

A simple blood test to improve health outcomes for mums and their unborn baby

Providing micro and nano fabrication facilities for Australia's researchers, students and industry

Advanced microfabrication technology developed at the SA node of the Australian National Fabrication Facility has enabled UniSA biomedical engineers to extract rare fetal cells from a blood sample which could allow for testing of a large number of genetic conditions.

Dr Marnie Winter and Professor Benjamin Thierry, from the University of South Australia's Future Industries Institute and the ARC Centre of Excellence in Convergent Bio-Nano Science and Technology (CBNS), are part of a team of researchers who have utilised a tiny microfluidic device, known as Lab-on-a-chip (LOC) to develop an efficient, cheap and fast method to isolate fragile fetal cells from large volumes of blood.

Working in collaboration with Dr Majid Warkiani from the University of Technology Sydney and specialists from the Women's and Children's Hospital, SA Pathology and Repromed, Dr Winter and Prof. Thierry have adapted the LOC device from one initially developed to isolate tumour cells from the blood of cancer patients.

Their combined efforts to isolate fetal cells from a blood sample has been published in *Advanced Materials Technologies*.

Dr Winter says the super-rare fetal cells which detach from the placenta and enter the mother's blood stream are an ideal source of fetal genetic material.

Presenting vital information on the developing fetus, the cells give insight to genetic disorders and could detect potential complications, like preeclampsia and foetal growth restrictions, long before any symptoms become evident.

Current genetic diagnostic testing procedures are only offered to high risk pregnancies as they are invasive, stressful and also associated with a small risk of miscarriage.

Dr Winter hopes to make their non-invasive genetic testing part of the routine screening for all women who would like it to ensure early intervention, treatment and monitoring.

"From as early as five weeks gestation, microfluidic

technology enables us to find the few fetal cells floating in millilitres of blood amongst billions of other cells," said Dr Winter.

"These cells can lead to the identification of many genetic disorders and provide early indications of complications that would significantly impact the health of the mother and baby."

Prior to undertaking her PhD with Prof. Thierry, Dr Winter completed a Bachelor of Laboratory Medicine which gave her a good understanding of clinical laboratories.

This experience sharpened her focus on clinical viability; helping to shape her research with a device that could integrate easily in the lab.

Prof. Thierry says having the ANFF-SA facility and their expert staff on site has been a real advantage for the rapid turn-around of device prototyping and he says this feature serves the research community well.

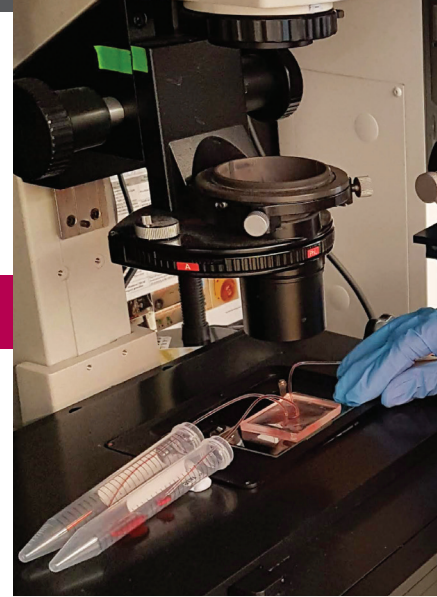
"The development of this type of LOC device required advanced microfabrication technologies which are only available in Australia through ANFF-SA," said

Prof. Thierry. "Their Kira Supermill 2M allows us to fabricate molds with extreme precision and achieve the performance necessary to isolate these ultra-rare fetal cells from blood."

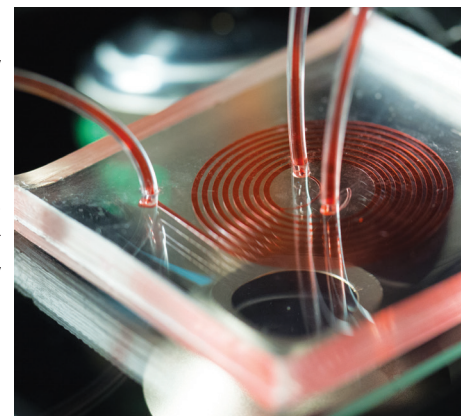
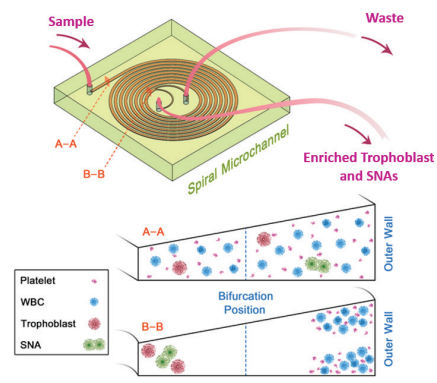
Prof. Thierry, Dr Winter and their research team acknowledge their research is extremely challenging and they are working to address a world-wide demand for comprehensive and accurate diagnostic technology.

"Thanks to ANFF-SA we have access to world-class technology, facilities and expertise," said Dr Winter. "Combined with the strength of our industry partners and hospitals, we are ideally placed to advance the field of non-invasive prenatal testing and make this technology affordable and accessible."

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This research breakthrough is testament to the cutting-edge technology being developed at UniSA's Future Industries Institute and UniSA is a leading player in LOC technology thanks to our ANFF-SA micro and nanofabrication facility at Mawson Lakes.

South Australian Node of the Australian National Fabrication Facility

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