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Chikungunya Virus Detection Utilizing an Origami Based Electrochemical Paper Analytical Device

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Abstract : Due to the critical significance in the early identification of infectious diseases, electrochemical sensors have garnered considerable interest. Here, we develop a detection platform for the chikungunya virus by rationally implementing the extremely high charge-transfer efficiency of a ternary nanocomposite of graphene oxide, silver, and gold (G/Ag/Au) (CHIKV). Because paper is an inexpensive substrate and can be produced in large quantities, the use of electrochemical paper analytical device (EPAD) origami further enhances the sensor's appealing qualities. A cost-effective platform for point-of-care diagnostics is provided by paper-based testing. These types of sensors are referred to as eco-designed analytical tools due to their efficient production, usage of the eco-friendly substrate, and potential to reduce waste management after measuring by incinerating the sensor. In this research, the paper's foldability property has been used to develop and create 3D multifaceted biosensors that can specifically detect the CHIKVX-ray diffraction, scanning electron microscopy, UV-vis spectroscopy, and transmission electron microscopy (TEM) were used to characterize the produced nanoparticles. In this work, aptamers are used since they are thought to be a unique and sensitive tool for use in rapid diagnostic methods. Cyclic voltammetry (CV) and linear sweep voltammetry (LSV), which were both validated with a potentiostat, were used to measure the analytical response of the biosensor. The target CHIKV antigen was hybridized with using the aptamer-modified electrode as a signal modulation platform, and its presence was determined by a decline in the current produced by its interaction with an anionic mediator, Methylene Blue (MB). Additionally, a detection limit of 1ng/ml and a broad linear range of 1ng/ml-10µg/ml for the CHIKV antigen were reported.

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