Surface plasmon resonance (SPR) based sensing for selective blood protein monitoring through the use of aptamer technology

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The monitoring of specific blood proteins and biomarkers play a significant role in medical diagnostics, especially in the areas of early disease diagnosis and tracking of therapeutic progress during treatment of certain diseases. A shift from biomarker discovery toward research and development of diagnostic platforms has recently been gaining momentum. Although established clinical methods for biomarker detection are available, such as enzyme linked immunosorbent assay (ELISA), mass spectrometry (MS), and liquid chromatography (LC), a need still exists to further develop robust, rapid, and more cost-effective alternative diagnostic platforms that have similar, if not better, sensitivity and selectivity to these more established methods. Such platforms will play an important role in transitioning toward more personalized medicine, as well as, further facilitating biomarker validation studies.

This study utilizes surface plasmon resonance (SPR) optical sensing which is coupled to novel aptamer based functionalization methods to achieve ultrasensitive and selective blood protein monitoring. The proteins used in this study are human serum albumin and hemoglobin, and more specifically, both non-glycated and glycated forms of the proteins which are directly related to diabetes care. It will be demonstrated that the proposed technology is capable of selectively monitoring and quantifying both forms of each protein. The specific aptamers used have been identified through an adapted version of an in vitro selection process known as Systematic Evolution of Ligands by Exponential Amplification (SELEX). The aptamers are then immobilized onto gold SPR sensing surfaces using specialized coupling methods. These methods are adapted based on the target characteristics to achieve optimal performance. To date, the results demonstrate that SPR can provide both highly sensitive and specific blood/plasma protein measurements that are comparable to existing clinical analysis techniques.