INVESTIGATION OF REAL-TIME INTERACTIONS BETWEEN DPP IV PROTEIN AND SPECIFIC ANTIBODIES

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Dipeptidyl peptidase-IV (DPP IV) is a protein encoded by the DPP4 gene in humans. It is a transmembrane glycoprotein which can also be found circulating in blood. DPP IV is important for T-cell stimulation and glucose metabolism. Renal, colon, prostate and thyroid human carcinoma tissues overexpress DPP IV and it can also be a diagnostic for lysosomal storage diseases [1]. Due to DPP IV being a biomarker for cancer and type 2 diabetes, the importance of developing a biosensor for its detection has been increasing.

This study aimed to use a combined method of spectroscopic ellipsometry (SE) and quartz crystal microbalance with dissipation (QCM-D) to investigate interactions between DPP IV and specific antibodies and to assess the thermodynamic properties of formed complex. Specific antibodies were immobilized through protein G for them to be well-oriented and able to freely interact with DPP IV protein. SE allowed to assess the thickness of protein monolayers and to calculate the surface mass density of proteins. The data obtained from QCM-D method allowed to assess the viscoelastic properties of antibody and DPP IV monolayers and to calculate the amount of PBS trapped in each monolayer. Moreover, the combined method of SE and QCM-D is non-destructive, label-free and allows to watch the interaction between specific antibodies and DPP IV in real time. The results present that interaction between specific antibodies and DPP IV was successful. The monolayer of specific antibodies was found to be rigid, while the monolayer of DPP IV protein formed during the interaction with antibodies presented viscoelastic properties.

[1] J. Valverde-Pozo et al., “Ratiometric Two-Photon Near-Infrared probe to detect DPP IV in human plasma, living cells, human tissues, and whole organisms using zebrafish,” ACS Sensors, vol. 8, no. 3, pp. 1064−1075, Feb. 2023, doi: 10.1021/acssensors.2c02025.