Biosensor based in reduced graphene oxide electrodes for Naxitamab Monitoring in High-Risk Neuroblastoma Treatment

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Neuroblastoma is one of the most prevalent and aggressive pediatric cancers, with an incidence of 8–10 cases per million children annually. To reduce the toxicity of conventional treatments, immunotherapeutic alternatives such as naxitamab, a humanized antibody with targeted activity, have emerged as promising options. However, patient responses are highly variable, and some may develop anti-naxitamab antibodies that compromise treatment efficacy (1). For these reasons, in this study we present the development of a highly sensitive and specific biosensor for naxitamab monitoring. The biosensor employs electrodes fabricated from a composite of reduced graphene oxide and gold nanoparticles (rGO@AuNP), fabricated via laser scribing. The manufacturing process was optimized by adjusting laser power and stamping time, yielding electrodes with improved structural and electrochemical characteristics (2). In this configuration, gold nanoparticles embedded in the rGO matrix enhance performance by increasing the electrochemical surface area, improving conductivity, and promoting efficient antibody immobilization, see figure 1A. These features, combined with the intrinsic quantum capacitance properties of rGO, enable label-free detection through direct electronic signal transduction, eliminating the need for molecular tags and providing a robust platform for highly sensitive biosensing (3), see figure 1B. Preliminary results obtained from patient samples highlight the biosensor's potential for personalized naxitamab dose adjustment and improved therapeutic outcomes.

References

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Figures

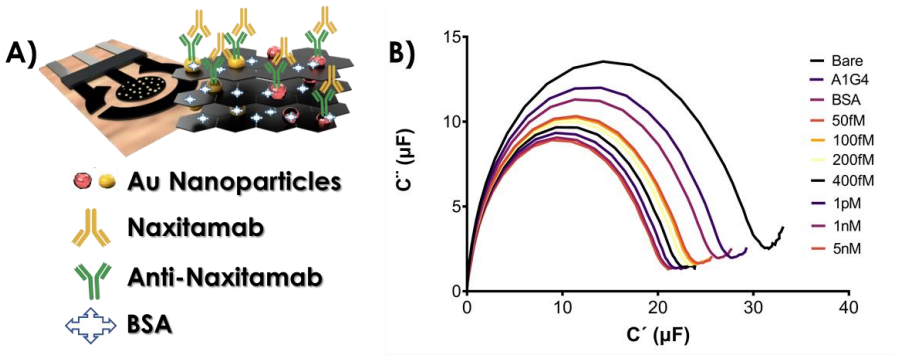

Figure 1: rGO@AuNP biosensor assembling and analytical performance. A) Schematic of the working electrode, already functionalized with a bioreceptor that can detect naxitamab, and blocked with BSA to prevent non-specific interactions. B) Step by step monitoring of the biosensor assembling and the analytical performance by quantum capacitance measurements.