Identification and engineering of affinity peptides for the improvement of sensor performance in norovirus detection

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Recently, we developed an electrochemical biosensor utilizing affinity peptides obtained by phage display for detection of norovirus. Even though specificity and sensitivity of the sensor for detection of human norovirus were significant, we want to improve binding affinity of peptides towards point-of-care applications. For this goal, structure-to-function studies combined with molecular docking and peptidomimetic approach were performed to determine binding motifs and to mimic a series of synthetic peptides. A series of amino acid-substituted and cysteine-incorporated recognition peptides was chemically synthesized and immobilized to a gold electrode, the binding affinity of synthetic peptides and the detection performance of gold-immobilized synthetic peptides was observed using electrochemical detection methods (CV and EIS). As a result, NoroBP-nonFoul(FlexL)2-coated gold electrode acts an efficient electrochemical biosensor for highly selective detection of human norovirus with a detection limit down to 1.7 copies/mL, which is 3-fold lower than the reported methods.
Keyword: norovirus, affinity peptide, detection performance, sensitivity