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Major Professor: Bikash Pattnaik

Degree Objective: Ph.D. Endocrinology and Reproductive Physiology

Background: BS Biological Sciences, Univ MO Columbia.

Current Research Project:

Oxytocin (OXT) is a cyclic nonapeptide produced in the paraventricular and supraoptic nuclei of the hypothalamus. Although best known for its association with parturition and lactation, OXT also has numerous central and peripheral effects, including, but not limited to, the modulation of sexual and social behavior, influence over metabolic activity in adipose tissues, and skeletal muscle maintenance. We have shown that OXT is a potential mediator of retinal physiology given its localization to the cone photoreceptor extracellular matrix. Moreover, the oxytocin receptor (OXTR) is expressed in the retinal pigment epithelium (RPE), leading to our hypothesis that oxytocinergic signaling is a potential means for communication between cone photoreceptors and the RPE.

In addition to functional implications for the RPE, oxytocinergic signaling in the retina could have developmental implications. During the development of the retina, RPE cells are formed as part of the same neuroectoderm that give rise to retinal neurons. Within the retinal neuron structure, cone photoreceptors also develop early. This suggests that an oxytocinergic signaling pathway between the RPE and cone PR could be functioning during early development. OXT levels rise in the third trimester, a time when the final development of the retina and its vasculature are occurring. Lack of OXT exposure therefore could be a cause of worry for the prevalent blindness related to premature birth. Exploring this pathway further will not only provide insight into how the RPE is regulated but could have immediate clinical implications.

In the Pillers-Pattnaik lab I have the opportunity to explore this yet unstudied signaling mechanism in the eye. I hope to look at the direct implications of OXT's presence on the RPE in the context of an individual cell's physiological response, as well as the larger implications for the development and maintenance of the retinal vasculature. I have already begun this work and have been met with initial successes that I hope to build on. Using our lab's expertise in the physiology of vision, biochemical and electrophysiology techniques, as well as my own experience with ion channel biology, I will be able to expand our understanding of the retina and vision.

Honors:

2016 Eye Research Institute Travel Grant Winner – ARVO 2016

2016 ERP Oral Presentation Award

Grants Received:

Patent Pending:



Publications:

Wang Z., York N.W., Nichols C.G. and Remedi M.S. (2014) Pancreatic β Cell Dedifferentiation in Diabetes and Redifferentiation following Insulin Therapy. *Cell Metabolism*, May;19(5): 872-82

Halbach P., Pillers D.M., York N., Asuma M.P., Chiu M.A., Wenxiang L., Tokarz S., Bird I.M., Pattnaik B.R. (2015) Oxytocin signaling axis in the posterior retina: expression and functional detection. *IOVS*, February; 56(2): 751-760

Pattnaik B.R., Shahi P.K., Marino M.J., Liu X., York N., Brar S., Chiang J., Pillers D.M., Traboulsi E.L. (2015) A Novel KCNJ13 Nonsense Mutation and Loss of Kir7.1 Channel Function Causes Leber Congenital Amaurosis (LCA16). *Human Mutation*, July; 36(7): 720-727

Submitted Paper:

Thesis Defense and Resulting Publications:

National Presentations:

"Oxytocin inhibits the function of Kir7.1 ion channels"

- Pediatric Academic Societies Annual Meeting. San Diego, California. April 25, 2015

"Molecular Mechanisms of Oxytocinergic Signaling and its Inhibition of Kir7.1 in the RPE"

- Association for Vision and Ophthalmology Annual Meeting. Seattle, Washington. May 1, 2016

Other Presentations:

"P2Y₂ receptor signaling pathways are attenuated by *Helicobacter pylori* urease"

- Missouri Life Sciences Week. Columbia, Missouri. April 13, 2012.

"Regulation of Kir7.1 by Oxytocin in HEK-OXTR cells"

- McPherson Eye Research Institute Fall Poster Session

"Oxytocinergic Signaling in the Retinal Pigment Epithelium"

- 7th Annual MERI Vision Science Poster Session

Teaching and Mentorship:

Wisconsin Stem Cell Roundtable (WiSCR) Summer Undergraduate Research Fellowship Mentor (June 2014-September 2014)

Madison Middle School Science Symposium Mentor
(December 2013-May 2014; November 2014-May 2015)

ERP Service: