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PRELIMINARY STUDY OF THE DEVELOPMENT OF BIOSENSOR FOR DETECTION OF STAPHYLOCOCCAL ENTEROTOXIN

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Abstract – Staphylococcal enterotoxin causes many cases of food poisoning. An alternative method for detection may be through biosensors. In this work were prepared screen-printed electrodes modified with antibodies against Staphylococcal enterotoxin A by self assembly method. The biosensor showed good linearity in phosphate buffer. The cyclic voltammetry demonstrated good stability of biosensor after fifty scans. The preliminary results are very promising for the development of quantitative detection Staphylococcal enterotoxin in food using biosensor.

Staphylococcus aureus is a common pathogen associated with gastrointestinal diseases and has been considered as one of the most important problem of public health. Some strains *S. aureus* can cause food poisoning by production of enterotoxins (SEs) when growing in foods (1). Staphylococcal food poisoning is characterized by short incubation period after ingestion of preformed toxins, following by nausea, vomiting and diarrhea. SEs are resistant to inactivation by gastrointestinal enzymes as well as by heat (2). Nowadays, the methods for detection of these enterotoxins are made by expensive immunological or biochemical kits. An alternative method of detection based on biosensor may be a desirable tool due to high sensitivity, specificity and low cost. In his work were prepared screen-printed electrodes modified with antibodies against Staphylococcal enterotoxin A. In the process of modification of the electrode, we used the self-assembly monolayer method. For this, 10 µL of 5 mg mL^{-1} protein A was dropped on the electrode. Next, we added 10 µL of 0.16 µg $µL^{-1}$ antibody anti-Staphylococcal enterotoxin (IgG), 10 µL of enterotoxin A, 10 µL of antibody anti-Staphylococcal enterotoxin conjugated to peroxidase. The solutions were prepared with phosphate buffer (pH 7.0). Each immobilization procedure was realized for one hour with subsequent washes in distilled water. The performance of the biosensor was evaluated at different concentrations of enterotoxin: 0.5; 0.25; 0.125 and 0.0313 µg $µL^{-1}$ in phosphate buffer with hydroquinone (mediator) and hydrogen peroxide (peroxidase substrate). Cyclic voltammetry measures were made in Potentiostat/Galvanostat Autolab PGSTAT100. We used glass cell of 10 mL and a conventional system with three electrodes: a platinum auxiliary electrode, reference electrode Ag/AgCl saturated with KCl 3 M and screen-printed printed carbon electrode. The biosensor showed good linearity in phosphate buffer (R^2= 0,96) (Figure 1). The cyclic voltammetry demonstrated good stability of biosensor after fifty scans (Figure 2). The preliminary results are very promising for the development of biosensor for detection of Staphylococcal enterotoxin in food using disposable electrodes and self assembly method.

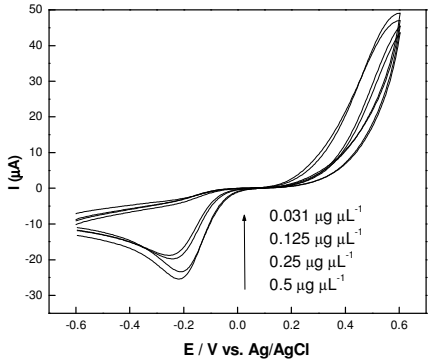

Figure 1: Cyclic voltammograms of modified sreen-printed electrodes with 0.5; 0.25; 0.125; 0.031 µg $µL^{-1}$ Staphylococcal Enterotoxin in buffer solution with 4 mM hydroquinone and 600 µM H_2O_2 .

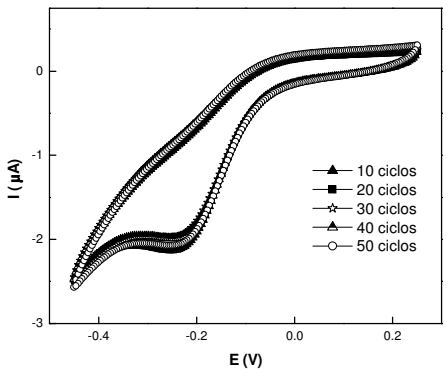

Figure 2: Cyclic voltammograms of modified screen-printed electrodes with 0.5 µg $µL^{-1}$ Staphylococcal Enterotoxin in buffer solution with 60 µM hydroquinone and 100 µM H_2O_2.

References

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[2] V. Nema, R. Agrawal, D. V. Kamboj; A. K. Goel; L. Singh. International Journal of Food Microbiology.117 (2007). 29-35.