PÔSTER - RESUMO - SENSORES E BIOSSENSORES

NANOCOMPOSITE-BASED ELECTROCHEMICAL IMMUNOSENSOR FOR DENGUE ANTIBODIES

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Dengue remains a major public health concern in tropical and subtropical regions due to its potential to cause severe disease and large-scale outbreaks. Conventional diagnostic techniques, such as RT-PCR and ELISA, although reliable, are often expensive, time-consuming, and require specialized infrastructure and trained personnel. In this context, electrochemical biosensors have emerged as attractive alternatives, offering rapid response, high sensitivity, and low operational cost [1]. The objective of this study was to develop an electrochemical immunosensor based on a glassy carbon electrode (GCE) modified with a gold nanoparticle (AuNP) and graphene quantum dot (GQD) nanocomposite to enhance electrical signal transduction. The GQD/AuNP nanocomposite was synthesized by mixing 10 mL of 2.5 × 10?³ mol L?¹ HAuCl4 solution with 5 mL of graphene quantum dots, followed by heating at 40 °C under stirring for 2 h. The resulting material was characterized by UV–

Vis spectroscopy and subsequently employed to modify the GCE surface. Prior to modification, the electrode was electrochemically oxidized to promote effective anchoring of the nanocomposite. Electrochemical characterization was performed using cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) before and after surface modification. The modified electrode exhibited a significant increase in anodic and cathodic peak currents, along with a marked decrease in charge transfer resistance, indicating enhanced electron transfer kinetics and an enlarged electroactive surface area. Following antigen incubation on the immunosensor surface, pronounced changes in the electrochemical response were observed, including a substantial decrease in peak currents and an increase in charge transfer resistance. These results confirm the effective recognition process and demonstrate the sensor's stability and sensitivity for dengue detection. Overall, the proposed platform shows strong potential for integration into portable rapid diagnostic devices, contributing to large-scale screening and epidemiological surveillance, particularly in high-incidence regions with limited laboratory infrastructure. The authors acknowledge GDEM–UEPG and INEO for financial support (FAPESP 2025/27044-5; CNPq 408449/2024-1).

REFERENCES

[1] SIRIVIBULKOVIT, K. et al. Electrochemical dengue sensor based on NS1 epitope-imprinted polymers. Biosensors and Bioelectronics, v. 117915, n. 1, p. 117915, 2025.

Palavras-chave: electrochemical immunosensor; dengue; gold nanoparticles; graphene quantum dots.