



2018 Annual Report

Division of Neonatology and Newborn Nursery

DIVISION DESCRIPTION

The Division of Neonatology and Newborn Nursery strives to promote the best health and well-being of all newborns. Our team cares for babies in the newborn nursery after a normal birth and babies in the neonatal intensive care unit who are critically ill, premature, or in need of special observation.

Our dynamic team has numerous research interests, which include chronic complications of prematurity, including lung and vision problems, acute kidney injury, congenital hypothyroidism, developmental biology (with a focus on congenital diaphragmatic hernia), nutrition in neonates (with special emphasis on iron metabolism and vitamin supplementation), palliative care, preventing perinatal brain injury, placental transfusion strategies, point-of-care ultrasound use in the NICU, quality improvement projects (e.g., antibiotic stewardship in the NICU, vision science, and neonatal global health).

2018 HIGHLIGHTS

- Undergraduate student Hailey Prosek (mentor: **Pamela Kling, MD**) received a 2018-2019 Hilldale Undergraduate/Faculty Research Fellowship from the University of Wisconsin-Madison.
- Medical student Mackenzie Carlson (mentor: **Ryan McAdams, MD**) received a Shapiro Summer Research Award for the project, "Investigating Viewpoints of Pregnant Mothers, Community Health Workers, and Doctors on Prenatal Care in Mukono, Uganda."
- **David McCulley, MD**, is a co-investigator on a new Program Project Grant from the National Institutes of Health, Eunice Kennedy Shriver National Institute of Child Health and Human Development (NIH-NICHD), "Gene Mutation and Rescue in Human Diaphragmatic Hernia" (principal investigator: Patricia Donahoe, MD, Massachusetts General Hospital). He will create and analyze new conditional mouse alleles using CRISPR/Cas9 technology as part of the project's focus on evaluating lung and pulmonary vascular phenotypes that result from deletion of genes implicated by genetic and genomic analyses of patients with congenital diaphragmatic hernia (CDH).

Dr. McCulley also received the 2018 Associate Member Outstanding Publication Award for Pediatrics at the 2018 Perinatal Research Society meeting for the following paper: **McCulley DJ**, Wienhold MD, Hines EA, Hacker TA, Rogers A, Pewowaruk RJ, Zewdu R, Chesler NC, Selleri L, Sun X. PBX transcription factors drive pulmonary vascular adaptation to birth. *J Clin Invest*. 2018 Feb 1;128(2):655-667. doi: 10.1172/JCI93395. PMID: 29251627.

- **Bikash Pattnaik, PhD**, received a two-year, \$250,000 research grant from Ateres Avigail for his project, "Restoration of Potassium Channel Function Using Mouse Models of Lebers Congenital Amaurosis (LCA16) as a Means to Treat Retinal Channelopathies." This project will use mouse models

to deliver lentiviral and adenoviral gene-therapy during early, middle and late stages of development targeted to retina pigment epithelium (RPE) apical processes.

Dr. Pattnaik is also a co-principal investigator on a two-year UW2020 grant, "Gene Editing Nanomedicines to Correct Pathogenic Mutations in Retinal Pigmented Epithelium," led by Krishanu Saha, PhD (Biomedical Engineering). In this WARF Discovery Initiative project, the team will use advances in biomaterials to generate nonviral, synthetic nanocarriers of CRISPR-Cas9 gene editing machinery for targeted delivery to the retinal pigmented epithelium (RPE) that surrounds the retina.

In addition, two learners in Dr. Pattnaik's lab received awards:

- Postdoctoral fellow **Pawan Shahi, PhD**, received a UW-Madison Stem Cell and Regenerative Medicine Center post-doctoral award to support his research to model compound heterozygous blindness using novel gene-editing technology; and a McPherson ERI/David G. Walsh Research Travel Award to present "Rescue of Kir7.1 Function by Gene Augmentation in LCA16 Patient Derived iPSC-RPE Cells" at the Association for Research in Vision and Ophthalmology Annual Meeting.
- Graduate research assistant **Katie Beverley** was selected as a trainee on the National Institutes of Health-funded T32 Endocrinology & Reproductive Physiology (ERP) Training Grant, directed by Ian Bird, PhD (Obstetrics and Gynecology).

Finally, the UW-Madison Office of the Secretary of the Faculty's Committee on Committees appointed Dr. Pattnaik to a one-year term on the Dean of Students Advisory Committee.

- **Jasmine Zapata, MD, MPH**, was selected as a University of Wisconsin School of Medicine and Public Health (SMPH) Centennial Scholar. She will receive three years of 50 percent protected time to complete scholarly activities related to maternal child health disparities research.

Dr. Zapata also received a two-year, \$150,000 New Investigator Grant from the Partnership Education and Research Committee (PERC) of the Wisconsin Partnership Program to support the project, "Addressing Black Infant Mortality in Wisconsin through a Collaborative Health Equity Approach to Community-Based, Group Prenatal Care and Infant Support." The project aims to reduce current birth outcome inequities in Wisconsin through models of prenatal care that are community driven, group based, culturally relevant, family centered, and include enhanced social support.

- Division faculty received the following research grant awards from the UnityPoint Health–Meriter Foundation:
 - **Eileen Cowan, MD**, and **Adam Bauer, MD**, received a one-year, \$63,236 grant for their project, "Point of Care Ultrasound Use in the NICU."
 - **Elizabeth Goetz, MD**, received \$5,000 to support a multidisciplinary education session for health care professionals at UnityPoint Health-Meriter and community stakeholders in Dane County about identifying and caring for victims of human trafficking.
 - **Elizabeth Goetz, MD**, and **Dinushan Kaluarachchi, MD**, received \$27,046 for their project, "Oxygen Saturation Profiles in Healthy Term Neonates."
 - **Matthew Harer, MD**, received \$40,000 for his project, "Use of NIRS Monitoring to Detect Acute Kidney Injury in Preterm Neonates."

- **Pamela Kling, MD**, received \$48,979 for her project, "Impact of Prenatal Depression and Anxiety on Iron-Mediated Inflammatory Pathways in Infant Behavior and Brain Development."
- **Ryan McAdams, MD**, and **Jasmine Zapata, MD, MPH**, received \$97,986 for their project, "A Pregnancy, Birth, and Lactation Support Program to Increase Exclusive Breastfeeding Rates in African American Women."
- **Bikash Pattnaik, PhD**, received a one-year, \$30,000 grant for his project, "Retinopathy of Prematurity due to Oxytocin Deprivation."

RECENT PUBLICATIONS

Aboualizadeh E, **Sorenson CM**, Schofield AJ, Unger M, Sheibani N, Hirschmugl CJ. Temporal diabetes-induced biochemical changes in distinctive layers of mouse retina. *Sci Rep*. 2018 Jan 18;8(1):1096. doi: 10.1038/s41598-018-19425-8. PubMed PMID: 29348593; PubMed Central PMCID: PMC5773523.

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** Publication had previously appeared in 2017 report as an ePub

GRANT SUPPORT

Principal Investigator	Sponsor	Title	Co-Investigators
Cowan, Eileen A	Meriter Foundation	Point of care ultrasound use in the neonatal intensive care unit	Neonatology: Adam Bauer
Harer, Matthew	Meriter Foundation	Use of NIRS monitoring to detect acute kidney injury in preterm neonates	
Kling, Pamela J	National Institutes of Health (NIH) & University of North Carolina-Chapel Hill	Prenatal alcohol exposure disrupts maternal-fetal iron metabolism in fetal alcohol spectrum disorders	
Kling, Pamela J	Wisconsin Alumni Research Foundation	Cellular signaling and disordered nephrogenesis during intrauterine growth restriction	
Coe, Christopher (UW Department of Psychology)	National Institutes of Health (NIH) & University of Minnesota	Detection and correction of iron deficiency induced abnormal brain metabolism	Neonatology: Pamela Kling
McCulley, David J	National Institutes of Health (NIH) & Massachusetts General Hospital	Gene mutation and rescue in diaphragmatic hernia	
McCulley, David J	Institute for Clinical & Translational Research (UW-ICTR)	Targeted treatment for pulmonary hypertension associated with congenital diaphragmatic hernia	
McCulley, David J	Institute for Clinical & Translational Research (UW-ICTR)	Congenital diaphragmatic hernia: genetic mechanisms of pulmonary hypoplasia and pulmonary hypertension	

Mezu-Ndubuisi, Olachi	Shire Human Genetic Therapies	Long-term outcome of children enrolled in study ROPP-2008-01 previously treated with rhIGF-1/rhIGFBP-3 for the prevention of retinopathy of prematurity or who received standard neonatal care	
Mezu-Ndubuisi, Olachi	Meriter Foundation	Monitoring predictors of chronic lung disease and length of stay - lessons learned	
Pattnaik, Bikash R	National Institutes of Health (NIH)	Molecular therapies for Lebers Congenital Amaurosis caused by KCNJ13 mutations	
Pattnaik, Bikash R	Meriter Foundation	Retinopathy of prematurity due to oxytocin deprivation	
Pattnaik, Bikash R	Ateres Avigail	Restoration of potassium channel function using mouse models of LCA16 as a means to treat retinal channelopathies	
Ikeda, Akihiro (UW Department of Medical Genetics)	National Institutes of Health (NIH)	Molecular genetics of age-dependent retinal degeneration	Neonatology: Bikash Pattnaik
Gamm, David (UW Department of Ophthalmology and Visual Sciences)	National Institutes of Health (NIH) & University of Iowa	Disease mechanisms in Best disease	Neonatology: Bikash Pattnaik
Nickells, Robert (UW Department of Ophthalmology and Visual Sciences)	DOD, Army & University of Pittsburgh	A comprehensive approach to whole eye transplantation: Building a scientific foundation for new therapies in vision restoration	Neonatology: Bikash Pattnaik
Sheibani, Nader (UW Department of Ophthalmology and Visual Sciences)	National Institutes of Health (NIH)	Novel antiangiogenic peptides for treatment of exudative AMD	Neonatology: Bikash Pattnaik, Christine Sorenson
Saha, Krishanu (Wisconsin Institutes for Discovery)	National Institutes of Health (NIH)	Single cell profiling to define biomarkers of photoreceptor dysfunction after gene editing within iPSC-derived organoids	Neonatology: Bikash Pattnaik

Sheibani, Nader (UW Department of Ophthalmology and Visual Sciences)	Research to Prevent Blindness	Targeting metabolic stress in retinal pericytes for treatment of diabetic retinopathy	Neonatology: Christine Sorenson
Sheibani, Nader (UW Department of Ophthalmology and Visual Sciences)	National Institutes of Health (NIH) & Northwestern University	Investigating oxygen metabolism in diabetic retinopathy	Neonatology: Christine Sorenson
Sheibani, Nader (UW Department of Ophthalmology and Visual Sciences)	Environmental Protection Agency	Human models for analysis of pathways (Human MAPs) center	Neonatology: Christine Sorenson
Zapata, Jasmine	University of Wisconsin, School of Medicine & Public Health	Centennial scholar	