# Nanophotonic platform offers faster detection of dangerous pregnancy disorder preeclampsia

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A new rapid test for the early diagnosis of preeclampsia, a potentially life-threatening complication of pregnancy, has been developed by a

team of researchers at the University of Technology Sydney (UTS). The test is significantly faster and more accurate than current methods.

Preeclampsia is a condition that affects around 4%–8% of all pregnancies and is characterized by high blood pressure, protein in the urine and damage to organs such as the kidney and liver in the second half of pregnancy. It can lead to serious complications, or loss of life, for both mother and baby if left untreated.

Currently, the diagnosis of preeclampsia involves measuring blood pressure and testing for protein in the urine, along with other clinical signs and symptoms. Adding to the complexity is the fact that preeclampsia is a multifactorial disease with varying symptoms and features, so the diagnosis can be missed or delayed, particularly for those living in rural and remote areas.

The new strip-based lateral flow assay uses innovative nanoparticle-based technology to detect the concentration of specific biomarkers present in the blood plasma of women with preeclampsia. The novel protein biomarkers, called FKBPL and CD44, were discovered by Associate Professor Lana McClements.

The development of the nanophotonic platform used in the rapid test was led by Distinguished Professor Dayong Jin, director of the UTS Institute for Biomedical Materials and Devices.

Associate Professor McClements said the new test can produce results within 15 minutes and is highly sensitive and specific. "We believe this test has the potential to revolutionize the way preeclampsia is diagnosed and managed," she said.

The research team conducted a study using clinical samples in collaboration with the Mercy Hospital for Women in Melbourne to

validate the effectiveness of the test. They found that the test showed significantly improved sensitivity (90.5% vs. 73.7%) and specificity (100% vs. 92.3%) compared to the most up-to-date method currently available.

The study, "Quantitative Point of Care Tests for Timely Diagnosis of Early-onset Preeclampsia with High Sensitivity and Specificity," has just been published in *Angewandte Chemie International Edition*. First authors, UTS Ph.D. candidate Sahar Ghorbanpour and Dr. Shihui Wen, performed the experiments and developed the prototype.

The new test can be performed at the point-of-care, such as a pre-natal clinic or doctor's office. "This essentially gives clinicians the ability to make immediate and life-saving informed decisions, and not wait 24 hours for the results to come back," Associate Professor McClements said.

At present, the only known cure for preeclampsia is delivery of the baby, however premature delivery can lead to complications and hospitalization.

"In addition to the new test, the novel biomarkers also show potential as drug and cell therapy targets of emerging treatments for preeclampsia. This offers hope not only for earlier diagnosis, but also for a future cure to this terrible disorder," Associate Professor McClements said.

The research team is now working to commercialize the test in collaboration with industry partners and hopes to eventually make it widely available to healthcare providers around the world.

"This is a major advance over current methods of diagnosis, which can be unreliable and time-consuming," said Associate Professor McClements. "Our test has the potential to make a real difference for

both mothers and babies."

**More information:** Sahar Masoumeh Ghorbanpour et al, Quantitative Point of Care Tests for Timely Diagnosis of Early-Onset Preeclampsia with High Sensitivity and Specificity, *Angewandte Chemie International Edition* (2023). DOI: 10.1002/anie.202301193