



Name: Aishwarya Rengarajan

Email: arengarajan@wisc.edu

Major Professor: Dr. Derek Boeldt

Degree Objective: Ph.D. Endocrinology and Reproductive Physiology

Background: B.Tech Biotechnology, National Institute of Technology - Warangal, India 2016

Current Research Project: Study of immune-endothelial interactions on endothelial dysfunction in preeclampsia

I am studying the effect of the cross talk between immune cells and endothelial cells (EC) on endothelial function/dysfunction in the context of pregnancy/preeclampsia. In pregnancy, adequate vasodilation of the endothelium is necessary to maintain appropriate maternal blood pressure. Preeclampsia is a maternal hypertensive disorder in pregnancy that is characterized by endothelial dysfunction. Decreased Ca_{2+} signaling in endothelium (potentially due to decreased gap junction communication) contributes to reduced production of vasodilator nitric oxide (NO) leading to reduced vasodilation in preeclampsia.

The cause of endothelial dysfunction in preeclampsia remains unknown. There is a possibility that immune cells mediate endothelial dysfunction, since preeclampsia is associated with an altered immune response in terms of immune cell numbers, localization of immune cell types and cytokine secretion.

I hypothesize that increased immune cell numbers could affect endothelial function negatively in ECs from normal pregnancy due to a combination of direct immune cell-endothelial cell interaction and secreted cytokine profile. Previous studies have demonstrated that Ca_{2+} signaling (as discrete bursting events) is decreased in ECs when treated with cytokines that are elevated in PE. It is therefore expected that immune cells in culture with endothelial cells can have similar effects on Ca_{2+} bursting by secreting cytokines. Furthermore, immune cells can affect endothelial monolayer integrity by modifying gap junction communication, by adhering to endothelial cells, or by trans-endothelial migration across the monolayer.

Preliminary experiments using co-culture of Peripheral Blood Mononuclear Cells (PBMCs) and Human Umbilical Vein Endothelial Cells (HUVECs) have demonstrated decreased Ca_{2+} bursting in HUVECs. Confirmatory experiments with immune cell lines have shown that multiple immune cell types are responsible for decreased Ca_{2+} bursting (established with monocytes, natural killer and T-cells currently). The decrease in Ca_{2+} bursting in ECs in the presence of immune cells suggests that immune cells are capable of contributing to endothelial dysfunction.

Based on my preliminary experiments showing endothelial dysfunction in 'normal' HUVECs when cultured with increased numbers of 'normal' immune cells and the knowledge that preeclampsia is a highly inflammatory condition with 'abnormal' HUVECs (where pregnancy adaptation is suppressed) and an 'abnormal' immune cell profile, I hypothesize that the negative effects on endothelial function will be pronounced in preeclampsia. This will potentially be a consequence of increased direct immune cell-endothelial cell interaction and a pro-inflammatory cytokine profile.



Honors:

2018 In Training Investigator Poster Award for best poster at 65th Annual Meeting for the Society for Reproductive Investigation, San Diego, CA, 2018.

Exceptional Poster Award at Women's Health and Health Equity Research Symposium, University of Wisconsin – Madison, 2018.

Grants Received:

Endocrinology-Reproductive Physiology Research Supply Grant, University of Wisconsin, Madison, 2018.

Student Research Travel Grants (for Conference), University of Wisconsin, Madison, 2019.

Publications:

Aishwarya Rengarajan, Amanda K. Mauro, and Derek S. Boeldt. "Maternal disease and gasotransmitters." *Nitric Oxide* (2020).

National Presentations:

Poster presentation: **Aishwarya Rengarajan**, Ian Bird, Manish Patankar, Derek Boeldt (2019) Immune Cell Lines Induce Endothelial Dysfunction in Human Umbilical Vein Endothelial Cells (HUVECs), F-195, 66th Annual Meeting for the Society for Reproductive Investigation, Paris, France.

Poster presentation: Amanda Mauro, **Aishwarya Rengarajan**, Ian Bird, Derek Boeldt (2019) CLA Rescues VEGF-Inhibited Ca²⁺ Signaling While Preserving Monolayer Integrity in HUVECs, T-202, 66th Annual Meeting for the Society for Reproductive Investigation, Paris, France.

Poster presentation: **Aishwarya Rengarajan**, Ian Bird, Manish Patankar, Derek Boeldt (2018) Peripheral blood mononuclear cells (PBMC) induce endothelial dysfunction in Human Umbilical Vein Endothelial Cells (HUVEC), F-188, 65th Annual Meeting for the Society for Reproductive Investigation, San Diego, CA.

Other Presentations:

Poster presentation: **Aishwarya Rengarajan**, Ian Bird, Manish Patankar, Derek Boeldt. Immune Cell Lines Induce Endothelial Dysfunction in Human Umbilical Vein Endothelial Cells (HUVECs), UW Women's Health and Health Equity Symposium 2019.

Oral presentation: **Aishwarya Rengarajan**, Ian Bird, Manish Patankar, Derek Boeldt. Immune Cell Lines Induce Endothelial Dysfunction in Human Umbilical Vein Endothelial Cells (HUVECs), Endocrinology Reproductive Physiology Symposium 2019, Madison, WI.



Poster presentation: Amanda Mauro, **Aishwarya Rengarajan**, Ian Bird, Derek Boeldt. CLA Rescues VEGF-Inhibited Ca²⁺ Signaling While Preserving Monolayer Integrity in HUVECs, UW Women's Health and Health Equity Symposium 2019, Department of Obstetrics & Gynecology Research Day 2019, Endocrinology Reproductive Physiology Symposium 2019.

Oral presentation: **Aishwarya Rengarajan**, Derek Boeldt. Immune mediated Endothelial effects in Preeclampsia, Endocrinology Reproductive Physiology Seminar 2019, Madison, WI.

Poster presentation: **Aishwarya Rengarajan**, Ian Bird, Manish Patankar, Derek Boeldt. Peripheral blood mononuclear cells (PBMC) induce endothelial dysfunction in Human Umbilical Vein Endothelial Cells (HUVEC), UW Women's Health and Health Equity Symposium 2017, Department of Obstetrics & Gynecology Research Day 2018, UW Women's Health and Health Equity Symposium 2018, Endocrinology Reproductive Physiology Symposium 2018.

Oral presentation: **Aishwarya Rengarajan**, Derek Boeldt. Immune Cells Induce Endothelial Dysfunction in Human Umbilical Vein Endothelial Cells (HUVECs), Endocrinology Reproductive Physiology Seminar, Madison, WI, 2018.

Teaching and Mentorship:

Teaching Assistant: Advanced Responsible Conduct of Research for Biomedical Students (OBS&GYN 956), Spring 2019.

Mentored Qingyun Zou: Ca²⁺ imaging.

Mentored Daniel Adu, MD : Basic laboratory methods and cell culture techniques.

ERP Service:

ERP student committee member: 2017-present

ERP recruitment volunteer: 2018-present