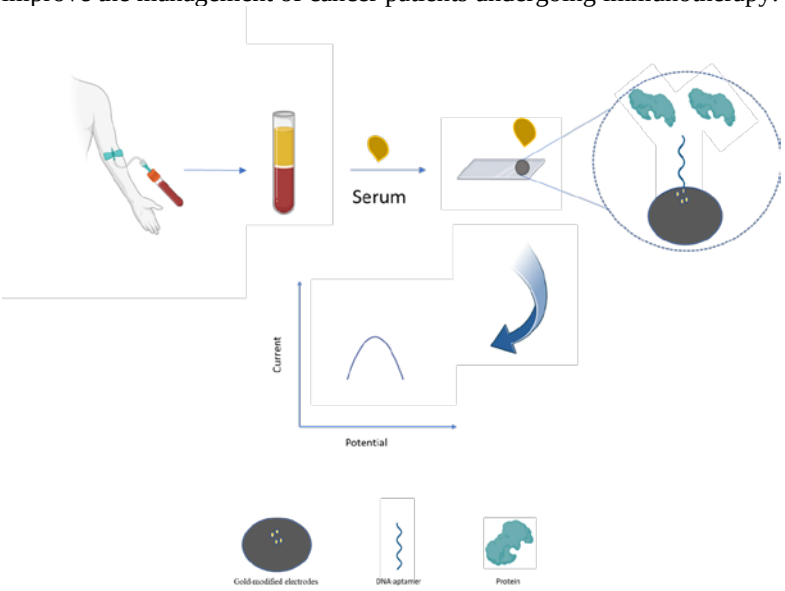
The use of immunotherapy has revolutionized cancer treatment, but response rates vary widely among patients. The Programmed Death-Ligand 1 (PD-L1) protein, belonging to the B7 family, plays a crucial role in suppressing the immune system by interacting with the programmed cell death protein 1 (PD-1) receptor on immune cells. This interaction prevents the activation of T cells and other immune cells, allowing cancer cells and other pathogens to evade immune surveillance and proliferation. Therefore, quantifying its level of expression is fundamental in cancer diagnostics as well as immunotherapy response assessment [1]. Several methods have been developed, among which ELISA is the most common approach. However, it's cumbersome, and it requires a relatively long assay time. In this context, we developed an electrochemical biosensor based on the DNA aptamer and nanomodified screen-printed carbon electrodes[2]. The electrochemical responses of the proposed biosensors were investigated via cyclic voltammetry and differential pulse voltammetry. The proposed platform demonstrated an excellent linear response towards PDL-1 in the range of concentrations from sub-micromolar to attomolar. Moreover, the biosensor was found to manifest desirable selectivity towards the target analyte in the presence of other proteins and biomolecules in blood serum. Overall, our study demonstrated the potential of electrochemical biosensors as a valuable tool for monitoring and evaluating the response to immunotherapy. This biosensor could be further developed and integrated into clinical practice to improve the management of cancer patients undergoing immunotherapy.



References

1. Wei, Wei, et al. "Prognostic significance of circulating soluble programmed death ligand-1 in patients with solid tumors: a meta-analysis." Medicine 97.3 (2018).
2. M. Ghosh Dastidar, K. Murugappan, A. Damry, D. Nisbet, C. J. Nolan and A. Tricoli, "When Less Gold is More: Selective Attomolar Biosensing at the Nanoscale", Adv. Funct. Mater., 32, 2105433 (2021).