

**Division Photo**



**First Row:** J. Vannest, B. Wong, M. Kabbouche, D. Morita, T. Arthur, T. deGrauw, D. Gilbert; **Second Row:** T. Glauser, D. Krueger, A. Byars, K. Agricola; **Third Row:** I. Rybalsky, S. LeCates, D. Rose, J. Xiang, K. Wesselkamper; **Fourth Row:** C. Molloy, B. Hallinan, S. Monahan, C. Vorhees, M. Williams, A. Hershey; **Fifth Row:** M. Schapiro, P. Vaughan, K. Holland-Bouley, D. Franz, K. Lee

**Division Data Summary**

**Research and Training Details**

Number of Faculty	24
Number of Joint Appointment Faculty	2
Number of Research Fellows	5
Number of Research Students	3
Number of Support Personnel	129
Direct Annual Grant Support	\$6,678,519
Direct Annual Industry Support	\$286,826
Peer Reviewed Publications	43

**Clinical Activities and Training**

Number of Clinical Staff	1
Number of Clinical Fellows	11
Inpatient Encounters	3,568
Outpatient Encounters	16,028

**Faculty Members**

**Antonius DeGrauw, MD, PhD, Professor ; Director Neurology Division**

**Research Interests:** neurodevelopment, mitochondrial disorders

**Todd Arthur, MD, Assistant Professor Clinical**

**Research Interests:** brain concussion

**Anna W Byars, PhD, Associate Professor Clinical**

**Research Interests:** cognitive effects of epilepsy

**Madeline Chadehumbe, MD**, Instructor  
**Research Interests:** neuromuscular disorders

**David Franz, MD**, Professor Clinical ; *Director Tuberous Sclerosis program*  
**Research Interests:** tuberous sclerosis

**Donald Gilbert, MD**, Associate Professor Clinical ; *Director Movement Disorders program*  
**Research Interests:** Tourette syndrome, Transcranial Magnetic Stimulation (TMS)

**Tracy A Glauser, MD**, Professor Clinical ; *Director Comprehensive Epilepsy program*  
**Research Interests:** epilepsy, pharmacology

**Barbara Hallinan, MD**, Assistant Professor Clinical  
**Research Interests:** CSF steroid profiles

**Andrew Hershey, MD**, Professor Clinical ; *Director Headache Center*  
**Research Interests:** migraine, blood genomics

**Katherine Holland-Bouley, MD, PhD**, Assistant Professor Clinical  
**Research Interests:** ion channels and epilepsy

**Marielle A Kabbouche, MD**, Assistant Professor Clinical  
**Research Interests:** migraine

**Darcy Krueger, MD**, Assistant Professor Clinical  
**Research Interests:** Tuberous Sclerosis

**Ki Lee, MD**, Associate Professor Clinical ; *Director EEG lab, EMU*  
**Research Interests:** Epilepsy surgery

**Diego Morita, MD**, Assistant Professor Clinical  
**Research Interests:** epilepsy, pharmacology

**Tonya Phillips, MD**, Associate Professor Clinical  
**Research Interests:** neonatal seizures

**Douglas Rose, MD**, Professor Clinical ; *Director MEG lab*  
**Research Interests:** Magneto-Encephalography (MEG)

**Mark Schapiro, MD**, Professor Clinical ; *Director Neurology Residency program*  
**Research Interests:** neurodevelopmental disorders

**Mary Sutton, MD**, Assistant Professor Clinical  
**Research Interests:** neuro-oncology

**Jennifer Vannest, PhD**, Research Assistant Professor  
**Research Interests:** speech and language development

**Charles Vorhees, PhD**, Research Professor ; *Director Animal Neurobehavior Core*  
**Research Interests:** drugs/toxicants and brain development

**Kristen Wesselkamper, MD**, Assistant Professor Clinical  
**Research Interests:** improvement science

**Michael Williams, PhD**, Research Associate Professor  
**Research Interests:** drugs/toxicants and brain development

**Brenda Wong, MD**, Associate Professor Clinical ; *Director Neuromuscular program*  
**Research Interests:** Duchenne's Muscular Dystrophy, Spinal Muscular Atrophy

**Jing Xiang, MD, PhD**, Research Associate Professor ; *Director MEG Research program*  
**Research Interests:** MEG

## Clinical Staff Members

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- Tina Narayan, MD

## Trainees

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- Shannon Standridge, DO, PGYVI, Kansas City University
- Marc DiSabella, DO, PGY-V, Cooper University Hospital
- Pierre Fequiere, MD, PGY-V, Long Island College Hospital
- Steve Wu, MD, PGY-V, Vanderbilt University
- James Collins, MD, PGY-IV, University of Cincinnati

- **Sarah Hopkins, MD**, PGY-IV, University of Arkansas
- **Laurel Malinowski, MD**, PGY-IV, University of Wisconsin
- **Alice Lawrence, MD**, PGYIII, Milton S. Hershey Medical Center
- **Cameron Thomas, MD**, PGYIII, University of Colorado
- **Shawn Aylward, MD**, PGYIII, Southern Illinois University
- **Keith Ridel, MD**, PGYIII, University of Cincinnati

## Significant Accomplishments in FY08

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### Epilepsy Program

The Children's Comprehensive Epilepsy Program is a nationally recognized leader in pediatric epilepsy with strengths in integrated multidisciplinary comprehensive clinical care, cutting edge clinical and basic research and patient education. The four major areas of focus include epilepsy pharmacology, epilepsy surgery, multimodality (MRI, fMRI, MEG) epilepsy imaging, and basic neuroscience. The pharmacology group (Drs. Glauser, Morita, Holland) aims to personalize care for children with new onset epilepsy by integrating multidisciplinary care, clinical research and patient education. The major research activities of this group include examination of the role of drug-gene interactions on the inter-individual variation in antiepileptic drug clinical response, laboratory studies of the functional significance of the genetic variations found, and study of parental adherence to prescribed medication regimens. Gene-drug interactions include research on the impact of variation in genes coding for drug metabolizing enzymes, drug transporters and drug receptors on clinical response to antiepileptic medications (pharmacogenetics) along with the impact of antiepileptic medications on gene expression (pharmacogenomics). The pharmacogenetics research is funded through an NIH U01 that is based at CCHMC and includes 31 other centers. The trial is a double blind, randomized, comparison trial of three antiepileptic medications focused on identifying the optimal initial therapy for children with absence epilepsy. The study is also designed to identify pharmacokinetic, pharmacodynamic, and pharmacogenetic factors that impact upon response to therapy. This landmark study has completed enrollment and will be announcing its results at the end of 2008.

The epilepsy surgery program, led by Drs. Lee and Mangano are undergoing a major expansion and expect to become a national leader in the surgical evaluation and management of children with treatment resistant epilepsy. The program is currently one of the busiest in the nation and utilizes a novel multimodality (MRI, fMRI, MEG) imaging approach to seizure lateralization and localization that aims to improve surgical outcome. The multimodality (MRI, fMRI, MEG) epilepsy imaging teams (Drs. Rose, Xiang, Vannest) also have active research programs focused using non-invasive imaging to better understand the interaction between epileptic seizures, brain development and brain activity. The basic neuroscience component of the epilepsy program focuses on determining the functional significance of the genetic variations found in the clinical pharmacogenetic studies (Dr. Holland) along with developing non-genetic biomarkers of epilepsy and response to therapy (Dr. Hallinan).

### Tuberous Sclerosis

In the past year I have seen enhancement and extension of various research programs related to Tuberous Sclerosis Clinic. A trial of RAD-001 in giant cell astrocytomas has almost completed enrollment and shows great promise for reduction in tumor volume as well as improvement in seizures and cognition. The trial is to continue with RAD-001 for renal angiomyolipomas as well as with rapamycin for lymphangiomyomatosis and angiomyolipomas. The addition of Darcy Krueger, MD, PhD has enhanced our basic science program. In cooperation with Dr. George Thomas and Sara Kozma at Genome Research Institute. Dr. Krueger is performing basic science research on the role of mTOR in cognition and motor development. An NIH grant was submitted to fund CCHMC involvement in an infantile spasms consortium. The key aspect to this will be an evaluation of the efficacy of RAD-001 for infantile spasms, first in tuberous sclerosis patients, and later in infantile spasms for other causes. Novartis has agreed to fund the performance of a trial of RAD-001 in infantile spasms and tuberous sclerosis patients. A clinical trial is being planned for intractable epilepsy and tuberous sclerosis and cortical dysplasia using RAD-001 in collaboration with Baylor University College of Medicine.

Our Tuberous Sclerosis Clinic remains the largest in the United States following over 500 adults and children with the disorder. We have improved and extended services to individuals with tuberous sclerosis through educational programs, community support, and the first ever camp for tuberous sclerosis children. Our clinic remains the only true and multidisciplinary Tuberous Sclerosis Clinic with access to full range of medical care for both adults and children with the disorder.

### The Headache Center

The Headache Center at Cincinnati Children's Hospital Medical Center, Department of Neurology, was established in the fall of 1996. The Headache Center was organized as a multi-disciplinary clinic combining Child Neurologist, Child

Psychologist and Nurse Practitioners to diagnose and treat children with headache disorders. It is based within a growing academically and clinically based neurology department at Cincinnati's Children's Hospital Medical Center, and is affiliated with the University of Cincinnati College of Medicine and the Division of Psychology at CCHMC. Over the past 10 years, we have seen nearly 4000 children with the complaint of headaches. A clinical diagnosis and a standardized diagnosis using the International Classification of Headache Disorders, 2nd Edition, are also made for each of these children. A detailed questionnaire about the child's headache has been developed and a computer-based database to accumulate medical information as well as response rate was designed and is continually updated. Treatment strategies include acute therapy for individual headache episodes, prophylactic therapy for preventing headache episodes and psychological intervention including biofeedback-assisted relaxation training as well as life style behavior adjustments. This multidisciplinary approach has been demonstrated to be highly effective, not only in the standard methods of measuring outcome, but also in using tools developed and validated at CCHMC to characterize disability and quality of life. The Headache Center has also been designed to develop and expand research into childhood headache disorders by examining new treatment options, improved characterization of childhood headache and response patterns, and understanding the genetic pathophysiology of childhood headaches. In this role, multiple studies and publications have been developed including one of the few NIH sponsored studies in headache examining genomic expression patterns, as well as an NIH sponsored study on treatment of chronic daily headache with combined pharmacologic and behavioral treatment. Education is also a key component with the Headache Center established the first pediatric fellowship for the study of childhood headaches in the country, the only pediatric headache fellowships out of the 1 established headache fellowships in the country certified by the United Council of Neurologic Subspecialties with both Drs. Hershey and Kabbouche board certified in Headache Medicine.

## **Significant Publications in FY08**

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### **Bissler, JJ etal, Sirolimus for angiomyolipoma in tuberous sclerosis complex or lymphangioleiomyomatosis, N.Engl. J. Med. 2008, 358: 140-151**

This is the second report from our group of a new treatment for patients with tuberous sclerosis. This shows that mTOR inhibition works for angiomyolipoma. The previous report showed the same results for brain tumors in this condition.

### **Holland, KD etal, Mutation of sodium channel SCN3A in a patient with cryptogenic pediatric partial epilepsy, Neurosci. Lett. 2008, 433: 65-70**

First report on SCN3A mutation as likely cause of epilepsy in this patient

### **Tillema, JM etal, Cortical reorganization of language functioning following perinatal left MCA stroke, Brain Lang. 2008, 105: 99-111**

Clear evidence of plasticity of the neonatal brain for language function after perinatal stroke.

## **Division Highlights**

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### **Movement Disorders**

The Transcranial Magnetic Stimulation Laboratory - We continue to study motor cortex physiology in Tourette Syndrome and ADHD and have performed pioneering studies of the relationship between dopamine transporter genotype variations and physiological responses to dopaminergic and noradrenergic medications. See publications list. We also are co-investigators in a two-site, five year study, the first NIH funded study to combine TMS and fMRI to assess motor cortex and motor function in ADHD, with ongoing recruitment. We have recently purchased equipment which could allow for an exciting new venture in quantifying long term potentiation and depression in vivo in humans, using TMS, and have submitted a grant proposal to use this for Tuberous Sclerosis Complex.

### **Movement Disorders**

Tourette Syndrome Genetics - We are one of two sites in a 5-year NIH-funded study to identify the prevalence of SLITRK1 mutations and other mutations in TS. Another NIH grant is in the planning phases.

### **Neurology Basic Science Labs**

The Division officially launched the Animal Behavioral Phenotyping Core this past year under the direction of Drs. Vorhees and Williams (Website: <http://www.cincinnatichildrens.org/research/cores/abc/default.htm>). This is a new collaborative research facility available to investigators from all divisions of CCRF, any department of UC, and outside

institutions. The new core has already secured multiple CCRF and UC collaborators, one outside contract with a major pharmaceutical company, and has a pending contract with a start-up pharmaceutical company. The core specializes in the characterization of transgenic mice, but can also evaluate rats. The new core offers a wide range of behavioral assays for both species, many more than most comparable facilities at other universities. A new laboratory to expand the core's testing capacity will begin construction in the near future.

## Neurology Basic Science Labs

**New Animal Model of Methamphetamine-induced Cognitive Impairment** - Over the course of the last 10-15 years there has emerged clear evidence that methamphetamine (Meth) abusers, especially chronic users, develop cognitive impairments that remain long after these individuals enter treatment and even after they have been abstinent for 6 months, a year, or even longer. Attention, learning, and memory deficits have been reported in many studies of former chronic users. For 5-10 years, animal models of this problem have been under investigation as a means to understand these effects, uncover the mechanisms of action, and to use these models to develop interventions to treat these impairments. Meth is neurotoxic at high doses in humans and rodents. Unfortunately, in rodents few learning and memory effects have been found even after neurotoxic doses are given. The best model until now has been Meth-induced novel object memory impairments in rats. Recently, the reliability of this model has come into question. During the past year, the laboratories of Drs. Williams and Vorhees have found a new cognitive effect from high dose Meth treatment in the form of impairments in path integration (also called egocentric) learning. The effect has been replicated using different Meth dosing schedules and is both reliable and substantial. Further, the effect on the HPA axis was tested in sham versus adrenalectomized Meth or Saline treated rats and the impairment was unchanged. This proved that Meth-induced corticosterone release does not contribute to the learning impairment. Drs. Williams and Vorhees recently submitted a new grant application to NIH to perfect the model, expand its utility, test potential mechanisms of action in relation to neurotransmitters (dopamine, serotonin, and glutamate), and to test a potentially promising treatment to reverse the damage after it has occurred using a drug already marketed.

## MEG Research

We have completed a study on high-frequency neuromagnetic signals in the developing brain. To our knowledge, this is the world's first high-frequency MEG database from healthy children. The database lays a foundation for identification of brain abnormality and functional developmental delay in children. primary clinical application and research interests are 1) determination of the seizure onset location in children with medically intractable epilepsy who are candidates for surgery and 2) localization of the normal functional brain regions subserving language and motor control so that these regions are preserved during epilepsy surgery. There are multiple methods for localization of abnormal and normal brain function with MEG; however, only a few sites worldwide study children with MEG. The optimum methods are not yet known for localization of the epileptic focus and normal brain function in children. Dr. Rose has just received approval for an IRB protocol: Algorithms for Improved Interpretation of Electromagnetic Brain Activity to evaluate and optimize these MEG methodologies for children. He is collaborating with researchers at the University of Cincinnati, Miami University, and Oakland University in these pursuits. A second research interest is in the synergistic value of comparing findings across multiple modalities (MEG, fMRI, SPECT, PET). Dr. Rose has been developing collaborations principally with CCHMC Department of Radiology in pursuit of these research goals. Dr. Rose is also collaborating with multiple colleagues within the Neurology Division on brain research using MEG and also EEG.

## Division Collaboration

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### Collaboration with Division of Human Genetics

#### Collaborating Faculty: [Greg Grabowski, MD](#) ; [Ying Sun, PhD](#)

Collaborating on mouse knock-out models of lipid storage disease

### Collaboration with Division of Anesthesiology

#### Collaborating Faculty: [Steve Danzer, PhD](#)

Collaborating on the dentate gyrus-specific floxed pten knock-out mouse model of autism with hypothesized increased seizure susceptibility

### Collaboration with Imaging Research Center

#### Collaborating Faculty: [Weihong Yuan, PhD](#); [Scott Holland, PhD](#)

Collaborating on a model of early onset hydrocephalus and the beneficial effects of shunt surgery on cognitive and behavioral outcome in rats

### Collaboration with Division of Anesthesiology

### Collaborating Faculty: John McAuliffe, MD

Effects of early hypoxia-ischemia and anesthetics on cognitive outcome in mice

### Collaboration with Division of Anesthesiology

#### Collaborating Faculty: Andreas Lepke, MD

Effects of early anesthesia exposure on apoptosis and cognitive development

### Collaboration with Division of Allergy & Immunology

#### Collaborating Faculty: Marc Rothenberg, MD, PhD

Effects of NPS and its putative receptor GPRA in asthma and CNS function

## Division Publications

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1. Newmeyer A, deGrauw T, Clark J, Chuck G, Salomons G. [Screening of male patients with autism spectrum disorder for creatine transporter deficiency](#). *Neuropediatrics*. 2007; 38: 310-2.
2. Newmeyer AJ, Grether S, Grasha C, White J, Akers R, Aylward C, Ishikawa K, Degrauw T. [Fine motor function and oral-motor imitation skills in preschool-age children with speech-sound disorders](#). *Clin Pediatr (Phila)*. 2007; 46: 604-11.
3. Rosenberg EH, Martinez Munoz C, Betsalel OT, van Dooren SJ, Fernandez M, Jakobs C, deGrauw TJ, Kleefstra T, Schwartz CE, Salomons GS. [Functional characterization of missense variants in the creatine transporter gene \(SLC6A8\): improved diagnostic application](#). *Hum Mutat*. 2007; 28: 890-6.
4. Bissler JJ, McCormack FX, Young LR, Elwing JM, Chuck G, Leonard JM, Schmithorst VJ, Laor T, Brody AS, Bean J, Salisbury S, Franz DN. [Sirolimus for angiomyolipoma in tuberous sclerosis complex or lymphangiomyomatosis](#). *N Engl J Med*. 2008; 358: 140-51.
5. Ma L, Teruya-Feldstein J, Bonner P, Bernardi R, Franz DN, Witte D, Cordon-Cardo C, Pandolfi PP. [Identification of S664 TSC2 phosphorylation as a marker for extracellular signal-regulated kinase mediated mTOR activation in tuberous sclerosis and human cancer](#). *Cancer Res*. 2007; 67: 7106-12.
6. Madhavan D, Schaffer S, Yankovsky A, Arzimanoglou A, Renaldo F, Zaroff CM, LaJoie J, Weiner HL, Andermann E, Franz DN, Leonard J, Connolly M, Cascino GD, Devinsky O. [Surgical outcome in tuberous sclerosis complex: a multicenter survey](#). *Epilepsia*. 2007; 48: 1625-8.
7. Gilbert DL, Zhang J, Lipps TD, Natarajan N, Brandyberry J, Wang Z, Sallee FR, Wassermann EM. [Atomoxetine treatment of ADHD in Tourette syndrome: reduction in motor cortex inhibition correlates with clinical improvement](#). *Clin Neurophysiol*. 2007; 118: 1835-41.
8. Lit L, Gilbert DL, Walker W, Sharp FR. [A subgroup of Tourette's patients overexpress specific natural killer cell genes in blood: a preliminary report](#). *Am J Med Genet B Neuropsychiatr Genet*. 2007; 144B: 958-63.
9. Spencer TJ, Sallee FR, Gilbert DL, Dunn DW, McCracken JT, Coffey BJ, Budman CL, Ricardi RK, Leonard HL, Allen AJ, Milton DR, Feldman PD, Kelsey DK, Geller DA, Linder SL, Lewis DW, Winner PK, Kurlan RM, Mintz M. [Atomoxetine treatment of ADHD in children with comorbid Tourette syndrome](#). *J Atten Disord*. 2008; 11: 470-81.
10. Baker GA, Hargis E, Hsieh MM, Mounfield H, Arzimanoglou A, Glauser T, Pellock J, Lund S. [Perceived impact of epilepsy in teenagers and young adults: an international survey](#). *Epilepsy Behav*. 2008; 12: 395-401.
11. de los Reyes EC, McJunkin JE, Glauser TA, Tomsho M, O'Neal J. [Periodic lateralized epileptiform discharges in La Crosse encephalitis, a worrisome subgroup: clinical presentation, electroencephalogram \(EEG\) patterns, and long-term neurologic outcome](#). *J Child Neurol*. 2008; 23: 167-72.
12. Glauser T, Kluger G, Sachdeo R, Krauss G, Perdomo C, Arroyo S. [Rufinamide for generalized seizures associated with Lennox-Gastaut syndrome](#). *Neurology*. 2008; 70: 1950-8.
13. Grace CE, Schaefer TL, Herring NR, Skelton MR, McCrea AE, Vorhees CV, Williams MT. [\(+\)-Methamphetamine increases corticosterone in plasma and BDNF in brain more than forced swim or isolation in neonatal rats](#). *Synapse*. 2008; 62: 110-21.
14. Hershey AD. [Genetics of migraine headache in children](#). *Curr Pain Headache Rep*. 2007; 11: 390-5.
15. Hershey AD, Winner P, Kabbouche MA, Powers SW. [Headaches](#). *Curr Opin Pediatr*. 2007; 19: 663-9.
16. Lewis DW, Winner P, Hershey AD, Wasiewski WW. [Efficacy of zolmitriptan nasal spray in adolescent migraine](#). *Pediatrics*. 2007; 120: 390-6.
17. Winner P, Hershey AD. [Epidemiology and diagnosis of migraine in children](#). *Curr Pain Headache Rep*. 2007; 11: 375-82.
18. Holland KD, Glauser TA. [Response to carbamazepine in children with newly diagnosed partial onset epilepsy](#).

*Neurology*. 2007; 69: 596-9.

19. Holland KD, Kearney JA, Glauser TA, Buck G, Keddache M, Blankston JR, Glaaser IW, Kass RS, Meisler MH. [Mutation of sodium channel SCN3A in a patient with cryptogenic pediatric partial epilepsy](#). *Neurosci Lett*. 2008; 433: 65-70.
20. Lachhwani DK, Loddenkemper T, Holland KD, Kotagal P, Mascha E, Bingaman W, Wyllie E. [Discontinuation of medications after successful epilepsy surgery in children](#). *Pediatr Neurol*. 2008; 38: 340-4.
21. Gilman DK, Palermo TM, Kabbouche MA, Hershey AD, Powers SW. [Primary headache and sleep disturbances in adolescents](#). *Headache*. 2007; 47: 1189-94.
22. Korostenskaja M, Kicic D, Kahkonen S. [The effect of methylphenidate on auditory information processing in healthy volunteers: a combined EEG/MEG study](#). *Psychopharmacology (Berl)*. 2008; 197: 475-86.
23. Krueger DA, Franz DN. [Current management of tuberous sclerosis complex](#). *Paediatr Drugs*. 2008; 10: 299-313.
24. Modi AC, Morita DA, Glauser TA. [One-month adherence in children with new-onset epilepsy: white-coat compliance does not occur](#). *Pediatrics*. 2008; 121: e961-6.
25. Spitzmiller RE, Phillips T, Meinzen-Derr J, Hoath SB. [Amplitude-integrated EEG is useful in predicting neurodevelopmental outcome in full-term infants with hypoxic-ischemic encephalopathy: a meta-analysis](#). *J Child Neurol*. 2007; 22: 1069-78.
26. Herring NR, Schaefer TL, Tang PH, Skelton MR, Lucot JP, Gudelsky GA, Vorhees CV, Williams MT. [Comparison of time-dependent effects of \(+\)-methamphetamine or forced swim on monoamines, corticosterone, glucose, creatine, and creatinine in rats](#). *BMC Neurosci*. 2008; 9: 49.
27. Schaefer TL, Skelton MR, Herring NR, Gudelsky GA, Vorhees CV, Williams MT. [Short- and long-term effects of \(+\)-methamphetamine and \(+/-\)-3,4-methylenedioxymethamphetamine on monoamine and corticosterone levels in the neonatal rat following multiple days of treatment](#). *J Neurochem*. 2008; 104: 1674-85.
28. Miles MV, Patterson BJ, Chalfonte-Evans ML, Horn PS, Hickey FJ, Schapiro MB, Steele PE, Tang PH, Hotze SL. [Coenzyme Q10 \(ubiquinol-10\) supplementation improves oxidative imbalance in children with trisomy 21](#). *Pediatr Neurol*. 2007; 37: 398-403.
29. Skelton MR, Williams MT, Schaefer TL, Vorhees CV. [Neonatal \(+\)-methamphetamine increases brain derived neurotrophic factor, but not nerve growth factor, during treatment and results in long-term spatial learning deficits](#). *Psychoneuroendocrinology*. 2007; 32: 734-45.
30. Skelton MR, Williams MT, Vorhees CV. [Developmental effects of 3,4-methylenedioxymethamphetamine: a review](#). *Behav Pharmacol*. 2008; 19: 91-111.
31. Tillema JM, Byars AW, Jacola LM, Schapiro MB, Schmithorst VJ, Szaflarski JP, Holland SK. [Cortical reorganization of language functioning following perinatal left MCA stroke](#). *Brain Lang*. 2008; 105: 99-111.
32. Holland SK, Vannest J, Mecoli M, Jacola LM, Tillema JM, Karunanayaka PR, Schmithorst VJ, Yuan W, Plante E, Byars AW. [Functional MRI of language lateralization during development in children](#). *Int J Audiol*. 2007; 46: 533-51.
33. Vannest J, Szaflarski JP, Privitera MD, Schefft BK, Holland SK. [Medial temporal fMRI activation reflects memory lateralization and memory performance in patients with epilepsy](#). *Epilepsy Behav*. 2008; 12: 410-8.
34. McAuliffe JJ, Joseph B, Hughes E, Miles L, Vorhees CV. [Metallothionein I.II deficient mice do not exhibit significantly worse long-term behavioral outcomes following neonatal hypoxia-ischemia: MT-I,II deficient mice have inherent behavioral impairments](#). *Brain Res*. 2008; 1190: 175-85.
35. Pan D, Sciascia A, 2nd, Vorhees CV, Williams MT. [Progression of multiple behavioral deficits with various ages of onset in a murine model of Hurler syndrome](#). *Brain Res*. 2008; 1188: 241-53.
36. Siuciak JA, McCarthy SA, Chapin DS, Reed TM, Vorhees CV, Repaske DR. [Behavioral and neurochemical characterization of mice deficient in the phosphodiesterase-1B \(PDE1B\) enzyme](#). *Neuropharmacology*. 2007; 53: 113-24.
37. Vorhees CV, Schaefer TL, Williams MT. [Developmental effects of +/-3,4-methylenedioxymethamphetamine on spatial versus path integration learning: effects of dose distribution](#). *Synapse*. 2007; 61: 488-99.
38. Vorhees CV, Skelton MR, Williams MT. [Age-dependent effects of neonatal methamphetamine exposure on spatial learning](#). *Behav Pharmacol*. 2007; 18: 549-62.
39. Lingrel JB, Williams MT, Vorhees CV, Moseley AE. [Na,K-ATPase and the role of alpha isoforms in behavior](#). *J Bioenerg Biomembr*. 2007; 39: 385-9.
40. Markham LW, Kinnett K, Wong BL, Woodrow Benson D, Cripe LH. [Corticosteroid treatment retards development of ventricular dysfunction in Duchenne muscular dystrophy](#). *Neuromuscul Disord*. 2008; 18: 365-70.
41. Miles MV, Miles L, Tang PH, Horn PS, Steele PE, DeGrauw AJ, Wong BL, Bove KE. [Systematic evaluation of muscle coenzyme Q10 content in children with mitochondrial respiratory chain enzyme deficiencies](#). *Mitochondrion*. 2008; 8: 170-80.

42. Wu SW, Graham B, Gelfand MJ, Gruppo RE, Dinopolous A, Gilbert DL. [Clinical and positron emission tomography findings of chorea associated with primary antiphospholipid antibody syndrome](#). *Mov Disord*. 2007; 22: 1813-5.
43. Liu Y, Xiang J, Wang Y, Vannest JJ, Byars AW, Rose DF. [Spatial and frequency differences of neuromagnetic activities in processing concrete and abstract words](#). *Brain Topogr*. 2008; 20: 123-9.

## Grants, Contracts, and Industry Agreements

### Grant and Contract Awards

### Annual Direct / Project Period Direct

#### Degrauw, A

##### Phase 3 Trial of Coenzyme Q10 in Mitochondrial Diseases

National Institutes of Health (University of Florida)

R01 FD 003032 09/20/06 - 05/31/08 \$54,932 / \$108,933

##### Point Care Center for Emerging Neurotechnologies

National Institutes of Health (University of Cincinnati)

U54 EB 007954 09/30/07 - 06/30/12 \$6,881 / \$37,271

#### Gilbert, D

##### Anomalous Motor Physiology In ADHD

National Institutes of Health (Kennedy Krieger Research Institute)

R01 MH 078160 07/01/06 - 06/30/11 \$60,525 / \$318,246

##### The Role of SLITRK1 in Tourette and Related Disorders

National Institutes of Health (Yale University School of Medicine)

R01 NS 056276 09/01/06 - 08/31/11 \$25,030 / \$134,949

#### Glauser, T

##### Childhood Absence Epilepsy: RX, PK-PD-Pharmacogenetics

National Institutes of Health

U01 NS 045911 09/30/03 - 10/31/08 \$5,512,280 / \$14,846,498

##### Epilepsy Phenome/Genome Project

National Institutes of Health (University of California-San Francisco)

R01 NL 053998 05/01/07 - 04/30/12 \$14,898 / \$74,490

#### Hallinan, B

##### Predictive Potential of CSF Steroid Profile in Infants

Thrasher Research Fund

10/01/06 - 09/30/08 \$15,855 / \$23,465

#### Vannest, J

##### The Neural Basis of Language In Neurodevelopmental Disorders

Jerome LeJeune Foundation

07/01/07 - 06/28/09 \$9,458 / \$18,916

#### Vorhees, C

##### Genetic Differences in PCB-Induced Behavior

National Institutes of Health (University of Cincinnati)

R21 ES 015335 12/15/07 - 11/30/09 \$60,600 / \$80,127

##### Developmental Effects of Methamphetamine-Like Stimulants

National Institutes of Health

R01 DA 006733 04/01/05 - 03/31/10 \$185,843 / \$1,000,000

##### Effects of Neonatal MDMA on Brain and Behavior

National Institutes of Health

R01 DA 021394 04/01/06 - 03/31/11 \$190,316 / \$1,000,000

##### Training Program in Teratology

National Institutes of Health

T32 ES 007051 07/01/07 - 06/30/12 \$286,170 / \$1,432,850

#### Williams, M.



**Effect of Lead, Manganese and Stress During Development**

National Institutes of Health

R01 ES 015689

09/18/06 - 06/30/11

\$242,750 / \$1,250,000

**Wong, B.****Translational Research in Dystrophinopathies**

National Institutes of Health (University of Utah)

R01 NS 043264

04/01/06 - 03/31/11

\$12,981 / \$78,663

**Current Year Direct****\$6,678,519****Industry Contracts****Franz, D**

Novartis Pharmaceuticals

\$ 68,056

**Hershey, A**

GlaxoSmithKline

\$ 1,925

**Kabbouche, M**

Ortho-McNeil Neurologies, Inc.

\$ 3,696

**Vorhees, C**

Eli Lilly and Company

\$ 159,652

**Wong, B**

PTC Therapeutics, Inc.

\$ 53,497

**Current Year Direct Receipts****\$286,826****Total \$6,965,345**