

Glyco-Biosensing as a Novel Tool for Prostate Cancer Early-Stage Diagnosis

Authors : Pavel Damborsky, Martina Zamorova, Jaroslav Katrlík

Abstract : Prostate cancer is annually the most common newly diagnosed cancer among men. An extensive number of evidence suggests that traditional serum Prostate-specific antigen (PSA) assay still suffers from a lack of sufficient specificity and sensitivity resulting in vast over-diagnosis and overtreatment. Thus, the early-stage detection of prostate cancer (PCa) plays undisputedly a critical role for successful treatment and improved quality of life. Over the last decade, particular altered glycans have been described that are associated with a range of chronic diseases, including cancer and inflammation. These glycans differences enable a distinction to be made between physiological and pathological state and suggest a valuable biosensing tool for diagnosis and follow-up purposes. Aberrant glycosylation is one of the major characteristics of disease progression. Consequently, the aim of this study was to develop a more reliable tool for early-stage PCa diagnosis employing lectins as glyco-recognition elements. Biosensor and biochip technology putting to use lectin-based glyco-profiling is one of the most promising strategies aimed at providing fast and efficient analysis of glycoproteins. The proof-of-concept experiments based on sandwich assay employing anti-PSA antibody and an aptamer as a capture molecules followed by lectin glycoprofiling were performed. We present a lectin-based biosensing assay for glycoprofiling of serum biomarker PSA using different biosensor and biochip platforms such as label-free surface plasmon resonance (SPR) and microarray with fluorescent label. The results suggest significant differences in interaction of particular lectins with PSA. The antibody-based assay is frequently associated with the sensitivity, reproducibility, and cross-reactivity issues. Aptamers provide remarkable advantages over antibodies due to the nucleic acid origin, stability and no glycosylation. All these data are further step for construction of highly selective, sensitive and reliable sensors for early-stage diagnosis. The experimental set-up also holds promise for the development of comparable assays with other glycosylated disease biomarkers.

Keywords : biomarker, glycosylation, lectin, prostate cancer

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