Title: Determination of Glycated Hemoglobin using boronic acid-coated CdTe Quantum Dots based on Fluorescence Resonance Energy Transfer

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Abstract: Introduction: Glycated hemoglobin (HbA<sub>1c</sub>) is formed by a nonenzymatic and approximately irreversible reaction of glucose with the N-terminal valine of adult hemoglobin's <em>β</em>-chain (HbA<sub>0</sub>). Since the lifetime of hemoglobin in blood is approximately 2–3 months so measuring HbA<sub>1c</sub> is well known for monitoring long-term glycemic control clinically. International Federation of Clinical Chemistry (IFCC) units (mmol/mol) and National Glycohemoglobin Standardization Program (NGSP) units (%) per total hemoglobin are two major standard for reporting HbA<sub>1c</sub>. The methods for measuring of HbA<sub>1c</sub> are based on charge differences (such as ion-exchange high-performance liquid chromatography) and structural differences (such as Boronate affinity chromatography and immunoassay) between the glycated and non-glycated species.

Method: Based on cis-diol binding ability of boronic acid, we coated CdTe quantum dots with 3-aminophenylboronic acid to bind with sugar moiety of HbA<sub>1c</sub>. Because of high extinction coefficient of Porphyrin, Hemoglobin act as a good acceptor in Fluorescence Resonance Energy Transfer (FRET) and we studied this mechanism between quantum dots and Porphyrin of Hemoglobin.

Results: We found that fluorescence of quantum dots decrease linearly with increasing percentile concentration from 3% to 16% HbA<sub>1c</sub> per total hemoglobin.

Conclusions: This method measures total glycated hemoglobin, including HbA<sub>1c</sub> and other glycated hemoglobin derivatives, and has potential of developing to determine the concentrations of a variety of glycoproteins that contain peripheral sugar moieties.

Presentation: Poster