Public Abstract
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Title:Optical Glucose Nanobiosensor Encapsulated in Erythrocytes

An implantable glucose biosensor encapsulated in erythrocytes, Red Blood Cells (RBC), will become a method for continuously measuring blood glucose concentration in diabetics. In 2005, the American Diabetes Association (ADA) reported that 20.8 million people have diabetes, making it the fifth leading cause of death by disease in the USA. This project focuses on the development and encapsulating phases of the glucose biosensor.

Glucose Binding Protein (GBP) from E. coli was labeled with two fluorophores, Alexa Fluor 680 (AF680), and Alexa Fluor 750 (AF750). This sensor based on Fluorescence Resonance Energy Transfer (FRET). FRET is a distance sensitive technique between the above fluorophores. The initial energy transfer between AF680 and AF750 labeled on the GBP before glucose additions was determined. After glucose additions, the labeled GBP went through conformational change which caused distance between the labeled sites. This change in distance caused a change in the energy transfer. The labeled GBP became the glucose nanobiosensor.

The labeled GBP nanobiosensors were encapsulated in erythrocytes, red blood cells (RBCs), by using the Hypo-Osmotic dialysis technique. The encapsulated RBCs responded well to different glucose concentrations ranging form 0-33.16mM. This range covers the normal blood glucose concentration, 4 – 9mM. This result will become a novel technique for measuring blood glucose continuously. The process will require injecting sensitive nanobiosensors loaded RBCs into patient once every three months. Patient will be able to read and save all glucose reading at any time with a wearable optical detector device similar to a watch.