

Sensitive Detection of Glycan-Protein Interactions with Glycan Biosensors

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Extended Abstract

Glycans are oligosaccharides playing an important role in many of biological and biochemical processes of a living organism. Glycans have an informative character, they play important role in cell signaling, immune response, infections, tumor metastasis etc. The study of glycan-protein interactions can help us to understand many of pathological and physiological processes. Glycan biosensors offer us a way to study these interactions (Hushegyi and Tkáč, 2014).

The preparation of glycan biosensors include few steps as: cleaning of the surface, formation of self-assembled (mono)layers (SAM) and immobilization of glycans. Gold is one of the most common material which is used as surface for biosensors (Tkáč et al., 2014). Sulfur atoms are able to make strong bonds with gold and these features are used for the easy modification of the surface with thiols differing in available functional groups, length and structure (Bertók et al., 2013). There are several techniques for glycan immobilization. Amine coupling (Liu et al., 2013) and Cu (I) catalyzed azide-alkyne cycloaddition (Rostovtsev et al., 2002) are used for immobilization of derivatized glycans (glycans with functional groups). Divinyl sulfone (DVS) can be used for immobilization of non-derivatized glycans (native glycans) onto hydroxyl terminated surface (Cheng et al., 2011). Biosensing can be done in label-free format, for example electrochemical impedance spectroscopy (EIS), surface plasmon resonance (SPR) and atomic force microscopy (AFM) are the most often applied label-free detections methods. Glycan biosensors have found applications in field of nanobiotechnology and glycobiotechnology, study of glycan protein-interaction (lectins, hemagglutinins and other proteins), study of enzymes, detection of viruses, bacteria and cancerous cells (Hushegyi and Tkáč, 2014).

EIS, AFM and SPR techniques were applied for characterization of glycan biosensors able to detect glycan-protein interaction at aM (10^{-18}) level between immobilized glycan and lectins (MAA, DSL) and also influenza virus hemagglutinins. The biosensor surface was modified with 11-mercaptopundecanoic acid and 1-mercapto-6-hexanol, and glycan with terminal sialic acid was immobilized onto SAM via amine coupling.

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