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Abstract

Application of SPR Analysis for Detection of Specific Antibodies in Human Blood Serum †

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Abstract: SPR technique possesses rich potential possibilities for investigation of different aspects of virus-specific agent interaction and modification of structure of viruses, induced by external factors. According to World Health Organization, viruses of Herpesviridae family infect 90% of the Earth's population. Herpetic infection is urgent for several spheres of medicine: infectology, infectious neurology, transplanthology, haemotology. It is perspective today using of biosensor technologies for developing of diagnostic systems. The aim of this work is develop and characteristics of biosensor chips for detection specific antibodies to herpes simplex virus and Epstein-Barr virus in patients' blood sera. The study was performed using the device "Plasmon-6", which is a computer-controlled optoelectronic spectrometer, which uses the SPR phenomenon in the optical configuration Kretschmann. It is developed at the Institute of Semiconductor Physics NAS of Ukraine. The advantage of this device is a compact design; full record of kinetic dependence; the minimum of one measurement: 0.2 s (mode slope); measurement in the gas or liquid; additional analog channel. We used additional channel as a control one. This allowed neutralize influences of environmental (temperature, humidity and another) at its operation. As antigens used purified proteins of viruses derived from cell cultures. The selection of sera was carried out using test kits "HSV-1 IgG ELISA" and «EBV VCA IgG ELISA» (GenWay, San Diego, CA, USA). Immobilization of viral proteins on sensor surface was performed using 0.2% solution of Dextran 17 000 (Sigma, St Louis, MO, USA). It was found direct dependence between amount of immobilized antigen and SPR response. The immobilization 8×10^{-5} mg/mm^2 of viral proteins on the surface of the chip was optimal for detection of antibodies. About 200 samples positive and negative blood sera of patients were tested who were previously tested by ELISA and created combined pools with varying degrees load of antibodies to studied virus. The limits of positive and negative response for SPR analysis was determined by using panel of negative blood sera of donors. SPR data were agreed with ELISA results in 84% of samples. The reproducibility of results varied between 85% and 95%. Thus, in this study biosensor chip for detection of specific antibodies to HSV-1 and EBV was successfully developed for express diagnostic of these pathogens.

Keywords: SPR; antibodies; HSV-1; EBV