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Facile biosensor for detecting norovirus using specific binding probes

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Norovirus is one of the worldwide infectious diseases by eating raw foods which were infected by others, and there are many people could be infected to touch to be contaminated things by norovirus. It is a major cause of foodborne and nosocomial outbreaks. In this study, thoroughly and highly sensitive biosensors for detecting norovirus by applying a recognized affinity peptide as a platform were described. As this electrochemical and optical methods are cost-effective, fast responsive and easy to integrate information into miniaturized micro-devices like a portable biosensor device. The performance of the peptides has been studied with fluorescent optical assay, and gold-immobilized synthetic peptides has been studying cyclic voltammetry, impedance spectroscopy, and colorimetry analyses. We found that several kinds of peptides (Noro-BP, nonFoul, (FelxL)2, nonFoul(FlexL)2) are the efficient recognizers for norovirus screened by using the M13 phage display method. These peptides were effectively applied to the electrochemical and optical analysis methods to detect the real norovirus sample with rotavirus as a negative control. Among them, nonFoul(FlexL)2 shows the best sensitive performance as the lowest detection limit value of 1.7 copies/mL. In addition, the result could be expected to be useful into the peptide-based detection sensor for the norovirus by using nanoflowers with large surface area. These results suggest that the biosensor consists of specific binding peptide, has affinity to norovirus as a molecular binder and will be used to micro-device as a diagnostic tool. Moreover, the biosensor could be helped as a new biosensing platform for point-of-care testing by applying much more fields.

Figure 1: Schematic illustration for the electrochemical detection of norovirus.

Recent Publications:

1. Hwang HJ, Ryu MY, Park CY, Ahn J, Park HG, Choi C, Ha SD, Park TJ, Park JP (2017) High sensitive and selective electrochemical biosensor: Label-free detection of human norovirus using affinity peptide as molecular binder. Biosens Bioelectron 87:164-170.
2. Lim JM, Ryu MY, Yun JW, Park TJ, Park JP (2017) Electrochemical peptide sensor for diagnosing adenoma-carcinoma transition in colon cancer. Biosens Bioelectron 98:330-337.
3. Lim JM, Oh SY, Heo NS, Ryu MY, Seo JH, Park TJ, Huh YS, Park JP (2018) Selection of affinity peptides for interference-free detection of cholera toxin. Biosens Bioelectron 99:289-296.
4. Park CY, Seo JM, Jo H, Park J, Ok, Park TJ (2017) Hexagonal tungsten oxide nanoflowers as enzymatic mimics and electrocatalysts. Sci Rep 7:40928.
5. Lee SW, Cheon SA, Kim MI, Park TJ (2015) Organic-inorganic hybrid nanoflowers: Types, characteristics, and future prospects. J Nanobiotechnol 13:54.

Biography

Tae Jung Park has completed his PhD from Korea Advanced Institute of Science and Technology in 2004. He is currently the professor of chemistry department in Chung-Ang University. He has published more than 125 papers in reputed journals and has been serving as an editorial board member within nanobiotechnology category of Bioprocess and Biosystems Engineering, and Biotechnology and Bioprocess Engineering.

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