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Electrochemical immunosensors: Universal tools for rapid detection of viruses

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Here, we report examples of successful developing of several type of immunosensors destined for the detection of Highly-Pathogenic Avian Influenza type H5N1 virus (HPAI) spreading among wild and domestic birds. The immunosensor were developed by the successive modification of gold as well as glassy carbon electrodes. The whole antibody or their fragments have been applied as the sensing elements. The complex between virions and specific antibody adsorbing on a surface of an electrode forms an insulating layer. This phenomenon, which is a base of ion-channel mimetic type of immunosensors, can be monitored by the electrochemical impedance spectroscopy (EIS) in the presence of $[Fe(CN)6]^{3-/4-}$ as a redox marker. The another type of immunosensors are based on redox active layers incorporated di-pyrromethene-Cu(II). The changes of electrochemical parameters of redox centers upon target analyte binging are the base of analytical signal generation. The both type of immunosensors displayed better sensitivity towards viruses as well as antibodies in comparison to ELISA; they are also very selective. The matrix from hen sera has no influence on the immunosensors performance. In addition, very small analyzed sample volumes (10 µl) are needed. After miniaturization, they keep excellent analytical parameters. Therefore, immunosensors presented could be recommended for the direct electrochemical detection of viruses as well as antibodies in the natural physiological samples.

Biography

Hanna Radecka was graduated from the Department of Chemistry of Nicolaus Copernicus University in Torun in 1978. She was a Visiting Scientist at the Hokkaido University in Sapporo and at the University of Tokyo. Since 1998, she is working at Department of Biosensors of the Polish Academy of Sciences in Olsztyn. In 2011 she has received the title of Professor of Analytical Chemistry and was nominated as the Head of Laboratory of Bioelectroanalysis. Currently she is working on the development of the new biosensors for determination of avian influenza viruses, possible biomarkers of Alzheimer's and other neurodegenerative diseases present in human plasma.

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