2013 Research Annual Report

Ophthalmology

Division Details

Division Data Summary

**RESEARCH AND TRAINING DETAILS**

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**CLINICAL ACTIVITIES AND TRAINING**

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**Significant Accomplishments**

**A link between fetal light exposure and retinopathy of prematurity**

In a multidisciplinary collaboration between basic scientists and clinicians, members of Pediatric Ophthalmology showed that light exposure during pregnancy is a risk factor for severe retinopathy of prematurity. A study published in *Nature* in February 2013 by researchers in the laboratory of Richard Lang, PhD, and David Copenhagen, PhD, University of California, San Francisco, first showed that a light response in the fetal eye of mice regulates the number of retinal neurons and, in turn, the pattern of retinal vascularization. Taking his cue from this biology, Michael Yang, MD, published an analysis in *Ophthalmology* that shows reduced light exposure during the first trimester is strongly associated with severe forms of retinopathy of prematurity. These findings may suggest that many cases of retinopathy of prematurity could be prevented if newly pregnant mothers received sufficient daily light exposure.

**Eye Genetics Clinic Launched**

In October 2012, Pediatric Ophthalmology and Human Genetics established a joint clinic to evaluate and diagnose patients with rare and novel genetic eye disorders. The clinic evaluation and diagnosis side is led by Constance West, MD, Director of Pediatric Ophthalmology, and Howard Saal, MD, Director of Clinical Genetics and Cytogenetics. They are assisted by Virginia Utz, MD, and Robert Hufnagel, MD, PhD. Additional staff includes fellows, residents, genetic counselors, and research coordinators. So far, the Eye Genetics Clinic has provided formal evaluations for more than 20 families. Patients are evaluated by ocular examination, modern imaging, color vision analysis, electrophysiology and clinical genetic testing. The genetic research aspect of
the clinic is led by Zubair Ahmed, PhD, Associate Professor of Pediatric Ophthalmology and Human Genetics. With the goal of describing novel diseases and uncovering new disease genes, 70 individuals have been enrolled in Ahmed’s research. Identification of novel disease genes will provide new questions for research in animal model systems, to be answered in research labs of the Visual Systems Group led by Richard Lang, PhD. The group studies the mechanisms of familial ocular disease to identify therapeutic targets and test novel treatments.

**Research Highlights**

**Zubair Ahmed, PhD**

Zubair Ahmed’s lab continued to investigate the molecular and genetic basis of Usher syndrome and oculocutaneous albinism (OCA) by utilizing human, mouse and zebrafish genetics. In collaboration with the Human Genetic Division, Dr. Ahmed’s lab and Ophthalmology Division clinicians have established a specialized EyeGenetic Clinic at Cincinnati Children’s to provide contemporary clinical and genetic diagnostic facilities. In the past year, work from Dr. Ahmed’s lab was presented at the Association for Research in Otolaryngology (ARO) annual meeting and the Gordon Research Conference (GRC) on Auditory Systems.

**Tiffany Cook, PhD**

Dr. Cook’s research continues to explore evolutionarily conserved processes underlying retina and lens formation. Her group has made important advances in understanding into how the decision to become neuronal (retina) vs. non-neuronal (lens) is made during development. In addition, Dr. Cook’s retina research has provided mechanistic insight into how the various light-sensing photoreceptor cells are generated and maintained. This work has implications for developing better diagnostic and therapeutic tools for retinal degenerative diseases. Last year, Dr. Cook presented her work at the University of Georgia, the University of Kentucky, and members of her laboratory received awards at the Association for Research in Vision & Ophthalmology Annual Conferences, and the Midwest Society for Developmental Biology Meeting.

**Fumika Hamada, PhD**

Dr. Hamada’s laboratory studies circadian rhythm of body temperature (body temperature rhythm). Body temperature rhythm is critical for the maintenance of homeostasis functions, such as metabolic energy generation and sleep. Her lab progress has been remarkable as their work reveals the hitherto unknown molecular mechanisms underlying body temperature rhythm and has led to the first identification of a molecule that links circadian clock to body temperature rhythm. Dr. Hamada has presented her work at Cold Spring Harbor, Janelia Farm and SRBR (The Society for Research on Biological Rhythms) meeting.

**Sarah Lopper, OD**

Dr. Lopper is a Team Member of the Uveitis Task Force with the Division of Rheumatology. This task force has been working on various educational tools and a reporting system for area eye care providers. They recently published the updated “Best evidence statement (BEST) for Screening for uveitis in children with juvenile idiopathic arthritis (JIA)” in the National Guideline Clearinghouse (an agency of the US Department of Health & Human Services that is an online resource for evidence-based clinical practice guidelines). She is also part of the clinical team that is working on the Divisional outcomes goal for Juvenile Idiopathic Arthritis (JIA) disease and the percentage of JIA patients without active uveitis. Dr. Lopper is a volunteer clinician at the Cincinnati Association for the Blind and Visually Impaired. Her current research includes examining the interactions of visual characteristics of school-aged visually impaired children, validating a functional low vision clinic model
and describing predictors for success with reading in these children.

Kelly E. Lusk, PhD, CLVT

Dr. Lusk is the Director of Education and Research for the Cincinnati Children’s Vision Rehabilitation Program (CCVRP), a clinical low vision service delivery program serving children (ages 3-22) with low vision. Current collaborative efforts in research within Cincinnati Children’s include the Aaron W. Perlman Center, the Division of Neonatology and Pulmonary Biology, and the Pediatric Neuroimaging Research Consortium.

W. Walker Motley, MS, MD

Dr. Motley is the Director of the Cincinnati Children’s Clinical Fellowship in Pediatric Ophthalmology and Adult Strabismus. Dr. Motley has continued his work in improving physician education in Cincinnati-based collaboration with adult eye surgeons in nine countries. Dr. Motley’s co-authored two peer-reviewed publications in the area eye surgery training. Dr. Motley also continued clinical research on eye disease affecting individual with Down syndrome and other developmental disabilities. Dr. Motley was elected to serve as the Secretary-Treasurer of the Ohio Ophthalmological Society. Dr. Motley was selected to participate in the competitive Leadership Development Program of the American Academy of Ophthalmology.

Michael B. Yang, MD

Dr. Yang’s research focus is on retinopathy of prematurity (ROP). His recent clinical research suggested an association between length of day during early gestation (i.e. season of conception) and the subsequent development of ROP during late gestation in premature infants. This work, performed in collaboration with Dr. Lang and colleagues, complements Dr. Lang’s findings on the effect of light and melanopsin on vascular development in the eyes of fetal mice and was presented at two national meetings this past year. Under Dr. Yang’s leadership, the division has also begun data collection for the G-ROP (Growth for ROP) Multicenter Study which evaluates weekly weight gain after birth in premature infants as a predictor of ROP outcome. The goal of the G-ROP study is to develop a highly accurate model of ROP outcome that allows a reduction in the number of screening eye examinations that have to be performed on premature infants to detect the small number of infants who develop severe ROP. As a member of the Ophthalmic Technology Assessment Committee of the American Academy of Ophthalmology, Dr. Yang co-authored a paper assessing the accuracy of rebound tonometry for the measurement of intraocular pressure.

Significant Publications


This study describes the identification of a novel gene (CIB2; calcium and integrin binding protein 2) causing autosomal recessive non-syndromic hearing impairment as well as the Usher syndrome 1J (USH1J). Causative mutations in the CIB2 were found in 56 families segregating non-syndromic deafness (DFNB48). Moreover a causative CIB2 mutation was present in one family segregating Usher syndrome (USH1J). This study provides genetic and functional data from human, wild type mouse, zebrafish and Drosophila CIB2 orthologs. Taken together our genetic and functional studies indicate that CIB2 is essential for the development, maintenance and normal receptor potential currents of sensory hair cells and for the photoreceptor function.

The ophthalmology surgical competency assessment rubric for strabismus surgery (OSCAR) assessment tool was designed and validated by the authors and subsequently adopted by the International Council on Ophthalmology as the recommended assessment tool for resident training. Following this publication, we completed additional work to further validate the OSCAR assessment tool. New data will be presented at the American Academy of Ophthalmology meeting in November.


In this study, we uncovered a light response pathway in the fetal eye. This pathway uses the atypical opsin melanopsin to regulate and number of neurons that develop and ultimately, the pattern of vascular development in the eye. An unusual feature of this response is that it occurs while the fetus is still gestating and relies on light that passes through the body wall of the mother. Though this study was performed using mice, it is likely that this same pathway is important for human fetal development.

**Division Publications**


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**Faculty, Staff, and Trainees**

**Faculty Members**

**Constance E. West, MD,** Associate Professor  
**Leadership** Division Director

**James J. Augsburger, MD, FACS,** Professor  
**Leadership** Chairperson, Department of Ophthalmology

**Richard A. Lang, PhD,** Professor  
**Leadership** Emma and Irving Goldman Scholar; Director, Visual Systems Group

**Zubair Ahmed, PhD,** Assistant Professor

**Marie I. Bodack, OD, FAAO, FCODC,** Instructor

**Tiffany Cook, PhD,** Associate Professor

**Fumika Hamada, PhD,** Assistant Professor

**Michael Gray, MD,** Assistant Professor

**Sarah L. Lopper, OD,** Instructor
Kelly Lusk, PhD, CLVT, Assistant Professor
William Walker Motley, III, MS, MD, Assistant Professor
Daniele Saltarelli, OD, Instructor
Terry Schwartz, MD, Professor
Virginia Miraldi-Utz, MD, Assistant Professor
Michael B. Yang, MD, Associate Professor

Joint Appointment Faculty Members
Saima Riazuddin, PhD, Assistant Professor (Department of Otolaryngology)

Clinical Staff Members
Corey Bowman, COT, LDO, ABOC
Rosalyn Brooks,
JaTawna Bush,
Shemeka Butler, CO
Brandy Dearwater, COA
Jennifer Duncan, COA
Lisa Fite, COA
Amanda Johnson, COA
Sherri Jones,
Melody Klayer, COA
Debbie Lipps, COA
Patty Lucas, COA
Tamara Lyons,
Jessica McCabe,
Nicole McLeod, COA
Debbie Meister, COA
Jill Simmons, COA
Miqua Stewart, CO
Kelli Vieson, COT, Clinical Manager
Leanne Wagner, COA

Trainees
Nathan Bingham, MD, PhD, Clinical Fellow, University of Texas Southwestern Graduate School of Biomedical Sciences, Dallas, TX
Rashid Bhatti, MPhil, Visiting Research Fellow, University of the Punjab, Lahore, Pakistan
April Carpenter-Elrod, PhD, Research Fellow, Hospital for Special Surgery, New York, NY
Mark Charlton-Perkins, BS, Graduate Student, University of Otago, Dunedin, New Zealand
Bharesh Chauhan, PhD, Research Associate, Oxford University, Oxford England
Jieqing Fan, BS, Graduate Student, Tsinghua University, Beijing, China
Amanda Huston, OD, Pediatric Optometry Resident, Ohio State University
Arnaud Giese, PhD, Research Fellow, Université Victor Segalen Bordeaux II, Bordeaux, France
Tadahiro Goda, PhD. Research Fellow, Kyushu University, Fukuoka, Japan
Mary "Meg" Grulee, MD, PGY4, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Tasleem Kauser, MPhil, Graduate Student, Bahauddin Zakariya University, Multan Pakistan
Laura Hanson, MD, PGY2, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Hena Khaja, MD, PGY4, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Ailee Laham, MD, PGY4, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Shawn Lewis, MD, PGY4, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Luke Lindsell, MD, PGY3, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Greg Mecoli, MD, PGY3, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Eileen Myers, MD, PGY2, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Ajit Muley, PhD, Anna University, Chennai, India
Gowri Nayak, PhD, Research Fellow, University of Sussex, Brighton, United Kingdom
Minh-Thanh Nguyen, PhD, Research Associate, University of Florida, Gainesville, FL
Jon Pargament, MD, PGY3, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Timothy Plageman, PhD, Research Fellow, University of Cincinnati, Cincinnati, OH
Sujata Rao, PhD, Research Associate, Cornell University, Ithaca, New York
Elodie Richard, PhD, Research Fellow, Université Victor Segalen Bordeaux II, Bordeaux, France
Deepam Rusia, MD, PGY2, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Mohsin Shazad, PhD, Research Fellow, Center for Excellence in Molecular Biology, University of The Punjab, Lahore, Pakistan
James A. Stefater, MD, PhD, Instructor of Clinical Medicine, University of Cincinnati, Cincinnati, OH
David Terrell, BS, Graduate Student, Texas State University - San Marcos, San Marcos, TX
Shruti Vemaraju, PhD, Research Fellow, Texas A&M University, College Station, TX
Aaron Weber, MD, PGY3, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
Baotong Xie, PhD, Research Fellow, Chinese Academy of Sciences, Beijing, China
Rizwan Yousaf, MS, Graduate Student, Center for Excellence in Molecular Biology, University of The Punjab, Lahore, Pakistan
Fareeha Zulfiqar, PhD, Research Associate, University of The Punjab, Lahore, Pakistan

Division Collaboration

Developmental Biology » Saulius Sumanas, PhD
Analysis of DFNB26 mutation using Zebrafish as a model system with Zubair Ahmed, PhD.

Developmental Biology » Rashmi Hegde, PhD
Molecular modeling of USH1 protein to identify the effect on the structure with Zubair Ahmed, PhD.

Developmental Biology » Brian Gebelein, PhD
Molecular control of Drosophila nervous system development with Tiffany Cook, PhD.

Developmental Biology » Rashmi Hegde, PhD
Eyes absent proteins in vascular development, cancer and the retinal vasculopathies with Richard Lang, PhD.

Human Genetics » Taosheng Huang, PhD
Role of new deafness protein in the mitochondrial function with Zubair Ahmed, PhD.

Human Genetics » Robert Hufnagel, MD, PhD
Functional analysis of newly retinal disorder genes with Zubair Ahmed, PhD.
# Grants, Contracts, and Industry Agreements

## Grant and Contract Awards

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<td>Jaeb Center for Health Research Foundation, Inc. (National Eye Institute)</td>
<td>U10 EY 11751</td>
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YANG, M.
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