Detecting Pathogens in Real Samples Using Graphene Quantum Dots as Nanoenzymes: Is it Possible?

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Electrochemical sensors operate on the principle of detecting changes in electrical potentials resulting from chemical reactions [1]. These sensors enable precise, rapid, and specific measurements of target substances in samples, which is particularly advantageous for on-site detection of foodborne pathogens, contributing to the prevention of potential epidemics. The incorporation of nanomaterials in electrochemical sensors significantly enhances sensitivity and response time. Among these nanomaterials, Graphene Quantum Dots (GQDs) play a pivotal role. GQDs exhibit peroxidase (POD)-like catalytic properties, involving the oxidation of electron-donor substrates coupled with the simultaneous reduction of hydrogen peroxide (H2O2) [2,3]. Functioning as nanozymes, GQDs offer a label-free approach to analyte detection, replacing traditional HRP-based systems. Importantly, GQDs enhance the speed of electrochemical reactions, a critical consideration in the development of efficient electrochemical sensors. In this training, practical use of a GQDs based electrochemical sensor system will be demonstrated. This system is user-friendly, designed for smart mobile applications, allows label-free real-time direct pathogen measurement from actual samples.

References

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Figures