FACULTY OF VETERINARY MEDICINE
DEPARTMENT OF MICROBIOLOGY

Biomimetic immunoassay based on polymeric virus imprints for diagnosis of Foot and Mouth Disease virus (FMDV) serotypes

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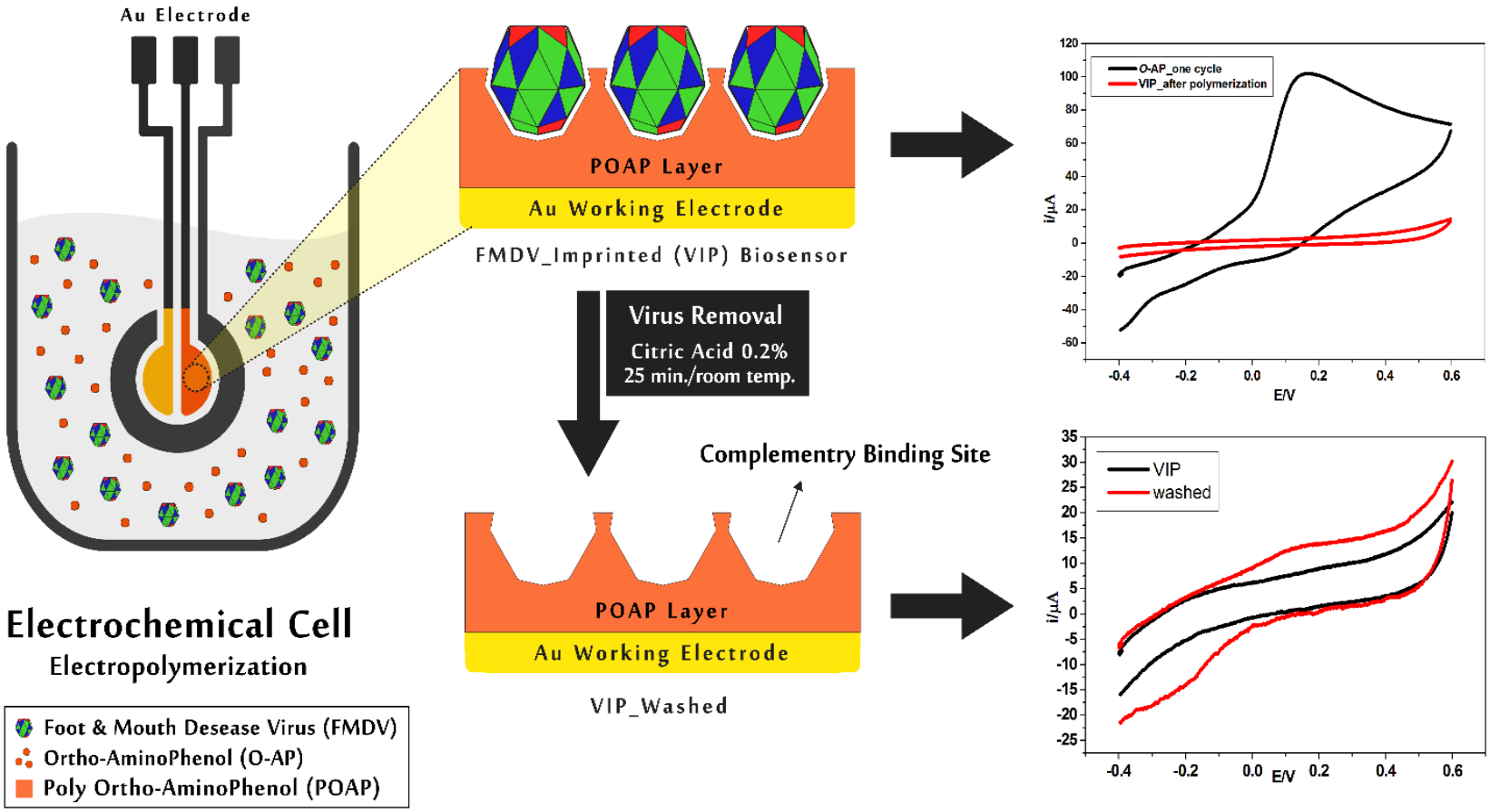
Abstract

Foot and mouth disease virus (FMDV) is a highly contagious virus due to its ease of transmission. FMDV has seven genetically distinguished serotypes with many subtypes within each serotype. The traditional diagnostic methods of FMDV have demonstrated many drawbacks related to sensitivity, specificity, and cross-reactivity. In the current study, a new viral imprinted polymer (VIP)-based biosensor was designed and fabricated for the rapid and selective detection of the FMDV. The bio-recognition components were formed via electrochemical polymerization of the oxidized O-aminophenol (*O*-AP) film imprinted with FMDV serotype O on a gold screen-printed electrode (SPE). The overall changes in the design template have been investigated using cyclic voltammetry (CV) and atomic force microscopy. Optimal conditions were achieved through investigating the capturing efficiency, binding stability, selectivity and lifetime of the developed biosensor. The results depicted a high selectivity of the biosensor to the serotype O over all other genus serotypes A, SAT2 and Lumpy skin disease virus (LSDV) as well as the inactivated serotype O. The limits of detection (LOD) and quantification (LOQ) were around 2 ng/mL and 6 ng/mL, respectively, in addition to the tested repeatability and reproducibility values with a variance coefficient of 1.0% and 3.6%, respectively. In comparison with the reference methods (ELISA and PCR), the analysis of saliva real samples using the developed affordable biosensor offered 50 fold better LOD with the possibility of on-line monitoring in the field with no prior sample treatment.

Keywords: Foot and mouth disease virus (FMDV), Virus imprinted polymers (VIPs), Screen printed electrode (SPE), Biomimetic virus biosensors

Graphical abstract:



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