New sensor technology could speed up blood tests for COVID patients

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Researchers are using laser-light technology to develop handheld biosensors with the potential to deliver fast, real-time blood test results for patients including those suffering from COVID-19 with secondary

infections such as pneumonia.

The technology uses laser interferometry—where two beams of light merge to create an interference pattern—to detect proteins such as procalcitonin, the level of which increases in blood when a patient has a bacterial infection.

The researchers, from the University of York, have shown the technology is viable and are now exploring routes to scaling it up. They expect to start the first patient trials in the next 24 months.

Simplicity and low cost

Lead author of the study, Isabel Barth, from the Department of Physics at the University of York said: "Great progress has already been achieved with biosensors based on nanotechnology, yet very few sensors obtain high performance while also ensuring simplicity and low cost. To accomplish this valuable combination, we developed a highly sensitive sensor based on the interference of light and eliminated sources of noise without increasing complexity."

Senior author of the study, Professor Thomas Krauss, from the Department of Physics at the University of York, added: "Laser interferometry is one of the most sensitive ways of measurement known in Physics and our study paves the way for this technology to be incorporated into a handheld biosensor device.

"Our work to develop this device has the potential to save lives by significantly speeding up the diagnostic process. Currently, COVID patients and patients with other viral infections who have suspected secondary infections have to wait for blood samples to be sent away to a lab for analysis. The technology could cut time delays as well as costs, while delivering testing of the same or even better quality.

"The technology also has the potential to detect multiple disease biomarkers as well as antibodies in one small sample of blood, which would significantly improve the reliability of any diagnosis."

Antimicrobial resistance

In developing the sensor, the researchers aim to provide a tool that can help general practitioners in their decision making. For example, in most patients who present symptoms of infections, it is difficult for doctors to decide whether their symptoms are caused by a viral or bacterial infection –knowledge which is crucial to reducing the unnecessary prescribing of antibiotics and the spread of antimicrobial resistance.

Isabel Barth added: "The high sensitivity of our sensor might in the future also enable a very precise and fast diagnosis outside of a GP practise—for example in a Pharmacy.

"These exciting results would not have been possible without the contributions from our interdisciplinary team of Electronic Engineers, Chemists and Biologists and the strong support and advice from clinical collaborators at York Hospital."

More information: Isabel Barth et al. Common-path interferometric label-free protein sensing with resonant dielectric nanostructures, *Light: Science & Applications* (2020). DOI: 10.1038/s41377-020-0336-6

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