# 2013 Research Annual Report

# **Neurology**



### **Division Details**

### **Division Data Summary**

### RESEARCH AND TRAINING DETAILS

Number of Faculty	30
Number of Joint Appointment Faculty	2
Number of Research Fellows	1
Number of Research Students	1
Number of Support Personnel	40
Direct Annual Grant Support	\$6,802,888
Direct Annual Industry Support	\$1,202,848
Peer Reviewed Publications	83

Number of Clinical Staff	
	89
Number of Clinical Fellows	3
Number of Clinical Students	0
Number of Other Students	23
Inpatient Encounters	5270
Outpatient Encounters	21.123

### **Division Photo**



Row 1: B Wong, J Xiang, P Horn, J Taylor Row 2: J Vannest, T Arthur, R Arya, A Hershey Row 3: J Wilson, T Glauser, D Gilbert, M Schapiro

## Significant Accomplishments

### Comprehensive Neuromuscular program

Our Comprehensive Neuromuscular Care Center continues to be a center of excellence for the coordinated care of patients with pediatric neuromuscular disorders, especially Duchenne muscular dystrophy (DMD). More than 80 percent of our DMD patients travel here from other states and nations, including some from as far as Russia and Ireland. We also have become world-class experts in caring for patients with dystrophinopathy. Meanwhile, our new "one stop" interdisciplinary neuromuscular clinic brings specialists from as many as nine different fields to one location to serve our patients with multi-system needs.

#### Our Research in Neuromuscular Disease

We participate in ongoing industry-sponsored clinical trials as well as in a transcriptomics and proteomics study in DMD. This has been attained through training of residents and fellows and collaboration with multiple divisions, including endocrinology, cardiology and radiology.

### Breakthrough Headache Research

Our Headache Center, formed 16 years ago, continues to grow in the management, treatment and understanding of headaches in children, adolescents and young adults. Our multidisciplinary outpatient clinic, acute treatment center, young adult headache program and a focused inpatient service provide the basis for the research and educational activities, including an UCNS-certified Headache Medicine fellowship. Our research highlights from the past year include an NIH-sponsored study that demonstrated significant effectiveness of cognitive behavioral therapy in a multidisciplinary care model of the treatment of chronic migraine that is comparable to pharmaceutical treatment in adults. We also are comparing the effectiveness of amitriptyline and topiramate in the prevention of pediatric and adolescent migraine (CHAMP) study with significant collaborative effort from Behavioral Medicine and Clinical Psychology, the Center for Clinical and Translation Research and the Department of Biostatistics and Clinical Trials Statistical and Data Management Center at the University of lowa.

### Tuberous Sclerosis Program is the World's Largest

Our Tuberous Sclerosis Program, now designated a Center of Excellence, is the largest in the world and the only one that manages every aspect of the disorder in both adults and children. We receive increasing numbers of national and international referrals because our program conducts leading-edge research while offering unique social and emotional support to patients and families, such as our TSC summer camp, the first and only one of its kind. Research conducted or led by our physicians has resulted in 15 peer-reviewed publications over the past year. We also have launched an NIH-sponsored, multisite, national study to continue to improve care for children with TSC.

### Research Highlights

Mark Schapiro, MD

We previously showed differences in neural activation during language processing in adolescents and young adults with Down syndrome in comparison with typically developing individuals matched for chronological age. We now show that activation in the adolescents and young adults with Down syndrome differs significantly in magnitude and spatial extent when compared with both chronological and mental age-matched typically developing control groups during a story listening task. These results provide additional support for an atypical pattern of functional organization for language processing in this population.

Reference: Jacola LM, Byars AW, Hickey F, Vannest J, Holland SK, Schapiro MB. Functional magnetic resonance imaging of story listening in adolescents and young adults with Down syndrome: evidence for atypical neurodevelopment. Journal of Intellectual Disability Research, in press.

Movement disorder (Donald Gilbert, MD and Steve Wu, MD)

ADHD/ Tourette Syndrome: We have two ongoing NIH-funded studies of motor cortex physiology as a biomarker of behavioral control impairments and of pharmacological treatment responses in ADHD.

*Neuroplasticity: Long Term Potentiation/Depression*: Dr. Steve Wu has led a series of exciting studies piloting new methods of using Transcranial Magnetic Stimulation to study long term potentiation and long term depression in motor cortex.

Tourette SyndromeGenetics: We are a site in a new, international, NIMH funded collaborative study of genetics of Tourette Syndrome.

Clinical Trials in Tourette Syndrome: We just completed a phase 2a study of a new pharmacological treatment for Tourette Syndrome, and we are participating in an ongoing study.

Tuberous Sclerosis (Darcy Krueger, MD, PhD and David Franz, MD)

The TSC Center, led by Drs. Franz and Dr. Krueger, has seen considerable expansion in both clinical care and research projects in 2013, building on similar successes of 2012. In 2013 alone, two major NIH-funded research studies and one major multicenter phase III clinical trial were officially launched. Major publications by the group included manuscripts in high-impact journals such as *Lancet*, *Annals of Neurology*, *PlosOne*, and *Chest*.

Epilepsy (Tracy Glauser, MD; Todd Arthur, MD; Hans Greiner, MD; Barb Hallinan, MD; Katherine Holland, MD; Sejal Jain, MD; Diego Morita, MD; Douglas Rose, MD; Shannon Standridge, MD; Jeff Tenney, MD; Cameron Thomas, MD)

The Comprehensive Epilepsy Center discoveries ranged the entire spectrum from clinical trials results through epilepsy surgical evaluation techniques to animal models of epileptogenesis. In the ongoing NIH funded Childhood Absence epilepsy study, 12-month outcome data from the double blind portion of the study confirmed that ethosuximide is the optimal initial empirical monotherapy for CAE and established this study as the first randomized controlled trial meeting International League Against Epilepsy criteria for class I evidence for any type of generalized seizure in adults or children. In addition, this study reported the EEG characteristics of untreated Childhood Absence Epilepsy along with the associations between specific EEG findings and baseline measure of attention and short term outcome. The surgical epilepsy team identified that ictal high-frequency oscillations are commonly seen with intracranial EEG and have localizing value. Complete resection of the high-frequency oscillations region was a favorable prognostic indicator for surgical outcome. Lastly, using a transgenic mouse model, the epilepsy basic scientists discovered that deletion of PTEN from postnatally generated dentate granule cells led to hyperactivation of the mTOR pathway and subsequent spontaneous seizures, confirming that these abnormal dentate granule cells can cause epilepsy.

### **Division Publications**

- 1. Amann JP, Glauser T, Chiron C. Developing antiepileptic drugs in children: balancing protection and access. *Handb Clin Neurol.* 2013; 111:741-6.
- Amos-Kroohs RM, Williams MT, Braun AA, Graham DL, Webb CL, Birtles TS, Greene RM, Vorhees CV, Pisano MM. Neurobehavioral phenotype of C57BL/6J mice prenatally and neonatally exposed to cigarette smoke. Neurotoxicol Teratol. 2013; 35:34-45.
- 3. Arya R, Glauser TA. Pharmacotherapy of focal epilepsy in children: a systematic review of approved agents. CNS Drugs. 2013; 27:273-86.
- 4. Arya R, Greiner HM, Lewis A, Mangano FT, Gonsalves C, Holland KD, Glauser TA. Vagus nerve stimulation for medically refractory absence epilepsy. Seizure. 2013; 22:267-70.
- 5. Arya R, Mangano FT, Horn PS, Holland KD, Rose DF, Glauser TA. Adverse events related to extraoperative invasive EEG monitoring with subdural grid electrodes: a systematic review and meta-analysis. *Epilepsia*. 2013; 54:828-39.
- 6. Arya R, Shinnar S, Glauser TA. Corticosteroids for the treatment of infantile spasms: a systematic review. *J Child Neurol.* 2012; 27:1284-8.
- 7. Bigras C, Shear PK, Vannest J, Allendorfer JB, Szaflarski JP. The effects of temporal lobe epilepsy on scene encoding. *Epilepsy Behav.* 2013; 26:11-21.
- Buelow JM, Perkins SM, Johnson CS, Byars AW, Fastenau PS, Dunn DW, Austin JK. Adaptive functioning in children with epilepsy and learning problems. J Child Neurol. 2012; 27:1241-9.
- 9. Castro OW, Santos VR, Pun RY, McKlveen JM, Batie M, Holland KD, Gardner M, Garcia-Cairasco N,

- Herman JP, Danzer SC. Impact of corticosterone treatment on spontaneous seizure frequency and epileptiform activity in mice with chronic epilepsy. *PLoS One.* 2012; 7:e46044.
- Chen Y, Curran CP, Nebert DW, Patel KV, Williams MT, Vorhees CV. Effect of chronic glutathione deficiency on the behavioral phenotype of Gclm-/- knockout mice. Neurotoxicol Teratol. 2012; 34:450-7.
- Dodge HS, Ekhator NN, Jefferson-Wilson L, Fischer M, Jansen I, Horn PS, Hurford WE, Geracioti TD.
   Cigarette smokers have reduced risk for post-dural puncture headache. Pain Physician. 2013; 16:E25-30.
- 12. Edden RA, Crocetti D, Zhu H, Gilbert DL, Mostofsky SH. Reduced GABA concentration in attention-deficit/hyperactivity disorder. *Arch Gen Psychiatry*. 2012; 69:750-3.
- 13. Elliott I, Kadis DS, Lach L, Olds J, McCleary L, Whiting S, Snyder T, Smith ML. Quality of life in young adults who underwent resective surgery for epilepsy in childhood. *Epilepsia*. 2012; 53:1577-86.
- 14. Epstein LG, Shinnar S, Hesdorffer DC, Nordli DR, Hamidullah A, Benn EK, Pellock JM, Frank LM, Lewis DV, Moshe SL, Shinnar RC, Sun S, team Fs. **Human herpesvirus 6 and 7 in febrile status epilepticus:** the FEBSTAT study. *Epilepsia*. 2012; 53:1481-8.
- 15. Fisher RS, Blum DE, DiVentura B, Vannest J, Hixson JD, Moss R, Herman ST, Fureman BE, French JA. Seizure diaries for clinical research and practice: limitations and future prospects. *Epilepsy Behav.* 2012; 24:304-10.
- 16. Fletcher S, Adkin CF, Meloni P, Wong B, Muntoni F, Kole R, Fragall C, Greer K, Johnsen R, Wilton SD. **Targeted exon skipping to address "leaky" mutations in the dystrophin gene**. *Mol Ther Nucleic Acids*. 2012; 1:e48.
- 17. Frank LM, Shinnar S, Hesdorffer DC, Shinnar RC, Pellock JM, Gallentine W, Nordli DR, Jr., Epstein LG, Moshe SL, Lewis DV, Sun S, Team FS. Cerebrospinal fluid findings in children with fever-associated status epilepticus: results of the consequences of prolonged febrile seizures (FEBSTAT) study. *J Pediatr.* 2012; 161:1169-71.
- 18. Franz DN. Everolimus for astrocytomas in tuberous sclerosis author's reply. Lancet. 2013; 381:1275.
- 19. Franz DN, Agricola KD, Tudor CA, Krueger DA. Everolimus for tumor recurrence after surgical resection for subependymal giant cell astrocytoma associated with tuberous sclerosis complex. *J Child Neurol.* 2013; 28:602-7.
- 20. Franz DN, Belousova E, Sparagana S, Bebin EM, Frost M, Kuperman R, Witt O, Kohrman MH, Flamini JR, Wu JY, Curatolo P, de Vries PJ, Whittemore VH, Thiele EA, Ford JP, Shah G, Cauwel H, Lebwohl D, Sahmoud T, Jozwiak S. Efficacy and safety of everolimus for subependymal giant cell astrocytomas associated with tuberous sclerosis complex (EXIST-1): a multicentre, randomised, placebocontrolled phase 3 trial. Lancet. 2013; 381:125-32.
- 21. Fujiwara H, Greiner HM, Lee KH, Holland-Bouley KD, Seo JH, Arthur T, Mangano FT, Leach JL, Rose DF. Resection of ictal high-frequency oscillations leads to favorable surgical outcome in pediatric epilepsy. *Epilepsia*. 2012; 53:1607-17.
- 22. Gilbert DL. **Drug Treatments for Tourette Syndrome and Co-Morbid Disorders**. In: JT Walkup, JW Mink, KS McNaught, eds. *A Family's Guide to Tourette Syndrome*. Bloomington, IN: iUniverse Press; 2012:110-124.
- 23. Glauser T, Ben-Menachem E, Bourgeois B, Cnaan A, Guerreiro C, Kälviäinen R, Mattson R, French JA, Perucca E, Tomson T, Guidelines ISoA. **Updated ILAE evidence review of antiepileptic drug efficacy and effectiveness as initial monotherapy for epileptic seizures and syndromes**. *Epilepsia*. 2013; 54:551-63.

- 24. Glauser TA, Cnaan A, Shinnar S, Hirtz DG, Dlugos D, Masur D, Clark PO, Adamson PC, Childhood Absence Epilepsy Study T. Ethosuximide, valproic acid, and lamotrigine in childhood absence epilepsy: initial monotherapy outcomes at 12 months. Epilepsia. 2013; 54:141-55.
- 25. Glauser TA, Loddenkemper T. Management of childhood epilepsy. *Continuum (Minneap Minn)*. 2013; 19:656-81.
- 26. Golekoh MC, Hu S, Norman AM, Horn PS, Brady RC, Wong BL. Comparison of the immunogenicity of intramuscular versus subcutaneous administration of trivalent inactivated influenza vaccine in individuals with neuromuscular diseases. J Child Neurol. 2013; 28:596-601.
- 27. Graham DL, Amos-Kroohs RM, Braun AA, Grace CE, Schaefer TL, Skelton MR, Williams MT, Vorhees CV. Neonatal +-methamphetamine exposure in rats alters adult locomotor responses to dopamine D1 and D2 agonists and to a glutamate NMDA receptor antagonist, but not to serotonin agonists. Int J Neuropsychopharmacol. 2013; 16:377-91.
- 28. Graham DL, Schaefer TL, Vorhees CV. **Neurobehavioral Testing for Developmental Toxicity**. In: RD Hood, ed. *Developmental and Reproductive Toxicology, A Practical Approach*. London: Informa Healthcare; 2012:346-387.
- 29. Greiner HM, Horn PS, Holland K, Collins J, Hershey AD, Glauser TA. mRNA blood expression patterns in new-onset idiopathic pediatric epilepsy. *Epilepsia*. 2013; 54:272-9.
- 30. Gummadavelli A, Wang Y, Guo X, Pardos M, Chu H, Liu Y, Horn P, Zhang F, Xiang J. Spatiotemporal and frequency signatures of word recognition in the developing brain: A magnetoencephalographic study. *Brain Res.* 2013; 1498:20-32.
- 31. Guo X, Xiang J, Wang Y, O'Brien H, Kabbouche M, Horn P, Powers SW, Hershey AD. Aberrant neuromagnetic activation in the motor cortex in children with acute migraine: a magnetoencephalography study. *PLoS One.* 2012; 7:e50095.
- 32. Hart CK, Wiley S, Choo DI, Eby C, Tucker L, Schapiro M, Meinzen-Derr J. **Developmental disabilities** and intracranial abnormalities in children with symptomatic cytomegalovirus and cochlear implants. *ISRN Otolaryngol.* 2012; 2012:502746.
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- 36. Hershey AD, Powers SW, Coffey CS, Eklund DD, Chamberlin LA, Korbee LL, Group CS. Childhood and Adolescent Migraine Prevention (CHAMP) study: a double-blinded, placebo-controlled, comparative effectiveness study of amitriptyline, topiramate, and placebo in the prevention of childhood and adolescent migraine. *Headache*. 2013; 53:799-816.
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- 38. Holland K, Shinnar S. Status epilepticus in children. Handb Clin Neurol. 2012; 108:795-812.
- 39. Jain SV, Horn PS, Simakajornboon N, Glauser TA. Obstructive sleep apnea and primary snoring in children with epilepsy. *J Child Neurol*. 2013; 28:77-82.
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- 42. Krueger DA, Care MM, Agricola K, Tudor C, Mays M, Franz DN. Everolimus long-term safety and efficacy in subependymal giant cell astrocytoma. *Neurology*. 2013; 80:574-80.
- 43. Lebowitz ER, Motlagh MG, Katsovich L, King RA, Lombroso PJ, Grantz H, Lin H, Bentley MJ, Gilbert DL, Singer HS, Coffey BJ, Tourette Syndrome Study G, Kurlan RM, Leckman JF. **Tourette syndrome in youth with and without obsessive compulsive disorder and attention deficit hyperactivity disorder**. *Eur Child Adolesc Psychiatry*. 2012; 21:451-7.
- 44. Malinowska IA, Lee N, Kumar V, Thiele EA, Franz DN, Ashwal S, Sagalowsky A, Dimario FJ, Jr., Cutler D, Krueger D, Camposano S, Paolini J, Dabora SL. Similar trends in serum VEGF-D levels and kidney angiomyolipoma responses with longer duration sirolimus treatment in adults with tuberous sclerosis. *PLoS One.* 2013; 8:e56199.
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- 46. Modi AC, Ingerski LM, Rausch JR, Glauser TA, Drotar D. White coat adherence over the first year of therapy in pediatric epilepsy. *J Pediatr*. 2012; 161:695-9 e1.
- 47. Modi AC, Wu YP, Guilfoyle SM, Glauser TA. Uninformed clinical decisions resulting from lack of adherence assessment in children with new-onset epilepsy. *Epilepsy Behav.* 2012; 25:481-4.
- 48. Morita DA, Glauser TA, Modi AC. **Development and validation of the Pediatric Epilepsy Side Effects Questionnaire**. *Neurology*. 2012; 79:1252-8.
- 49. Morrison JA, Glueck CJ, Daniels SR, Horn PS, Wang P. Determinants of ApoB, ApoA1, and the ApoB/ApoA1 ratio in healthy schoolgirls, prospectively studied from mean ages 10 to 19 years: the Cincinnati National Growth and Health Study. *Metabolism*. 2012; 61:1377-87.
- 50. Namasivayam AK, Pukonen M, Goshulak D, Yu VY, Kadis DS, Kroll R, Pang EW, De Nil LF. Relationship between speech motor control and speech intelligibility in children with speech sound disorders. *J Commun Disord*. 2013; 46:264-80.
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- 52. Ngamprasertwong P, Michelfelder EC, Arbabi S, Choi YS, Statile C, Ding L, Boat A, Eghtesady P, Holland K, Sadhasivam S. **Anesthetic techniques for fetal surgery: effects of maternal anesthesia on intraoperative fetal outcomes in a sheep model**. *Anesthesiology*. 2013; 118:796-808.
- 53. Okun MS, Foote KD, Wu SS, Ward HE, Bowers D, Rodriguez RL, Malaty IA, Goodman WK, Gilbert DM, Walker HC, Mink JW, Merritt S, Morishita T, Sanchez JC. A trial of scheduled deep brain stimulation for Tourette syndrome: moving away from continuous deep brain stimulation paradigms. *JAMA Neurol.* 2013; 70:85-94.
- 54. Pestian J, Matykiewicz P, Holland-Bouley K, Standridge S, Spencer M, Glauser T. **Selecting anti-epileptic drugs: a pediatric epileptologist's view, a computer's view**. *Acta Neurol Scand*. 2013; 127:208-15.
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- 56. Richtand NM, Ahlbrand R, Horn PS, Chambers B, Davis J, Benoit S. Effects of prenatal immune activation and peri-adolescent stress on amphetamine-induced conditioned place preference in the rat. Psychopharmacology (Berl). 2012; 222:313-24.

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- 61. Schaefer TL, Braun AA, Amos-Kroohs RM, Williams MT, Ostertag E, Vorhees CV. A new model of Pde4d deficiency: genetic knock-down of PDE4D enzyme in rats produces an antidepressant phenotype without spatial cognitive effects. Genes Brain Behav. 2012; 11:614-22.
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- degradation in mutant mice. Hum Mol Genet. 2013; 22:2435-50.
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- 83. Wu SW, Shahana N, Huddleston DA, Lewis AN, Gilbert DL. **Safety and tolerability of theta-burst transcranial magnetic stimulation in children**. *Dev Med Child Neurol*. 2012; 54:636-9.

## Faculty, Staff, and Trainees

**Faculty Members** 

Andrew Hershey, MD, PhD, Professor

Leadership Division Director; Director Headache Center

Research Interests Migraine, blood genomics

Todd Arthur, MD, Assistant Professor

Research Interests Brain concussion

Anna W Byars, PhD, Associate Professor

Research Interests Cognitive effects of epilepsy

James Collins, MD, PhD, Assistant Professor

Research Interests Congenital Muscular Dystrophy; Neuromuscular Disease

David Franz, MD, Professor

Leadership Director Tuberous Sclerosis program

Research Interests Tuberous sclerosis

Donald Gilbert, MD, Professor

Leadership Director Movement Disorders program; Director Neurology Residency Program

Research Interests Tourette syndrome, Transcranial Magnetic Stimulation (TMS)

Tracy A Glauser, MD, Professor

Leadership Director Comprehensive Epilepsy program

Research Interests Epilepsy, pharmacology

Hansel Greiner, MD, Assistant Professor

Research Interests Epilepsy

Barbara Hallinan, MD, PhD, Assistant Professor

Research Interests CSF steroid profiles

Katherine Holland-Bouley, MD, PhD, Associate Professor

Research Interests Ion channels and epilepsy

Sejal Jain, MD, Assistant Professor

Research Interests Epilepsy, sleep

Marielle A Kabbouche, MD, Associate Professor

Research Interests Migraine

Darren Kadis, PhD, Assistant Professor

Research Interests Neuroimaging and MEG of language

Darcy Krueger, MD, PhD, Associate Professor

Research Interests Tuberous Sclerosis

Diego Morita, MD, Assistant Professor

Research Interests Epilepsy, pharmacology

Hope O'Brien, MD, Assistant Professor

Research Interests Headaches

Douglas Rose, MD, Professor

Leadership Director, MEG lab

Research Interests Magneto-Encephalography (MEG)

Mark Schapiro, MD, Professor

Research Interests Neurodevelopmental disorders

Matthew Skelton, PhD, Assistant Professor

Research Interests Neurobehavioral and neurometabolic

Shannon Standridge, DO, Assistant Professor

Research Interests Outcomes study, epilepsy

Mary Sutton, MD, Associate Professor

Research Interests Neuro-oncology

Jeffrey Tenney, MD, PhD, Assistant Professor

Research Interests Neurophysiology and genesis of absence epilepsy

Cameron Thomas, MD, Assistant Professor

Research Interests Neonatal neurology

Jennifer Vannest, PhD, Associate Professor

Research Interests Speech and language development

Charles Vorhees, PhD, Professor

Leadership Director Animal Neurobehavior Core

Research Interests Drugs/toxicants and brain development

Kristen Wesselkamper, MD, Assistant Professor

Research Interests Improvement science

Michael Williams, PhD, Associate Professor

Research Interests Drugs/toxicants and brain development

Brenda Wong, MD, Professor

Leadership Director Neuromuscular program

Research Interests Duchenne's Muscular Dystrophy, Spinal Muscular Atrophy

Steve Wu, MD, Assistant Professor

Research Interests Movement Disorder; Transcranial Magnetic Stimulation (TMS)

Jing Xiang, MD, PhD, Associate Professor

Leadership Director MEG Research program

Research Interests MEG

Joint Appointment Faculty Members

Michael Miles, PhD, Professor (Pathology)

Clinical Staff Members

Jamie Capal, MD.

Neurodevelopment and neurobehavior

Irina Rybalsky, MD,

Duchenne's Muscular Dystrophy

**Trainees** 

Ravindra Arya, MD, DM, PGYX, All India Institute of Medical Sciences

Haneul Lee, MD, PGYV, Yonsei University

Nina Natarajan, MD, PGYV, University of Cincinnati

Sarah Weatherspoon, MD, PGYV, University of Texas Southwestern

Katrina Peariso, MD, PGYV, University of New Mexico

Thomas Dye, MD, PGYV, St. Louis University

Tanishia Williams, MD, PGYV, University of Medicine & Dentistry of New Jersey

Gewalin Aungaroon, MD, PGYIV, Faculty of Medicine Ramathibodi

Dror Kraus, MD, PGYIV, Hebrew University

Michael Oldham, MD, PGYIV, George Washington University

Cuixia Tian, MD, PGYIV, Medical Center of Fudan University

Vinita Knight, MD, PGYIII, Eastern Virginia Medical School

Kelly Kremer, MD, PGYIII, University of Cincinnati

Michael Sweeney, MD, PGYIII, Medical College of Wisconsin

Marissa Vawter, MD, PGYIII, Indiana University

### **Division Collaboration**

Human Genetics; Neurosurgery; Neuroradiology; Psychology/Neuropsychology; Developmental Pediatrics; Psychiatry » Drs. T.A. Burrow, Derek Neilson, Taoshang Huang, Dr. E. Air, Dr. K. Cecil, Dr. B. Lejeune, Dr. C. Erickson, and Dr. E. Harris

Movement Disorders Clinic/Tourette's Disorder Clinic

**Neurosurgery; Anesthesia; Bioinformatics; Radiology »** Dr. F. Mangano, Dr. S. Danzer, Dr. J. Pestian, and Drs. J. Leach, M. Gelfand

Comprehensive Epilepsy Program

Pulmonary Medicine; Nephrology; Plastic Surgery; Radiology; Neurosurgery; Cardiology; Human Genetics; Psychiatry; Genetics; DDBP » Drs. L. Young, F. McCormack, Dr. C. Gordon, Drs. M. Care, J. Leach, Drs. K. Crone, M. Care, S. Serai, W. Yuan, Dr. T. Knilans, Dr. B. Schorry, Dr. D. Nelson, Dr. E. Schorry, and Drs. D. Murray, N. Bing; B. Kent

Tuberous Sclerosis Program

Headache Center

**Behavioral Medicine and Clinical Psychology; Hematology »** Drs. S. Powers, A Lynch-Jordan, L. Crosby, S. Slater and Drs. Karen Kalinyak, Charles Quinn

Cardiology; Developmental and Behavioral Pediatrics; Nutrition; Human Genetics; Gastroenterology; Endocrinology; Orthopedics; Speech Therapy; Rehabilitative Medicine; Pulmonary; Physical Therapy; Pathology; Pediatric Surgery; Anesthesia & Palliative Care; Pain Services; Social Services; Translational Research; Nephrology » Drs. J. Towbin, JL Jefferies, R. Spicer, L. Cripe, Dr. D. Schonfeld, B. Godshall, D. Boutwell, M. Walker genetic counselor, Drs. A Kaul, N. Yazigi, A. Miethke, Drs. M. Rutter, S. Rose, Drs. J. McCarthy, V. Jain, P. Sturm, J. Linck, Dr. M. McMahon, Drs. R. Amin, H. Sawnani, J. Crisalli, A. McCormick, M. McGuire, Drs. L. Miles, K. Bove, Drs. R. Brown, T. Inge, Dr. N. Weidner, M. Meyer, Dr. K. Goldschneider, L. Demosthenes, Dr. J. Molkentin, and Dr. E. Jackson

Comprehensive Neuromuscular Center

**Sport Medicine; Physical Medicine & Rehabilitation »** Drs. J. Divine, N. Edwards, M. Shaffer and B. Kurowski Concussion Clinic

Neonatology & Pulmonary Biology; Cardiology; Hematology » Drs. B. Haberman, T. Cahill, S. Merhar, N. Monangi, Drs. B. Marino, J. Anderson, and Dr. D. Adams, A. Hammill

Neonatal Follow-up Clinic

Pulmonary » Drs. N. Simakajornboon, M. Ednick, J. Crisalli, H. Sawnani, G. McPhail

Human Genetics; Allergy & Immunology; Anesthesiology; Developmental Biology; Experimental Hematology; Psychiatry; General & Thoracic Surgery; Endocrinology; Neurosurgery; Neuroimaging Research Consortium; Pulmonary Biology » Drs. G. Grabowski, Y. Sun, T. Huang, R. Stottmann, Drs. M. Rothenberg, H. Zhu, Dr. S. Danzer, A. Lepke, Drs. K. Campbell, M. Nafafuku, Drs. R. Waclaw, L. Ehrman, D. Pan, N. Ratner, Dr.C. Erickson; T. Schaefer, Dr. M. Helmrath, Dr. T. Nakamura, Dr. F. Mangano, Dr. W. Yuan, and Dr. J. Bridges

Neurobehavioral Animal Core (Vorhees and Williams lab)

### Rehabilitative Medicine » Drs. D. Pruitt, L. Michaud

Pediatric Demyelinating Disease Clinic

Speech Pathology; Pediatric Neuroimaging Research Consortium; Biomedical Informatics; Radiology; Biostatistics & Epidemiology; Heart Institute Research/Heart Institute Neurodevelopmental Clinic; Pulmonary; Autism Speaks; Human Genetics » Dr. E. Redle, Drs. S. Holland, V. Schmithorst, Dr. M. Wagner, Dr. J. Tkach, S. Holland, G. Lee, Dr. M Altaye, Dr. B. Marino, Dr. R. Amin; Keith McConnell - Sr. Biomedical Engineer, Dr. D. Murray, and Dr. E. Schorry

Neuroimaging of Childhood Apraxia of Speech,

Cincinnati MR Imaging of Neural Development-(C-MIND study)

**Gastroenterology and Nutrition; Pathology; Neurosurgery »** Drs. R. Kohli, S. Xanthakos, Dr. L. Miles, and Dr. F. Mangano

Mltochondrial & Pathological Studies in Epilepsy Surgery/Evaluation of Coenzyme Q10 as a biomarker in liver disease

Child & Adolescent Psychiatry; Physical Medicine & Rehabilitation » Dr. E. Harris and Dr. J. Vargus-Adams MEG Research

## Grants, Contracts, and Industry Agreements

Grant and Contract Awards Annual Direct

GILBERT, D

#### 2/2-Anomalous Motor Physiology in ADHD

National Institutes of Health

R01 MH 095014 05/01/12-04/30/17 \$168,003

### 4/8-Collaborative Genomic Studies of Tourette Disorder

National Institutes of Health

R01 MH 092520 09/15/11-06/30/14 \$50,000

GLAUSER, T

### Cincinnati Neuroscience Clinical Trials Research Center

National Institutes of Health(University of Cincinnati)

U10 NS 077311 09/30/11-08/31/18 \$100,000

#### Impact of Initial Therapy and Response on Long Term Outcome in Children with CAE

National Institutes of Health

U01 NS 045911	09/01/10-08/31/14	\$2,539,145
Midazolam for the Pediatric Trials Network		
National Institutes of Health(Duke University) HHSN2752010000031	08/01/12-09/30/13	\$12,838
HERSHEY, A / POWERS, S	00/01/12 00/00/10	Ψ12,000
	on of Childhood Migrains	
Amitrityline and Topiramate in the Prevention National Institutes of Health	on of Childhood Migraine	
U01 NS 076788	9/30/11-8/31/16	\$2,414,730
HOLLAND-BOULEY, K		
Sodium Channel Gene Variation in the Trea	tment of Epilepsy	
National Institutes of Health		
R01 NS 062756	04/01/09-03/31/14	\$192,938
(RUEGER, D		
Early Biomarkers of Autism Spectrum Diso	rders in Infants with Tuberous Sclerosis	
National Institutes of Health(Children's Hosp	oital Boston)	
U01 NS 082320	09/01/12-08/31/17	\$519,97
Potential EEG Biomarkers and Antiepileptog National Institutes of Health (University of Ala		
P20 NS 080199	09/01/12-08/31/15	\$29,568
Topical Rapamycin Therapy to Alleviate Cut	aneous Manifestations of Tuberous Sclerosis Complex	
US Army Medical Research Acquisition Activi	ty(University of Texas Health Science Center-Houston)	
W81WH-11-1-0240	08/31/12-08/31/13	\$3,24
TSC Autism Center of Excellence Research	Network (TACERN) Research	
Tuberous Sclerosis Alliance(Children's Hos	pital Boston)	
2012-CRN-01	10/01/12-12/31/13	\$41,118
TSC Neurocognitive Clinical Trial		
Tuberous Sclerosis Alliance		
01-11B	07/01/12-11/30/13	\$54,49
MORAN, M		
Genetic Susceptibility to PCB-Induced Moto	or Dysfunction	
National Institutes of Health(Northern Kentuc	cky University)	
R15 ES 020053	02/18/13-06/30/13	\$5,229
/ANNEST, J		
Imaging the Effect of Centrotemporal Spike	s and Seizures on Language in Children	
National Institutes of Health	00/45/44 00/00/40	4000
R01 NS 065840	09/15/11-06/30/16	\$382,402

### **Training Grant in Teratology**

National Institutes of Health

T32 ES 07051	07/01/12-06/30/17		\$289,214
		Current Year Direct	\$6,802,888
Industry Contracts			
FRANZ, D			
Novartis Pharmaceuticals			\$453,043
Biocodex			\$9,047
Otsuka America Pharmaceutical, Inc			\$51,292
Psyadon Pharmaceuticals, Inc.			\$40,771
HERSHEY, A			
Palm Beach Neurology, PA			\$7,700
HOLLAND-BOULEY, K			
Novartis Pharmaceuticals			\$3,536
KABBOUCHE, M			
Allergan, Inc.			\$6,930
KRUEGER, D			
Lundbeck Inc			\$11,496
Novartis Pharmaceuticals			\$101,411
Novartis, Inc (Children's Hospital Boston)			\$152,759
MORITA, D			
Eisai Medical Service			\$15,775
VORHEES, C			
Council for the Advancement Pyrethroid			\$69,829
WONG, B			
DART Therapeutics			\$47,004
GlaxoSmithKline			\$213,621
PTC Therapeutics, Inc			\$11,088

Prosensa Therapeutics \$7,546

Current Year Direct Receipts	\$1,202,848
Total	\$8,005,736