Pediatrics 2017 Annual Report – Division Highlights

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, 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.

2017 HIGHLIGHTS

- Nathaniel York, a graduate student in the laboratory of **Bikash Pattnaik, PhD**, received a one-year, $3,000 Endocrinology and Reproductive Physiology Program (ERP) Student Research Grant from the University of Wisconsin School of Medicine and Public Health for his project, "Characterization of Oxytocin Receptor in the RPE."

  York was also selected as a trainee on the National Institutes of Health-funded T32 Endocrinology & Reproductive Physiology (ERP) Training Grant, directed by Ian Bird, PhD, in the UW-Madison Endocrinology & Reproductive Physiology Program.

- **Pamela Kling, MD**, received a one-year, $59,875 Fall Competition award from the UW Office of the Vice Chancellor for Research and Graduate Education for her project, "Cellular Signaling and Disordered Nephrogenesis during Intrauterine Growth Restriction."

  James Gannon, an undergraduate student mentored by Dr. Kling and Allison Pollock, MD, received a 2017-2018 University of Wisconsin Hilldale Undergraduate/Faculty Research Fellowship.

- **Olachi Mezu-Ndubuisi, MD, OD**, was selected for the Histochemical Society (HSC) award for her abstract, "Spectral Domain Optical Coherence Tomography correlates Retinal Thinning to Retinal Vascular Development in an In vivo Mouse Model of Retinopathy of Prematurity." She also received a $1,000 travel grant for the Experimental Biology April 2017 meeting.

- **Christine Sorenson, PhD,** received the title of Distinguished Scientist by the UW School of Medicine and Public Health, in recognition of her pivotal role in helping to strengthen the reputation of the university.

RECENT PUBLICATIONS

Aboualizadeh E, Ranji M, **Sorenson CM**, Sepehr R, Sheibani N, Hirschmugl CJ. Retinal oxidative stress at the onset of diabetes determined by synchrotron FTIR widefield imaging: towards diabetes pathogenesis.

Analyst. 2017 Mar 27;142(7):1061-1072. doi: 10.1039/c6an02603f. PubMed PMID: 28210739; PubMed Central PMCID: PMC5388248.

Alvarez RE, Boeldt DS, **Pattnaik BR**, Friedman HL, Bird IM. Pregnancy-adapted uterine artery endothelial cell Ca2+ signaling and its relationship with membrane potential. Physiol Rep. 2017 Nov;5(21). pii: e13452. doi: 10.14814/phy2.13452. PubMed PMID: 29122954; PubMed Central PMCID: PMC5688774.

Dharmarajan S, Fisk DL, **Sorenson CM**, Sheibani N, Belecky-Adams TL. Microglia activation is essential for BMP7-mediated retinal reactive gliosis. J Neuroinflammation. 2017 Apr 5;14(1):76. doi: 10.1186/s12974-017-0855-0. PubMed PMID: 28381236; PubMed Central PMCID: PMC5382432.

Falero-Perez J, Park S, **Sorenson CM**, Sheibani N. PEDF expression affects retinal endothelial cell proangiogenic properties through alterations in cell adhesive mechanisms. Am J Physiol Cell Physiol. 2017 Oct 1;313(4):C405-C420. doi: 10.1152/ajpcell.00004.2017. Epub 2017 Jul 26. PubMed PMID: 28747334; PubMed Central PMCID: PMC5668572.

Farnoodian M, Wang S, Dietz J, Nickells RW, **Sorenson CM**, Sheibani N. Negative regulators of angiogenesis: important targets for treatment of exudative AMD. Clin Sci (Lond). 2017 Jul 5;131(15):1763-1780. doi: 10.1042/CS20170066. Print 2017 Aug 1. Review. PubMed PMID: 28679845.

Ha B, O'Sullivan DL, Diamond CA, Plumb AJ, Sleeth JS, Greer FR, **Kling PJ.** Improving rates of screening for anemia in infancy. Clin Pediatr (Phila). 2017 Nov 1:9922817744608. doi: 10.1177/0009922817744608. [Epub ahead of print] PubMed PMID: 29183146. *

Harer MW, Pope CF, Conaway MR, Charlton JR. Follow-up of Acute kidney injury in Neonates during Childhood Years (FANCY): a prospective cohort study. Pediatr Nephrol. 2017 Jun;32(6):1067-1076. doi: 10.1007/s00467-017-3603-x. Epub 2017 Mar 3. PubMed PMID: 28255805.

Harer MW, Vergales B, Cady T, Early A, Chisholm C, Swanson JR. Implementation of a multidisciplinary guideline improves preterm infant admission temperatures. J Perinatol. 2017 Nov;37(11):1242-1247. doi: 10.1038/jp.2017.112. Epub 2017 Jul 20. PubMed PMID: 28726791.

Helfrich KK, Saini N, **Kling PJ**, Smith SM. Maternal iron nutriture as a critical modulator of FASD risk in alcohol-exposed pregnancies. Biochem Cell Biol. 2017 Oct 10. doi: 10.1139/bcb-2017-0206. [Epub ahead of print] PubMed PMID: 29017023. *

Jamali N, **Sorenson CM**, Sheibani N. Vitamin D and regulation of vascular cell function. Am J Physiol Heart Circ Physiol. 2017 Dec 22. doi: 10.1152/ajpheart.00319.2017. [Epub ahead of print] PubMed PMID: 29351464. *

Jamali N, Wang S, Darjatmoko SR, **Sorenson CM**, Sheibani N. Vitamin D receptor expression is essential during retinal vascular development and attenuation of neovascularization by 1, 25(OH)2D3. PLoS One. 2017 Dec 22;12(12):e0190131. doi: 10.1371/journal.pone.0190131. eCollection 2017. PubMed PMID: 29272316; PubMed Central PMCID: PMC5741250.

Kaluarachchi DC, Colaizy TT, Pesce LM, Tansey M, Klein JM. Congenital hypothyroidism with delayed thyroid-stimulating hormone elevation in premature infants born at less than 30 weeks gestation. J Perinatol. 2017 Mar;37(3):277-282. doi: 10.1038/jp.2016.213. Epub 2016 Dec 1. PubMed PMID: 27906195.

Kardon G, Ackerman KG, **McCulley DJ**, Shen Y, Wynn J, Shang L, Bogenschutz E, Sun X, Chung WK. Congenital diaphragmatic hernias: from genes to mechanisms to therapies. Dis Model Mech. 2017 Aug

1;10(8):955-970. doi: 10.1242/dmm.028365. Review. PubMed PMID: 28768736; PubMed Central PMCID: PMC5560060.

Katheria AC, Lakshminrusimha S, Rabe H, **McAdams R**, Mercer JS. Placental transfusion: a review. J Perinatol. 2017;37(2):105-111. doi:10.1038/jp.2016.151.

Kranch-Shorthouse RA, Bauer AS, Magness RR, Lopez GE, Segar JL, Blohowiak SE, **Kling PJ**. Ovine uterine space restriction causes dysregulation of the renin-angiotensin system in fetal kidneys. Biol Reprod. 2017 Jan 1;96(1):211-220. doi: 10.1095/biolreprod.116.140079. PubMed PMID: 28395333.

Lavine JA, Farnoodian M, Wang S, Darjatmoko SR, Wright LS, Gamm DM, Ip MS, **Sorenson CM**, Sheibani N. β2-adrenergic receptor antagonism attenuates CNV through inhibition of VEGF and IL-6 expression. Invest Ophthalmol Vis Sci. 2017 Jan 1;58(1):299-308. doi: 10.1167/iovs.16-20204. PubMed PMID: 28114591; PubMed Central PMCID: PMC5256681.

Li H, Liu W, **Sorenson CM**, Sheibani N, Albert DM, Senanayake T, Vinogradov S, Henkin J, Zhang HF. Sustaining intravitreal residence with L-Arginine peptide-conjugated nanocarriers. Invest Ophthalmol Vis Sci. 2017 Oct 1;58(12):5142-5150. doi: 10.1167/iovs.17-22160. PubMed PMID: 28986592; PubMed Central PMCID: PMC5634351.

Liu W, Wang S, Soetikno B, Yi J, Zhang K, Chen S, Linsenmeier RA, **Sorenson CM**, Sheibani N, Zhang HF. Increased retinal oxygen metabolism precedes microvascular alterations in Type 1 diabetic mice. Invest Ophthalmol Vis Sci. 2017 Feb 1;58(2):981-989. doi: 10.1167/iovs.16-20600. PubMed PMID: 28535269; PubMed Central PMCID: PMC5308771.

Liu X, Fu Y, Yang H, Mavlyutov T, Li J, McCurdy CR, Guo LW, **Pattnaik BR**. Potential independent action of sigma receptor ligands through inhibition of the Kv2.1 channel. Oncotarget. 2017 Jul 26;8(35):59345-59358. doi: 10.18632/oncotarget.19581. eCollection 2017 Aug 29. PubMed PMID: 28938641; PubMed Central PMCID: PMC5601737.

McAdams RM, Fay E, Delaney S. Whole blood volumes associated with milking intact and cut umbilical cords in term newborns. J Perinatol. 2017 Dec 12. doi: 10.1038/s41372-017-0002-x. [Epub ahead of print] PubMed PMID: 29234147. *

McAdams RM, Fleiss B, Traudt C, Schwendimann L, Snyder JM, Haynes RL, Natarajan N, Gressens P, Juul SE. Long-term neuropathological changes associated with cerebral palsy in a nonhuman primate model of hypoxic-ischemic encephalopathy. Dev Neurosci. 2017;39(1-4):124-140. doi: 10.1159/000470903. Epub 2017 May 10. PubMed PMID: 28486224; PubMed Central PMCID: PMC5519434.

McAdams RM, McPherson RJ, Kapur RP, Juul SE. Focal brain injury associated with a model of severe hypoxic-ischemic encephalopathy in nonhuman primates. Dev Neurosci. 2017;39(1-4):107-123. doi: 10.1159/000456658. Epub 2017 Mar 25. PubMed PMID: 28343228; PubMed Central PMCID: PMC5519439.

McAdams RM. Artist's statement: In the face of hunger. Acad Med. 2017 Aug;92(8):1121. doi: 10.1097/ACM.0000000000001795. PubMed PMID: 28742572.

McAdams RM. Ileal atresia and multiple jejunal perforations in a premature neonate with gestational alloimmune liver disease. J Pediatr Surg Case Reports. 2017; Vol. 19, p48–51.

Mezu-Ndubuisi OJ, Taylor LK, Schoephoerster JA. Simultaneous fluorescein angiography and spectral domain optical coherence tomography correlate retinal thickness changes to vascular abnormalities in an in vivo mouse model of retinopathy of prematurity. J Ophthalmol. 2017;2017:9620876. doi:

10.1155/2017/9620876. Epub 2017 May 10. PubMed PMID: 28573047; PubMed Central PMCID: PMC5442435.

Phillips MJ, Jiang P, Howden S, Barney P, Min J, York NW, Chu LF, Capowski EE, Cash A, Jain S, Barlow K, Tabassum T, Stewart R, **Pattnaik BR**, Thomson JA, Gamm DM. A novel approach to single cell RNA-sequence analysis facilitates in silico gene reporting of human pluripotent stem cell-derived retinal cell types. Stem Cells. 2017 Dec 12. doi: 10.1002/stem.2755. [Epub ahead of print] PubMed PMID: 29230913. *

Rolnick K, Buck S, Mezu-Nnabue K, Eickhoff J, Esenwah E, **Mezu-Ndubuisi OJ**. Influence of socio-economic status and educational achievement on cataract formation in a rural community in Imo State, South-Eastern Nigeria. Cogent Medicine. 2017;4(1), 1326212. https://doi.org/10.1080/2331205X.2017.1326212.

Saghiri MA, Asatourian A, Gurel Z, **Sorenson CM**, Sheibani N. Bcl-2 expression is essential for development and normal physiological properties of tooth hard tissue and saliva production. Exp Cell Res. 2017 Sep 15;358(2):94-100. doi: 10.1016/j.yexcr.2017.06.004. Epub 2017 Jun 10. PubMed PMID: 28610838; PubMed Central PMCID: PMC5771443.

Shah N, Rauenzahn S, Veltri L, Wen S, Craig M, Hamadani M, Kanate AS, Cumpston A. Long-term outcomes after thiotepa-based high-dose therapy (HDT) and autologous hematopoietic cell transplantation (auto-HCT) in non-Hodgkin lymphoma (NHL). Bone Marrow Transplant. 2017 Feb;52(2):321-322. doi: 10.1038/bmt.2016.275. Epub 2016 Nov 28. PubMed PMID: 27892948.

Shahi PK, Liu X, Aul B, Moyer A, Pattnaik A, Denton J, Pillers DM, **Pattnaik BR**. Abnormal electroretinogram after Kir7.1 channel suppression suggests role in retinal electrophysiology. Sci Rep. 2017 Sep 6;7(1):10651. doi: 10.1038/s41598-017-11034-1. PubMed PMID: 28878288; PubMed Central PMCID: PMC5587531.

Wang S, Zaitoun IS, Johnson RP, Jamali N, Gurel Z, Wintheiser CM, Strasser A, Lindner V, Sheibani N, **Sorenson CM**. Bim expression in endothelial cells and pericytes is essential for regression of the fetal ocular vasculature. PLoS One. 2017 May 26;12(5):e0178198. doi: 10.1371/journal.pone.0178198. eCollection 2017. PubMed PMID: 28552963; PubMed Central PMCID: PMC5446173.

Yang H, Fu Y, Liu X, Shahi PK, Mavlyutov TA, Li J, Yao A, Guo SZ, **Pattnaik BR**, Guo LW. Role of the sigma-1 receptor chaperone in rod and cone photoreceptor degenerations in a mouse model of retinitis pigmentosa. Mol Neurodegener. 2017 Sep 19;12(1):68. doi: 10.1186/s13024-017-0202-z. PubMed PMID: 28927431; PubMed Central PMCID: PMC5606113.

York N, Halbach P, Chiu MA, Bird IM, Pillers DM, **Pattnaik BR**. Oxytocin (OXT)-stimulated inhibition of Kir7.1 activity is through PIP(2)-dependent Ca(2+) response of the oxytocin receptor in the retinal pigment epithelium in vitro. Cell Signal. 2017 Sep;37:93-102. doi: 10.1016/j.cellsig.2017.06.005. Epub 2017 Jun 8. PubMed PMID: 28603013; PubMed Central PMCID: PMC5554455.

Zhao L, Li J, Fu Y, Zhang M, Wang B, Ouellette J, Shahi PK, **Pattnaik BR**, Watters JJ, Wong WT, Guo LW. Photoreceptor protection via blockade of BET epigenetic readers in a murine model of inherited retinal degeneration. J Neuroinflammation. 2017 Jan 19;14(1):14. doi: 10.1186/s12974-016-0775-4. PubMed PMID: 28103888; PubMed Central PMCID: PMC5248448.

**ePub only; no print citation available when report was compiled*

GRANT SUPPORT

Faculty/Role	Funding Agency	Title
Kling, Pamela J (PI)	Gerber Foundation	Impact of obesity during pregnancy on neonatal iron status and programming of inflammatory response patterns
Kling, Pamela J (PI)	University Of North Carolina at Chapel Hill	Prenatal alcohol exposure disrupts maternal-fetal iron metabolism in FASD
Kling, Pamela J (PI) with Harer, Matthew W (co-I)	Meriter Foundation	Recombinant erythropoietin as a renal protective agent in prematurity
Kling, Pamela J (PI)	Wisconsin Alumni Research Foundation	Cellular signaling and disordered nephrogenesis during intrauterine growth restriction
Kling, Pamela J (co-I) with Coe, Christopher (PI)	NIH/NICHD & University of Minnesota	Detection and correction of iron deficiency induced abnormal brain metabolism
Limjoco, Jamie J (PI)	UW Health	Establishing a regional virtual neonatal intensive care unit (vNICU) at the American Family Children's Hospital
McCulley, David J (PI)	Massachusetts General Hospital	Gene mutation and rescue in diaphragmatic hernia
McCulley, David J (PI)	UWF - UW Medical Foundation	Congenital diaphragmatic hernia: genetic mechanisms of pulmonary hypoplasia and pulmonary hypertension
McCulley, David J (PI)	UWHC	Targeted treatment for pulmonary hypertension associated with congenital diaphragmatic hernia
McCulley, David (co-I) with Sun, Xin (PI) and Gern, James E (co-I)	UWF - Wisconsin Partnership - MERC	Zooming in on childhood asthma: disease causality and personalized medicine
Mezu-Ndubuisi, Olachi (PI)	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 (PEDAL)
Mezu-Ndubuisi, Olachi (PI)	Meriter Foundation	Monitoring predictors of chronic lung disease and length of stay - lessons learned
Pattnaik, Bikash R (PI) with Pillers, De-Ann (co-I)	DHHS, PHS, National Institutes of Health	Molecular therapies for Lebers Congenital Amaurosis caused by KCNJ13 mutations
Pattnaik, Bikash R (PI)	Meriter Foundation	Specificity of oxytocin induced retinopathy
Pattnaik, Bikash R (PI)	UW - ERP	Student research grant
Pattnaik, Bikash R (co-I) with Gamm, David (PI)	DHHS, PHS, National Institutes of Health and University of Iowa	Disease mechanisms in Best disease
Pattnaik, Bikash R (co-I) with Guo, Lianwang (PI)	NIH/NEI	Sigma-1 chaperone-mediated in vivo neuroprotection in the retina
Pattnaik, Bikash R (co-I) with	DOD, Army & University of	A comprehensive approach to whole

Nickells, Robert (PI)	Pittsburgh	eye transplantation: building a scientific foundation for new therapies in vision restoration
Pattnaik, Bikash R (co-I) with Sheibani, Nader (PI)	NIH/NEI	Novel antiangiogenic peptides for treatment of exudative AMD
Pillers, De-Ann M (PI)	Gerber Foundation	Optimizing intravenous protein nutrition in premature infants using urine metabolomics
Pillers, De-Ann M (PI)	Meriter Foundation	Molecular effect of caffeine therapy on lung disease in the premature infant
Sorenson, Christine M (co-PI) with Blodi, Barbara (co-PI)	Department of Ophthalmology & Visual Sciences/Research to Prevent Blindness	Bim deficiency and anti-VEGF resistance in exudative AMD
Sorenson, Christine M (co-I) with Murphy, William (PI)	Environmental Protection Agency (EPA)	Human models for analysis of pathways (Human MAPs) center
Sorenson, Christine M (co-I) with Sheibani, Nader (PI)	Genentech	Diabetic retinopathy collaborative research project
Sorenson, Christine M (co-I) with Sheibani, Nader (PI)	NIH/NEI	Novel antiangiogenic peptides for treatment of exudative AMD
Sorenson, Christine M (co-I) with Sheibani, Nader (PI)	NIH/NEI & Northwestern University	Investigating oxygen metabolism in diabetic retinopathy
Sorenson, Christine M (co-I) with Sheibani, Nader (PI)	Research to Prevent Blindness	Targeting metabolic stress in retinal pericytes for treatment of diabetic retinopathy
Sorenson, Christine M (co-I) with Sun, Xin (PI)	DHHS, PHS, National Institutes of Health	FGF signaling in lung maturation and response to injury