

## Breastmilk Stem Cells, Immune Cells and microRNAs

### Research overview

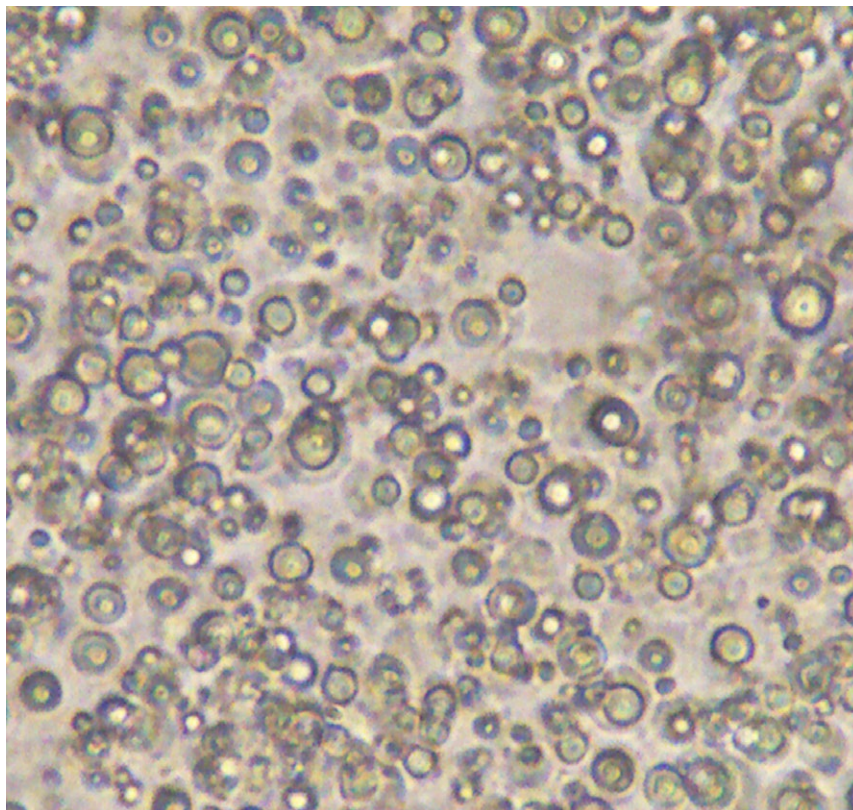
Foteini Kakulas (formerly Hassiotou) leads the Cell Biology Team of the Hartmann Human Lactation Research Group of the University of Western Australia. Her work focuses on the properties and functions of the different cell types of breastmilk, with particular interest in stem cells and immune cells. She also conducts research into microRNAs, newly discovered molecules present in breastmilk.

### Research highlights

In the last year, the team revealed novel attributes of breastmilk demonstrated by the presence of unique stem cells capable of turning into many cell types, both in the culture dish and inside the neonate's organs.

A mouse study conducted by the team showed that breastmilk stem cells and immune cells survive in the gastrointestinal tract of the suckling neonate and migrate into the bloodstream and various organs. There, the stem cells integrate and turn into functional organ-specific cells. This paradigm-shifting discovery offers a new type of stem cell for regenerative medicine, but also implicates breastmilk stem cells in normal infant development.

In a parallel study, breastmilk cells are used as a tool to investigate lactation performance and molecular causes of low milk supply in women. Factors that influence the cellular content of breastmilk are being investigated by PhD student Alecia-Jane Twigger, who won a Top-Up scholarship from WIRF. Maternal obesity, premature birth, and other factors were shown to be associated with immaturity of the mammary epithelial tissue in lactating women, which may provide an explanation for the low milk supply of some obese mothers or some mothers of preterm infants.

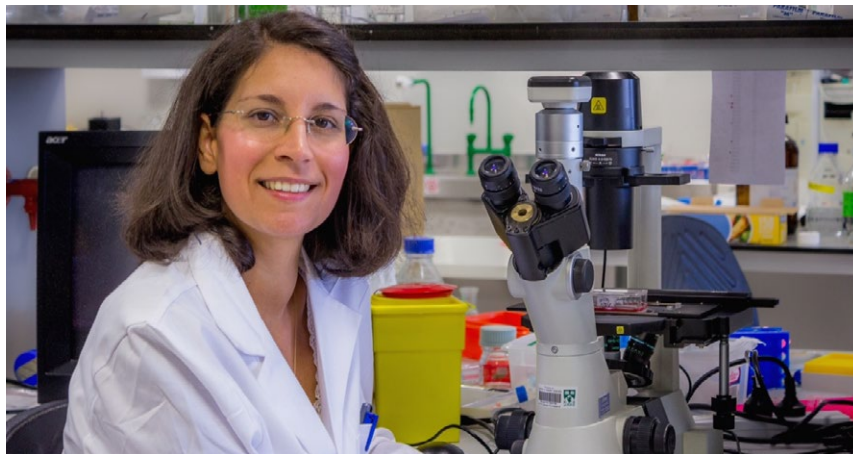


Moreover, the team conducted research on the immune cell responses specific to infections of the mother or the infant. This provided a new tool that could be used to assess the health status of the lactating breast as well as monitor the response to treatments.

Finally, breastmilk microRNA research conducted by PhD student Mohammed Alsaweed, revealed responses of these molecules to feeding and milk removal as well as an array of new microRNAs, only known thus far to be present in human milk. Future research will further examine these novel molecules in human milk, aiming at delineating their role in the lactating breast and for the infant.

### Research achievements

- Ehrlich-Koldovsky Early Career Scientist Award (Foteini Kakulas), International Society for Research in Human Milk and Lactation
- AAA Postdoctoral Fellowship, Foteini Kakulas (American Association of Anatomists)
- American Association of Anatomists Travel Award (Foteini Kakulas), Experimental Biology, Boston 2015
- Postdoc Platform Award Runner Up (Foteini Kakulas), American Association of Anatomists, Experimental Biology, Boston 2015
- American Society of Nutrition, Emerging Leader in Nutrition Science (Foteini Kakulas), Experimental Biology, Boston 2015



## THE TEAM

### Chief Investigators

Research Assistant Prof Foteini Kakulas (formerly Hassiotou) PhD  
Research Assoc/Prof Donna Geddes PhD

### Associate Investigators

Alecia-Jane Twigger BSc (Hons)  
Mohammed Alsaweed MSc  
Prof John Newnham AM FRANZCOG  
Emeritus Prof Peter Hartmann PhD AM  
Research Assistant Dr Donna Savigni PhD

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