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Early diagnosis of Diabetes mellitus through the eye

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Diabetes mellitus is an endocrinal metabolic disorder characterized by high blood sugar levels which gives rise to complications in various organs of the body. Currently, there are several methods used for the diagnosis of diabetes – A1C, FPG and OGT tests. Though, these tests give accurate results in diabetic patients, they have their exceptions. They do not take into consideration, the hemoglobin turnover, which is faster in case of diabetics and hence is a major disadvantage for diagnosing the patients in their early stages. Detection and intervention of diabetes in early stages can prolong the onset of diabetes.

Alpha Crystallin, an ocular lens protein is a small heat shock protein with no protein turnover and hence acts as an archive for post-translational modifications especially glycation which forms fluorescent advanced glycation end-products (AGEs). We have used steady state and time resolved fluorescence measurements to study the spectroscopic changes in alpha crystallin with increase in time of glycation. The AGE fluorescence lifetimes are extremely sensitive to the local biochemical environments which differ in healthy and diabetic tissue. It would also serve as a baseline for discriminating fluorophores which trigger auto-fluorescence for the detection of diabetic eye disease. Fluorescence measurements from non-diabetic and diabetic human donor lenses matched the spectral profiles created using glycated alpha crystallin as a model. Overall, this study will help us to establish a diagnostic tool for early detection of diabetes mellitus.

Biography

Devi Kalyan Karumanchi is a 4th year doctoral candidate in Gaillard group at Northern Illinois University.   His dissertation research involves studying biophysical and spectroscopic biomarkers in diabetic ocular diseases for developing non-invasive diagnostic tools. He also works on engineering sustained release drug delivery systems for treating various ocular disorders.

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