

Lions Medical Research Foundation

Progress Report

Project: Determining the role of the placental mitochondria in gestational diabetes

1 May 2021

Olivia Holland

Gestational diabetes is an epidemic posing an immediate threat to the almost 41,000 Australian women diagnosed each year. It's not currently possible to tell which women will have health problems related to gestational diabetes, like an overly large baby that can lead to birth trauma and a predisposition of the child to obesity and diabetes later in life. My LMRF Fellowship will help with limitations in current care by improving our understanding of how the placenta responds in gestational diabetes. This will let us develop new ways of testing how likely there are to be health problems with the pregnancy. Being able to check the placenta's health would be a paradigm shift to improve care of the one in seven Australian pregnancies that are diagnosed with gestational diabetes, improving the health of women and their babies.

Research has been progressing well. We have recently completed work that has helped us better understand how the placenta is changing and even adapting in gestational diabetes. We've found that when the gestational diabetes is less severe the placenta is dealing well with the stress of diabetes, but when the gestational diabetes is more severe this is not working as well. These studies were done after the pregnancy had finished, so we're now looking for ways to check how the placenta is coping with stress during pregnancy. If we're able to find this out it would dramatically improve how women with gestational diabetes are cared for by giving doctors a way to tell what treatment a women may need and how well treatments are working.

This work is continuing to be supported by Griffith University, with my being awarded an Innovation and Pilot Grant for \$5,000 as well as \$14,500 in student support. With this and the LMRF support I will be able to continue to research more effective mechanisms to manage gestational diabetes, to stop the vicious intergenerational cycle of obesity and diabetes.

By supporting my research, the LMRF is also critical to the success of the students that I supervise, and students in our research group have been doing very well lately. A highlight of this year has been my PhD student Nirajan Shrestha being successfully awarded his doctorate after four years of hard work. My MPhil student Keith Kwan Cheng has also handed in a great thesis and is now waiting on results. And I had three fantastic undergraduate students over the summer, all of which scored very highly in their reports. Our group is now expanding, with two new Masters and two new Honours students starting this year, and later in the year we should have two new PhD students as well.

I have been elected as the new Chair of the Queensland Perinatal Consortium, and the Co-chair of Centre for Children's Health Research Early- and Mid-Career Researcher Committee. These are fantastic groups that I've been involved with for several years now, and I'm hoping to continue their great work and give back to the research community. Through the Queensland Perinatal Consortium, I've already been successful in having a symposia proposal accepted for the Australian Physiological Society Meeting later in the year, where our researchers will be able to showcase their work.

Earlier this year I was also interviewed by the brilliant Amelia Travers for her Avid Research podcast. This was a terrific opportunity to talk about my research, why studying the placenta is so important, and what I hope to achieve. The interview can be found at this link, and there's even a drawing of a placenta from Amelia that you can colour in. Link: <https://avidresearch.com.au/?episodeld=031>

Thank you again to the LMRF and all the Lions for your support that makes this work possible.

Scientific publications in peer reviewed journals since last report

1. Josif Vidimce, Johara Pillay, Nirajan Shrestha, Lan-Feng Dong, Jiri Neuzil, Karl-Heinz Wagner, Olivia Jane Holland, Andrew Cameron Bulmer (2021). *Mitochondrial Function, Fatty Acid Metabolism, and Body Composition in the Hyperbilirubinemic Gunn Rat*. Front Pharmacol, 12:586715. doi: 10.3389/fphar.2021.586715.
2. Nirajan Shrestha, Simone L Sleep, Tessa J Helman, Olivia J Holland, James SM Cuffe, Anthony V Perkins, Andrew J McAinch, John P Headrick, Deanne H Hryciw (2021). *Maternal diet high in linoleic acid alters offspring fatty acids and cardiovascular function in a rat model*. Br J Nutr, 1-37. doi: 10.1017/S0007114521001276.
3. Nirajan Shrestha, Josif Vidimce, Olivia J Holland, James SM Cuffe, Belinda R Beck, Anthony V Perkins, Andrew J McAinch, Deanne H Hryciw (2021). *Maternal and Postnatal High Linoleic Acid Diet Impacts Lipid Metabolism in Adult Rat Offspring in a Sex-Specific Manner*. Int J Mol Sci, 22(6):2946. doi: 10.3390/ijms22062946.
4. Joshua J Fisher, Chelsea L Vanderpeet, Lucy A Bartho, Daniel R McKeating, James SM Cuffe, Olivia J Holland, Anthony V Perkins (2020). *Mitochondrial dysfunction in placental trophoblast cells experiencing gestational diabetes mellitus*. J Physiol, 599(4):1291-1305. doi: 10.1113/JP280593.
5. Eman Mosaad, Hassendrini N Peiris, Olivia Holland, Isabella Morean Garcia, Murray D Mitchell (2020). *The Role(s) of Eicosanoids and Exosomes in Human Parturition*. Front Physiol, 11:594313. doi: 10.3389/fphys.2020.594313.

Conference presentations since last report

1. Deanne H Hryciw, Nirajan Shrestha, Simone Sleep, James SM Cuffe, Olivia J Holland, Anthony V Perkins, Andrew J McAinch. *Maternal and postnatal diet high in linoleic acid alters fatty acid composition, cholesterol and hepatic gene expression, in adult offspring in a sex-specific manner*. Experimental Biology online conference. 27-30 April 2021.

Invited presentations since last report

1. O. J. Holland. *What we know about diabetes in pregnancy and beyond*. District Governor Elect - 2020 LMRF visit. Brisbane, Queensland. 15 November 2020.
2. O. J. Holland. *Diabetes in Pregnancy*. Robina Lions Club LMRF Melbourne Cup Race Day. Gold Coast, Queensland. 3 November 2020.
3. Upcoming: Lions Club Presidents' Tour at the Translational Research Institute. Brisbane, Queensland. 30 May 2021.
4. Upcoming: Brunswick Mullumbimby Lions Club. Ocean Shores, New South Wales. 6 July 2021.