

## The earlier, the better and the controlled. Glucose level sensing in diabetic patients through nano biosensors

Gone are the days when there was a big pain for patients suffering from high blood glucose (blood sugar) level that early and rapid detection was a long wait & rather unpleasant. Now recently developed approaches using tools of nanotechnology, Glucose Biosensors are convenient and handy. One such approach is Glycated Hemoglobin Test. In the blood, during the lifespan of Red Blood Cells (RBCs), the glucose molecules bind with hemoglobin to form Glycated Hemoglobin (HbA<sub>1c</sub>), a detectable marker for glucose measurement. Hemoglobin in RBC is a protein molecule which carries oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. When the glucose level is high in the blood, the glucose molecules attach to the hemoglobin through the process called glycation resulting formation of HbA<sub>1c</sub>. Higher the HbA<sub>1c</sub> in the blood, more glucose or sugar is detectable. Average sugar level in the blood can be monitored by measuring HbA<sub>1c</sub>.

HbA<sub>1c</sub> monitoring is very useful for patients suffering from Diabetes which provide patients to plan for their quantity and duration of their medicines to control Diabetes. Timely and easily detection of glucose can help them to overcome taking these irregular doses and timings.

Until recently many techniques are used for HbA<sub>1c</sub> monitoring for instance HPLC, Electrophoresis, Immunoassay and by enzymatic reactions. However, these techniques are very expensive, time-consuming and cannot be performed very frequently and are not portable making them unable to monitor at home. Interestingly, Nanotechnology made it all very easy. Now a patient or any other person can check his/her blood glucose lever in the blood at home and can keep the device in the pocket. The HbA<sub>1c</sub> can be monitored in routine blood checkup very easily.

New research has shown that a fructosyl amino-acid oxidase (FAO) enzyme immobilized nitrogen-doped graphene/gold nanoparticles (AuNPs)/fluorine doped tin oxide (FTO) glass electrode can detect the concentration of HbA<sub>1c</sub> in biological samples.

Existing sensors to measure the levels of HbA<sub>1c</sub> have drawbacks such as lack of stability, high response time, and low reproducibility. To devise a better sensor, the researchers chose 2D nanomaterials such nitrogen-doped graphene and AuNPs.

The sensor showed optimum response within seconds. This biosensor can be used 100 times over a period of 4 months. "It can also be used for point-of-care application and can be integrated with the current glucose meter for diabetic," says lead researcher Dr Nidhi Chauhan.

**Dr Nidhi Chauhan**  
Assistant Professor  
Amity Institute of Nanotechnology (AINT)

*Amity University, Noida, India*

## **Publication**

[Glycated hemoglobin detection with electrochemical sensing amplified by gold nanoparticles embedded N-doped graphene nanosheet.](#)

Jain U, Chauhan N

*Biosens Bioelectron. 2016 Feb 12*