

POPULAR SCIENTIFIC ABSTRACT

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[Photoacoustic sensor for non-invasive in-vivo measurement of blood glucose]

Diabetes is a disease with no cure that can cause a lot of health complications. Diabetics can only manage the disease by monitoring their blood glucose levels and adjusting it to normal levels using insulin and dietary restrictions. This requires them to measure their blood glucose levels several times each day. The current method for measuring blood glucose levels requires puncturing of the skin to get small amounts of blood. This is an uncomfortable experience especially when frequently performed.

To improve the quality of life of diabetics, a non-invasive sensor was suggested as an alternative method for measuring blood glucose. It is based on the photoacoustic effect which works by shining laser light on the skin of a diabetic to make the glucose molecules produce sound. The sound is then detected using a microphone. The strength of the sound is related to the blood glucose levels, that is, the stronger the sound, the higher the glucose levels and vice versa. This photoacoustic sensor is not able to measure very small glucose levels. As a result, it cannot be commercially available for diabetics.

This project contributes towards further development of this non-invasive photoacoustic blood glucose sensor. The aim is to improve the performance of the sensor to also detect small levels of blood glucose. We created computer simulations of the photoacoustic effect and used them to improve the sensor design. The accuracy of the results from the computer simulations were checked experimentally. Our findings showed that the ability of the sensor to measure small glucose levels can be improved by more than two times using a new sensor design. With these findings, we hope that a non-invasive photoacoustic sensor for measuring blood glucose levels will soon be commercially available for diabetics.