Biosensor could help diagnose illnesses directly in serum

August 30 2017

In this age of fast fashion and fast food, people want things immediately. The same holds true when they get sick and want to know what's wrong. But performing rapid, accurate diagnostics on a serum sample without complex and time-consuming manipulations is a tall order. Now, a team reports in *ACS Sensors* that they have developed a biosensor that overcomes these issues.

Field-effect transistor (FET)-based biosensors are ideal for point-of-care diagnostics because they are inexpensive, portable, sensitive and selective. They also provide results quickly and can be mass produced to meet market demand. These sensors detect the change in an electric field that results from a target compound, such as a protein or DNA, binding to it. But serum has a high ionic strength, or a high concentration of charged ions, that can mask the targets. Previous research has reported use of pretreatment steps, complex devices, and receptors with different lengths and orientations on the sensor surface, but with limited success. Alexey Tarasov and colleagues wanted to develop a new approach that would make it easier for FETs to be made as point-of-care diagnostic devices for serum analyses.

The researchers developed a FET sensor that included antibody fragments and polyethylene glycol molecules on a gold surface, which they linked to a commercially available transducer. In this configuration, different sensor chips can be swapped out for use with the same transducer. As a proof-of-principle, they tested the sensor with human thyroid-stimulating hormone. The team found that they could detect the

hormone at sub-picomolar concentrations, well below the detection limit previously reported with FETs, when testing it at elevated temperatures. They say that the device could be modified to diagnose many conditions and illnesses, and is inexpensive and easy to use.

More information: Direct, Label-Free, and Rapid Transistor-Based Immunodetection in Whole Serum, *ACS Sens.*, Article ASAP. DOI: 10.1021/acssensors.7b00187

Provided by American Chemical Society