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Press Release

FAO: SCIENCE, TECHNOLOGY, HEALTH EDITORS

New compact microscope to cut blood poisoning deaths by millions

A group of European scientists have invented a microscope that will allow the fastest ever detection of life-threatening infections caused by bacteria, such as E. coli or Staphylococcus, and conditions such as Meningitis, saving millions of lives every year.

About the size of a small book, the microscope has the potential to simultaneously detect more than one million biomarkers, the tell-tale signs of diseases such as Sepsis, a potentially fatal, whole-body inflammatory reaction that kills over 20,000 people per day worldwide.

Current techniques can take as long as one day to perform a similar test. This new method, which is part of a new platform combining photonics technology, microfluidics and molecular biology, can produce a result in just 30 minutes.

By sending polarised beams of light through birefringent crystals and a cartridge containing a blood drop and an array of receptors, the system is able to detect the interaction of light with the bacteria or proteins captured by the receptors (1). The intensity of the transmission image is then analysed to provide the physician with an accurate detection of 'what', and 'how much' bacteria or proteins are present.

With bacteria currently needing to reproduce in large quantities before an accurate diagnosis can be made, this can mean a patient waiting over 24 hours before all the information is at hand to decide a course of treatment. This new device produces sample-to-result processing up to 50 times quicker than current methods. With a condition like Sepsis, where time is of the essence, this looks set to usher in a new era of medical diagnosis.

Developed by the, 'Scalable point-of-care and label free microarray platform for rapid detection of Sepsis', or 'RAIS', the project is coordinated by ICFO-The Institute of Photonic Sciences in Barcelona, Spain and is yet another success story for the Photonics Public Private Partnership. Dr Josselin Pello, senior researcher on the project explains,

"Sepsis is one of the top 10 causes of death in the world. It can strike regardless of age, gender or fitness. Doctors need a quick, reliable way of detecting Sepsis and what stage it has reached."

"Current methods exist, but they are too slow: they can only look at a couple of parameters

at a time and they will not tell the physician what type of bacteria is present that is causing Sepsis. A doctor may not therefore prescribe the correct treatment in time.”

“RAIS can simultaneously examine many biomarkers, such as micro-ribonucleic acids or interleukins, and will let you know the bacteria source much earlier, allowing you to choose the correct treatment sooner”, said Dr Pello.

The financial implications of RAIS are very exciting. According to Dr Cindy Rechner, Clinical Trial Coordinator at Thermo Fisher Scientific,

“Not only can the RAIS device save lives through faster diagnosis of Sepsis but at under €50 per patient for a test it could remarkably reduce the estimated 10 billion Euros spend each year in Europe and the USA on hospital stays and unnecessary drugs.”

With the portable, point-of-care device being easy to use, complete with integrated software, it is thought that not only could this be used in remote areas by junior physicians, but self-diagnosis could be commonplace in the future.

“Although we are a long way off this, a self-diagnosis kit would certainly help with conditions like meningitis where an early diagnosis could be the difference between life and death”, said Dr Pello.

RAIS has received a grant of € 2,988,572.50 from the EU via the H2020 and the Photonics Public Private Partnership. It is made up of partners from Spain, Switzerland, Germany, Belgium, the U.K. and Italy represented by ICFO-The Institute of Photonic Sciences, Ecole Polytechnique Federale de Lausanne, iXscient, Diesse, Consejo Superior de Investigaciones Cientificas, microTEC, Trinean, Hospital Vall d’Hebron and Thermo Fischer Scientific.

1. R. A. Terborg, J. Pello, I. Mannelli, J. P. Torres, V. Pruneri, Ultrasensitive interferometric on-chip microscopy of transparent objects. *Sci. Adv.* 2, e1600077 (2016).

About RAIS

The Horizon 2020 project RAIS is aimed at developing a new scalable point-of-care label-free microarray platform for rapid detection of Sepsis biomarkers. The project will be coordinated by ICREA Professor at ICFO Valerio Pruneri in collaboration with companies and institutes from Switzerland, Italy, Spain, Germany, Belgium, and the United Kingdom.

The developed technology will be capable of detecting micro-ribonucleic acids (microRNAs), interleukins and other specific biomarkers associated with Sepsis using a few microliters of blood or serum samples. In addition it will provide fast results (30 minutes sample to result) at an affordable cost per patient. The new technology will aim to reduce the Sepsis mortality rate of more than 70%, with estimated cost savings of several billion Euros per year as a consequence of shorter hospital stays, reduced use of unnecessary drugs and lower associated insurance bills.

About Photonics21

Photonics21 is the European Technology Platform (ETP) for photonics –a technology encompassing all of the products and processes around the emission, manipulation and detection of light. It is integral to a wide range of industries that include the medical, healthcare, transport, manufacturing, and telecommunications sectors. In December 2005 "Photonics21" was set up to bring the community of photonics professionals and industries together.

In September 2009, the European Commission defined photonics as one of five European Key Enabling Technologies (KET's) and shortly after the European Research & Innovation Program "Horizon 2020" invited Photonics21 to become a "Public Private Partnership" (PPP). In November 2013 the "Photonics 21 Association", a legal entity under Belgium law, became the private contract partner in a Public Private Partnership (PPP) in conjunction with the EU Commission.

Today Photonics21 represents more than 2600 personal members from all over Europe. Our members are experts in the photonics industry, research organisations and universities who actively engage with us to develop a joint photonics strategy for future research and innovation in Europe.

With the global photonics market growing at twice the world economic growth rate, from 350 Billion Euros in 2011 to 615 Euros in 2020, Photonics21 stands in a secure global market position. The production of European photonics alone accounts for 60 billion Euros and employs over 350,000 people directly.

With strong growth forecast, current industry trends like digitalisation, resource efficiency, individual and zero failure production will drive the photonics industry further.

For more information about Photonics21 please go to <http://www.photonics21.org/index.php>