Australian Government
Australian Research Council

EI 2018 ENGAGEMENT AND IMPACT

Engagement and Impact 2018

The University of Western Australia

UWA06 (HLS) - Impact

Overview

Title

(Title of the impact study)

Breast physiology and milk biochemistry

Unit of Assessment

06 - Biological Sciences

Additional FoR codes

(Identify up to two additional two-digit FoRs that relate to the overall content of the impact study.)

11 - Medical and Health Sciences

Socio-Economic Objective (SEO) Codes

(Choose from the list of two-digit SEO codes that are relevant to the impact study.)

92 - Health

Australian and New Zealand Standard Industrial Classification (ANZSIC) Codes

(Choose from the list of two-digit ANZSIC codes that are relevant to the impact study.)

42 - Other Store-Based Retailing
43 - Non-Store Retailing and Retail Commission-Based Buying and/or Selling
69 - Professional, Scientific and Technical Services (Except Computer System Design and Related Services)
84 - Hospitals
85 - Medical and Other Health Care Services

Keywords

(List up to 10 keywords related to the impact described in Part A.)

Breast milk

Medela

infant feeding

breast pump

bottle teat

suck cycle

Sensitivities

Commercially sensitive

Yes

Culturally sensitive

No

Sensitivities description

(Please describe any sensitivities in relation to the impact study that need to be considered, including any particular instructions for ARC staff or assessors, or for the impact study to be made publicly available after EI 2018.)

The following phrase should not be made publicly available after EI2018: "Revenue was estimated at $US630 million in 2014".

Aboriginal and Torres Strait Islander research flag

(Is this impact study associated with Aboriginal and Torres Strait Islander content?
NOTE - institutions may identify impact studies where the impact, associated research and/or approach to impact relates to Aboriginal and Torres Strait Islander peoples, nations, communities, language, place, culture and knowledges and/or is undertaken with Aboriginal and Torres Strait Islander peoples, nations, and/or communities.)

No

Science and Research Priorities

(Does this impact study fall within one or more of the Science and Research Priorities?)

Yes

Science and	Practical Research Challenge

Research Priority	
Health	Effective technologies for individuals to manage their own health care, for example, using mobile apps, remote monitoring and online access to therapies.
Health	Better models of health care and services that improve outcomes, reduce disparities for disadvantaged and vulnerable groups, increase efficiency and provide greater value for a given expenditure.

Impact

Summary of the impact

(Briefly describe the specific impact in simple, clear English. This will enable the general community to understand the impact of the research.)

Research into breast anatomy and physiology and human milk biochemistry at The University of Western Australia (UWA) has led to partnerships with Medela AG (Medela) resulting in innovative solutions for mothers and babies. Calmita® is an infant teat for preterm infants with an integrated vacuum-controlled valve. Calmita increases breastfeeding in preterm infants and reduces length of stay in the neonatal intensive care unit (NICU). UWA research led to the development of Medela's breast pump: the Symphony. From 2011-2016 Medela extended that technology into four breast pumps designed for home use: offering solutions to mothers who are returning to work but wish to maintain lactation. UWA research is frequently used in Medela consumer outreach which relies on UWA's basic research.

Beneficiaries

(List up to 10 beneficiaries related to the impact study)

Medela

Lactating mothers

Parents of preterm babies

Preterm babies

Wider community

Countries in which the impact occurred

(Search the list of countries and add as many as relate to the location of the impact)

Australia
United States of America
India
Albania
Argentina
Aruba
Austria

Bahrain
Belarus
Netherlands
Bolivia, Plurinational State of
Bosnia and Herzegovina
Botswana
Brazil
Singapore
Bulgaria
Cambodia
Canada
Chile
China (excludes SARs and Taiwan)
Colombia
Costa Rica
Croatia
Cyprus
Czech Republic
Denmark
Dominican Republic
Ecuador
Egypt
Estonia
Finland
France
Germany
Greece
Hong Kong (SAR of China)
Hungary
Iceland
Indonesia
Iran
Iraq
Ireland
Israel
Italy
Japan
Jordan
Kazakhstan
Kenya

Korea, Republic of (South)
Kuwait
Latvia
Lebanon
Lesotho
Libya
Lithuania
Luxembourg
Malaysia
Malta
Mexico
Moldova
Myanmar, The Republic of the Union of
Namibia
Nepal
New Zealand
Nicaragua
Nigeria
Norway
Oman
Pakistan
Paraguay
Peru
Philippines
Poland
Portugal
Puerto Rico
Qatar
Romania
Russian Federation
Saudi Arabia
Serbia
Slovakia
Slovenia
South Africa
Spain
Swaziland
Sweden
Switzerland
Syria

Taiwan
Thailand
Turkey
Ukraine
United Arab Emirates
Uruguay
Venezuela, Bolivarian Republic of
Vietnam
Yemen
Zambia
Zimbabwe

Details of the impact

(Provide a narrative that clearly outlines the research impact. The narrative should explain the relationship between the associated research and the impact. It should also identify the contribution the research has made beyond academia, including:
- who or what has benefitted from the results of the research (this should identify relevant research end-users, or beneficiaries from industry, the community, government, wider public etc.)
- the nature or type of impact and how the research made a social, economic, cultural, and/or environmental impact
- the extent of the impact (with specific references to appropriate evidence, such as cost-benefit-analysis, quantity of those affected, reported benefits etc.)
- the dates and time period in which the impact occurred.

NOTE - the narrative must describe only impact that has occurred within the reference period, and must not make aspirational claims.)

Human milk is a juicy, complex, dynamic live fluid full of thousands of molecules that have evolved over time to provide protection from infection and other short and long-term health benefits. Breast milk is full of nutritive components such as macronutrients, vitamins, hormones as well as protective components such as live white blood cells. Its composition is uniquely tailored for the human infant. UWA's Human Lactation Research Group (HLRG) combines biochemistry, metabolomics, molecular biology, physiological measurements and ultrasound imaging to understand milk synthesis and milk removal from the breast as well as aims to understand how the milk assists in the development of the baby. To do this, HLRG studies the effect of milk composition, gastric emptying and breastfeeding behaviour on the development of infant appetite control and body composition. Key research developed at UWA has led to advances in knowledge about breast anatomy and physiology and for 20 years UWA has partnered with Medela AG (Medela) to co-develop specialist breast pumps and teats for preterm infants.

Products: Calmita and two-phase expression breast pumps
In 2010, based upon UWA research, Medela released Calma; the first infant teat that could closely simulate the way a baby feeds from the breast. Preterm infants often experience difficulties with breastfeeding so demand from neonatologists seeking a product like Calma but redesigned for preterm babies quickly followed. Calmita was developed at UWA based on applied research of a breastfeeding infant's suck, swallow and breathe patterns. It allows preterm infants to practise and apply natural sucking behaviour using an integrated vacuum-controlled valve. Released to market in 2013, Calmita has been shown to increase breastfeeding in preterm infants (Simmer, 2016). Use of Calmita has been shown to hasten discharge (mean 2.5 days) from neonatal intensive care. Considering that 16% of all live births in Australia are admitted to a special care nursery or neonatal intensive care unit (Australian Institute of Health and Welfare, 2015) at a costs of over AUD$1,500 per day, Calmita actively decreases expenditure on pre-term infants where independent feeding is often the last hurdle for NICU discharge.

UWA research also led to the development of Medela's flagship hospital-grade breast pump: the Symphony. The two-phase expression technology imitates two natural sucking patterns. During breastfeeding, the baby's sucking starts out fast yet gentle to stimulate the milk-ejection reflex. It then switches to a slower and deeper rhythm. Two-phase expression became a market differentiator other manufacturers have tried to replicate. From 2011-2016 Medela released four models of patent protected breast pumps, all of which used the two-phase technology but

were designed for home use.

The World Health Organisation recommends infants should be exclusively breastfed for the first six months of life but returning to work can jeopardise this gold standard. The Australian Bureau of Statistics (ABS) survey of Pregnancy and Work Transitions in 2013 found Australian women take on average 7-8 months maternity leave and during this time breastfeeding rates drop from half of all children at six months to just under a third in children nine to 12 months. One-day absences due to a sick child are twice as likely in mothers who formula-feed versus those who breastfeed (Cohen; Am J Health Promot. 1995). Medela breast pumps offer a solution to mothers who are returning to work but wish to maintain lactation.

Medela's Growth, Education Strategies and Branding
Medela positions itself as a research-based company that invests in basic and exploratory research. Their website names UWA as a long-standing research partner and seven of the web-based research resources they provide for professionals directly cites UWA research. UWA research is frequently used in their social media outreach to customers and their mission statement of translating scientific findings into evidence-based benefits heavily relies on UWA's basic research. The partnership with UWA has also impacted the company's culture with their evidence-based research heavily integrated into marketing strategies even resonating into a tag line of "Research is in Medela's DNA". Medela also showcases the world's top lactation scientists at an international conference each year aimed at midwives, lactation consultants, neonatal nurses, maternal child health nurses, general practitioners, paediatricians, speech therapists and dietitians. These conferences started as UWA's HLRG team translating their basic research but by 2016 attracted over 300 delegates representing 41 countries

The research-led business model employed by Medela has had great economic success. Revenue was estimated at $US630 million in 2014, with products being sold globally to 18 subsidiaries and upwards of 120 distributors.

Policy Change and Product Standards
Medela has used UWA research to successfully lobby for policy change with the US government and its health insurance providers in a way that has increased revenue and also benefitted US society. Using the evidence-based research, Medela lobbied for inclusion of a breastfeeding benefit in the Affordable Care Act, which was passed in 2013. As a result, Medela estimated that in 2014, 47,000 more US infants were breastfed; with minority, less educated and unmarried mothers disproportionately helped, for an estimated cost of $US1.54 per member, per year. Medela has used UWA research to substantively provide input to the US Food and Drug Administration and the EU body (TÜV) on what standards should be required for all products classified as a breast pump. An example of this is the minimum vacuum range available on breast pumps has been predicated on UWA research.

Associated research

(Briefly describe the research that led to the impact presented for the UoA. The research must meet the definition of research in Section 1.9 of the EI 2018 Submission Guidelines. The description should include details of:
- what was researched
- when the research occurred
- who conducted the research and what is the association with the institution)

The Human Lactation Research Group (HLRG) combines a number of modalities including biochemistry, metabolomics, molecular biology, physiological measurements and ultrasound imaging to understand milk synthesis, milk removal from the breast, the effect of milk composition on both term and preterm infant gastric emptying, breastfeeding behaviour, appetite control and body composition. The understanding of these mechanisms has facilitated successful breastfeeding by providing an evidence base for the clinical management of human lactation. Research has been ongoing since early 2000's, however the key findings relating to this case study were published between 2005 and 2012.

UWA's HLRG is headed by UWA Senior Research Fellow Professor Donna Geddes, with four UWA post-doctoral researchers: Dr Chinh Tai Lai, Dr Jacqueline Kent, Dr Melvin Gay, Dr Sharon Perrella. Professor Peter Hartman is a Senior Honorary Research Fellow at UWA. The head of Breastfeeding Research at Medela is Leon Mitoulas who is also an Honorary Fellow at UWA.

FoR of associated research

(Up to three two-digit FoRs that best describe the associated research)

06 - Biological Sciences
11 - Medical and Health Sciences

References (up to 10 references, 350 characters per reference)

(This section should include a list of up to 10 of the most relevant research outputs associated with the impact)

Ramsay, D., Kent, J., Hartmann, R. A., & Hartmann, P. (2005). Anatomy of the lactating human breast redefined with ultrasound imaging. Journal of Anatomy, 206(6), 525-534. DOI: 10.1111/j.1469-7580.2005.00417.x

Simmer, K., Kok, Y., Nancarrow, K., Hepworth, A., & Geddes, D. (2016). Novel feeding system to promote establishment of breastfeeds after preterm birth: a randomized controlled trial. Journal of Perinatology, 36(3), 210-215. DOI: 10.1038/jp.2015.184

Geddes, D., Sakalidis, V., Hepworth, A., Mcclellan, H., Kent, J., Lai, C., & Hartmann, P. (2012). Tongue movement and intra-oral vacuum of term infants during breastfeeding and feeding from an experimental teat that released milk under vacuum only. Early Human Development, 88, 443-449. DOI: 10.1016/j.earlhumdev.2011.10.012

Sakalidis, V., Mcclellan, H., Hepworth, A., Kent, J., Lai, C., Hartmann, P., & Geddes, D. (2012). Oxygen Saturation and Suck-Swallow-Breathe Coordination of Term Infants during Breastfeeding and Feeding froma Teat Releasing Milk Only with Vacuum. International Journal of Pediatrics, 2013, 1-10. DOI: 10.1155/2012/130769

Prime, D., Garbin, C., Hartmann, P., & Kent, J. (2012). Simultaneous Breast Expression in Breastfeeding Women Is More Efficacious than Sequential Breast Expression. Breastfeeding Medicine, 0(0), 1-6. DOI: 10.1089/bfm.2011.0139

Cregan, M., Fan, Y., Appelbee, A. J., Brown, M. L., Klopcic, B., Koppen, J., ... Hartmann, P. (2007). Identification of nestin-positive putative mammary stem cells in human breastmilk. Cell and Tissue Research, 329(1), 129-136. DOI: 10.1007/s00441-007-0390-x

Hassiotou, F., Beltran, A., Chetwynd, E., Stuebe, A. M., Twigger, A., Metzger, P., ... Hartmann, P. (2012). Breastmilk is a novel source of stem cells with multilineage differentiation potential. Stem Cells, 30, 2164-2174. DOI: 10.1002/stem.1188

Sakalidis, V., & Geddes, D. (2015). Suck-Swallow-Breathe Dynamics in Breastfed Infants. Journal of Human Lactation, 32(2), 201-211. DOI: 10.1177/0890334415601093

Cohen, R., Mrtek, M., Mrtek, R. (1995). Comparison of maternal absenteeism and infants illness rates among breast-feeding and formula-feeding women in two corporations. American Journal of Health Promotion, 10(2), 148-53.

Additional impact indicator information

Additional impact indicator information

(Provide information about any indicators not captured above that are relevant to the impact study, for example return on investment, jobs created, improvements in quality of life years (QALYs). Additional indicators should be quantitative in nature and include:
- name of indicator (100 characters)
- data for indicator (200 characters)
- brief description of indicator and how it is calculated (300 characters).)