

Development of immunoFET biosensor for detection of 3-nitrotyrosine

3-Nitrotyrosine (3-NT) is one of the important biomarkers for the detection of excess of oxidative and nitrosative stress in the body, and derived from peroxynitrite-induced nitration of free and protein-bound at tyrosine residues. It was increased with oxidative/nitrosative stress-induced apoptosis in various tumor cells and many human diseases. Therefore, the analytical methods to detect 3-NT levels in biological samples are important for in vitro study of the apoptotic mechanism of the compounds and for the diagnosis of 3 NT-related diseases. In this study, an accurate, sensitive, and specific assay was developed for 3-NT based on the immunoFET biosensors and the effects of protein-A for orientated immobilization of antibody were investigated on the sensitivity of this biosensors (figure 1). The comparison of sensor performance among two immobilization methods revealed that the assay sensitivity was appreciably improved and better with antibody attached covalently to the sensor surface than the immobilization method using protein-A. In addition, with this covalent immobilization technique, the output voltage shifts increased linearly ($R^2 = 0.9923$) across the 3-NT concentrations range from 10 to 1000 ng/mL (figure 2) and the limit of quantification of 10 ng/mL and the limit of detection was 0.15 ng/mL. Thus, the developed immunoFET sensors would be applicable for the detection of 3-NT in the biological samples.

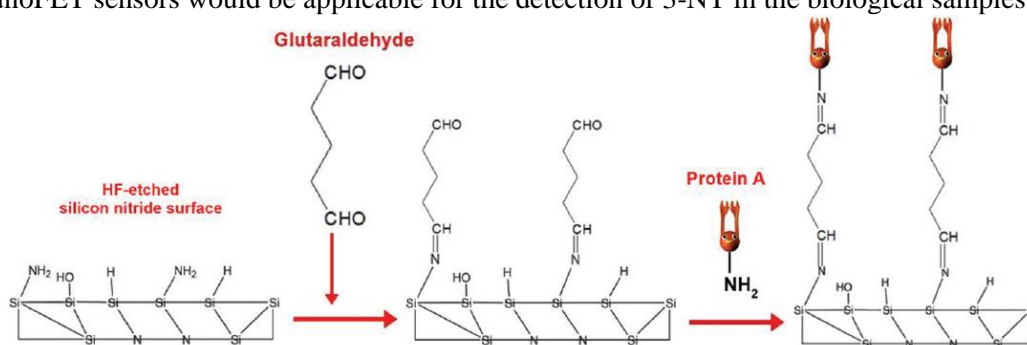


Figure 1. Schematic presentation of Protein A-immobilized surface through a crosslinking, glutaraldehyde

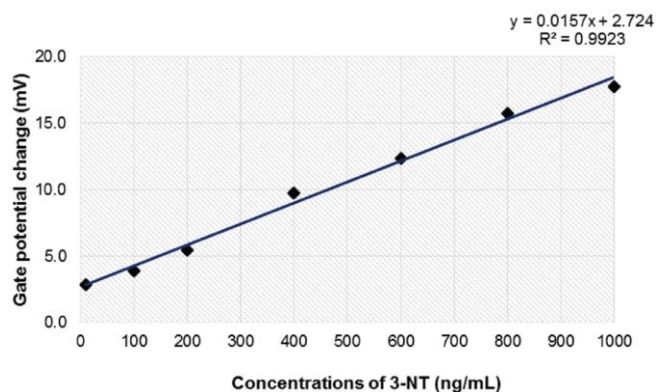


Figure 2. Standard calibration curve of the immunoFET biosensor after covalent immobilization of antibody for the detection of 3-nitrotyrosine in buffer solution

Reference:

Han KK, Mangmool S, Sathirakul K, Chansiri K, Jeamsaksiri W, Yasawong M. Development of ImmunoFET biosensor for detection of 3-nitrotyrosine. Thai J Pharm Sci. 2020;44(3):159-67.



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