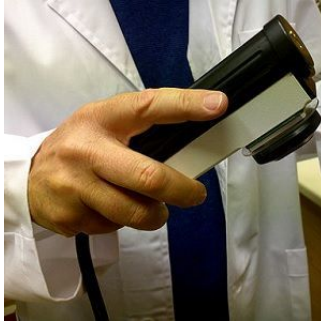## Ultrasound, Algorithms Detect Bacterial Meningitis in Babies

Researchers have developed a portable ultrasound device that is expected to revolutionise the detection of bacterial meningitis in infants. Currently the only test to diagnose the condition is through a lumbar puncture, a painful and difficult procedure to perform on babies.

The new device will allow bacterial meningitis to be diagnosed in babies with a simple ultrasound scan of the fontanelle — the opening between the cranial bones which does not close for the first 12 months. The high-resolution image obtained is then analysed with algorithms and within seconds indicates if there is cellularity in the cerebrospinal fluid that is a sign of infection.

The system was developed by a team of specialists in biomedical engineering: Carlos Castro, Javier Jiménez and Berta Martí, all from Spain, and Ian Butterworth from the UK. It has already been tested on a small sample of patients at the La Paz University Hospital (Madrid, Spain) and in ex vivo tissues of animal models.

The project has been financed by Madrid-MIT M+Visión, a consortium that aims to boost the collaboration between research centres and hospitals in the autonomous community of Madrid with the Massachusetts Institute of Technology (MIT) and other institutions in the Boston area (USA).

The researchers were searching for an alternative to the lumbar puncture (LP) test, which consists of extracting a sample of cerebrospinal fluid (CSF) with a syringe inserted between two vertebrae in the lumbar region.

"We witnessed an LP on a 29-day-old baby that had arrived at the accident and emergency department at Boston Children's Hospital with a fever. It took three paediatricians and five attempts to be able to extract a CSF sample. It was awful," Castro remembers.

Knowing the cellularity — the relationship between the blood-forming cells and the adipose tissue expressed in percentage of cells — "is important to start the treatment as soon as possible. But the LP results, which tell whether there is an infection in the fluid, can take between 24 and 48 hours," he explains.

With the new system developed by Castro's team, the image obtained is analysed by image-processing algorithms to determine the presence of cells indicating infection if there are any. "This entire process lasts just seconds," Castro reiterates.

The team believes that their system will mean a breakthrough for diagnosing bacterial meningitis in babies and save lives in developing countries, as it is a low-cost and simple technology. The device "can be used without having to undergo specialised training, and as it is portable, it can be made available to any intensive care or accident and emergency unit and observation or hospital room," he says.

Castro adds that, with sufficient funding, they will be able to have a finished product that complies with European regulations by the end of 2018.

Source and image credit: Research Laboratory of Electronics of MIT

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