2014 Research Annual Report

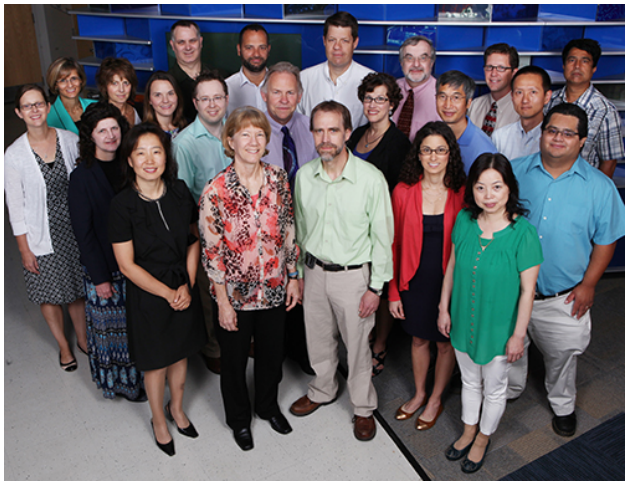
Human Genetics

Division Summary

RESEARCH AND TRAINING DETAILS	
Number of Faculty	**27**
Number of Joint Appointment Faculty	**5**
Number of Research Fellows	**4**
Number of Research Students	**7**
Number of Support Personnel	**139**
Direct Annual Grant Support	**$2,717,177**
Direct Annual Industry Support	**$617,729**
Peer Reviewed Publications	**76**

CLINICAL ACTIVITIES AND TRAINING	
Number of Clinical Staff	**33**
Number of Clinical Fellows	**4**
Number of Clinical Students	**24**
Number of Other Students	**4**
Inpatient Encounters	**427**
Outpatient Encounters	**5,631**

Division Photo



Row 1: K Zhang, C Prows, R Hopkin, L Dyer, X Li
Row 2: T Smolarek, T Burrow, W Nichols, L Martin, R Li, A Valencia
Row 3: C Atzinger, M Myers, I Sageser, A Begtrup, D Prows, M Keddache, R Stottmann, H Saal, D Neilson, G Zhang, M Pandey

Significant Accomplishments

Ending the diagnostic odyssey through exome sequencing

The past year marked an expansion in exome sequencing to provide molecular diagnoses to individual families, both through research and as a clinically available test offered through the Molecular Diagnostic Laboratory. Led by Cindy Prows, MSN, CNS, and Kristen Sund, PhD, LGC, 24 families were enrolled and sequencing studies completed by the Cincinnati Children's DNA Sequencing and Genotyping Core. Analysis has been completed in 21 families. For seven families, a molecular diagnosis in a known gene fitting the phenotype was identified; and for an additional six families, a potentially novel gene was identified. Throughout this process, family preferences for return of results were investigated. In July 2013, the Molecular Diagnostic Laboratory launched ExomeSeq for clinical exome sequencing. A multidisciplinary team of laboratory professionals, analysts, genetic counselors, and clinical geneticists completed 24 exome studies and were able to provide a molecular diagnosis to eight families for whom a genetic diagnosis had been elusive, some for more than 15 years.

Of mice and men …

Rolf Stottmann, PhD, has received an NIH grant to study congenital defects in cortical circuits and structural development. Stottmann plans to apply next-generation sequencing approaches to identify mutations leading to human movement disorders and structural brain defects in children with brain malformations recruited from Cincinnati Children's clinics to define new disease genes. These studies are expected to reveal entirely new molecular pathways in neurological disease, which eventually could lead to development of novel therapeutic

targets.

Bringing new options for individuals with rare disease

The work of genetics is not limited to diagnosis. Our Clinical Trials unit, led by Laurie Bailey, MS, LGC, has helped 36 adults and children participate in seven interventional trials of new biologic approaches to disease management. A new trial to study the benefits of enzyme therapy for hypophosphatasia lead by Howard Saal, MD, was launched. As preliminary results of this transformational therapy for a skeletal dysplasia became known, Cincinnati Children's quickly became a busy site, enrolling four patients from the US and two children from the Middle East. Other diseases in which our physicians are participating in interventional trials for include Pompe, Gaucher, Fabry, and cholesterol ester storage disease. Progress in rare disease management depends on collaborative registries. The Division has enrolled 281 individuals in seven rare disease registries, and several clinical faculty and counselors have been involved in registry boards that analyze the accruing data and make sure that worldwide experiences are translated into better patient outcomes.

Research Highlights

Lisa Martin, PhD

Dr. Lisa Martin performed exome sequencing on a family with multiple individuals with bicuspid aortic valve (BAV). Using this data she and her team established an error control workflow as well as a workflow to identify variants for autosomal dominant inheritance where protein coding changes cannot be assumed. This is important because next generation sequencing has a low success rate using the current strategies, part of this may be because of the assumption of protein coding variants. Our approach allows the identification of non-protein coding changes.

Melanie Myers, PhD, MS, CGC, and Carrie Atzinger, MS

Melanie Myers and Carrie Atzinger,directors of the Genetic Counseling Graduate Program, admitted their most diverse class of genetic counseling graduate students yet. The program launched a new online course for CEUs, Laboratory Genetic Counseling, which has attracted enrollees from other programs. In addition, they created a new pharmacogenomics industry rotation with AssureRX for genetic counseling graduate students.

William C. Nichols, PhD

Dr. Nichols' research efforts were concentrated in three areas: 1) Enrollment of patients in the NHLBI-funded National Biological Sample and Data Repository for Pulmonary Arterial Hypertension. Samples from more than 1200 patients have been collected from 24 Enrollment Centers across the United States. Genetic data comprising both whole genome SNP data as well as coding sequence data for six known PAH genes have been/are being generated for all enrolled patients. Biological samples, clinical data, and genetic data on WHO Group 1 PAH patients will be distributed to researchers worldwide to enhance genetic and other studies of this devastating disease. 2) Use of mouse models of pulmonary hypertension to identify additional genetic factors as well as changes in mRNA and microRNA expression patterns leading to chronic hypoxia-induced pulmonary hypertension. Through mRNASeq and miRNASeq, expression pattern differences have been identified between a highly PH susceptible strain and a largely resistant strain after hypoxia exposure. 3) Genetic analysis of Parkinson disease patients for Parkin and GBA variants in collaboration with Dr. Karen Marder and Dr. Roy Alcalay at Columbia University in support of their genetic epidemiology studies.

Manoj Pandey, PhD

Dr. Pandey's research recognized MyD88 signaling as critical component for causing B lymphocyte-mediated inflammation, (e.g., plasmacytosis, hypergammaglobulinemias, elevated cytokine and chemokines) in Gaucher disease. Blocking such signaling could provide potential avenues for disruption of the identified pathways,

which control B cell mediated functions. These approaches may be explored as adjunctive therapeutic strategies to prevent Gaucher disease complications.

Cynthia Prows, MSN, CNS

Ms. Prows developed productive multi-disciplinary national collaborations through NIH funded initiatives: The Electronic Medical Records and Genomics (eMERGE) Network and the Clinical Pharmacogenetics Implementation Consortium (CPIC). Within eMERGE, Ms. Prows led the effort within the pharmacogenomics workgroup to develop process outcome measures for return of drug response genes' exome results to electronic medical records.

Daniel R. Prows, PhD

In the **Prows' Lab** mouse model of differential susceptibility to hyperoxic acute lung injury, we discovered that survival time of mice was sex-dependent and correlated with a three-four week extension of the normal resistance period in very young mice of some strains but not others. We have identified, captured and validated separate congenic lines for two chromosomal regions that harbor genes reciprocally affecting these age- and sex-related survival differences. The sensitivity region (Chr 1) has been refined to ~8.5 Mb and the resistance region (Chr 4) was found to have multiple sub-regions with smaller effects. These unique mouse models provide specific tools to identify the genes responsible for differential susceptibility to hyperoxic lung injury and to examine the roles of age and sex in the overall response.

Elizabeth K. Schorry, MD

Dr. Schorry participated as a site PI for an international Neurofibromatosis Clinical Trials Consortium, which completed three clinical drug trials for NF1 and developed and launched three additional trials for NF1 and NF2. In addition, she has participated in the international group REINS Group (Response Evaluation In Neurofibromatosis and Schwannomatosis) which has reviewed patient-reported outcomes as well as functional outcome measures, and has published recommendations to assure standardization of NF-related clinical trials.

Ying Sun, PhD and T. Andrew Burrow, MD

Dr. Ying Sun showed that in mice with lysosomal acid lipase deficiency, even advanced disease can be improved biochemically and histopathologically by various dosages of enzyme therapy. In related work, **Dr. T Andrew Burrow** began enrolling subjects in a clinical trial to evaluate efficacy of enzyme therapy in cholesterol ester storage disease.

Ge Zhang, PhD

Dr. Zhang has conducted multiple genome-wide association (GWA) studies and quantitative genetic analyses of human complex traits and diseases. He also systematically examined signatures of polygenic selections on genetic variants affecting complex human traits. The significant results generated from these studies provided deeper insights into the molecular etiology and genetic architecture of human complex traits.

Kejian Zhang, MD, MBA; C. Alex Valencia, PhD; Amber Begtrup-Hogart, PhD; Mehdi Keddache, PhD; Nancy Leslie, MD; Derek Nelson, MD

The **Clinical Exome Program (ExomeSeq)** was launched in July 2013. The program combines state-of-the-art next-generation sequencing technology, a custom bioinformatics pipeline, and result interpretation by clinical and molecular geneticists to provide high-quality and clinically actionable results.

Division Publications

1. Abonia JP, Wen T, Stucke EM, Grotjan T, Griffith MS, Kemme KA, Collins MH, Putnam PE, Franciosi JP, von Tiehl KF, Tinkle BT, Marsolo KA, Martin LJ, Ware SM, Rothenberg ME. **High prevalence of**

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7. Burrow TA, Grabowski G. **Lysosomal Storage Diseases of the Liver**. In: F Suchy, R Sokol, W Balistreri, eds. *Liver Disease In Children*. New York: Cambridge University Press; 2014:546-566.
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Faculty, Staff, and Trainees

Faculty Members

Nancy Doan Leslie, MD, Professor

Leadership Co-Director, Division of Human Genetics; Director, Biochemical Genetics Laboratory; Director, Medical Biochemical Genetics Fellowship; Program Director, Laboratory Fellowships

Research Interests Inborn errors of metabolism, with an emphasis on long term outcome in PKU and in the molecular biology of galactosemia

William Nichols, PhD, Professor

Leadership Co-Director, Division of Human Genetics; Associate Director of Research

Research Interests The identification of genetic variants contributing to disease susceptibility with an emphasis on pulmonary arterial hypertension and Parkinson disease.

Carrie Atzinger, MS, Assistant Professor

Leadership Assistant Director, The Genetic Counseling Graduate Program

T. Andrew Burrow, MD, Assistant Professor

Research Interests Lysosomal storage diseases, particularly Gaucher disease; Inborn errors of metabolism, and neurogenetics

Min-Xin Guan, PhD, Adjunct

Research Interests Mechanisms of mitochondrial disorders, with a focus on maternally transmitted hearing loss and vision loss.

Amber Hogart-Begtrup, PhD, Assistant Professor

Leadership Assistant Director, Clinical Molecular Genetics Laboratory

Research Interests Next Generation Sequencing/ Epigenomics/Molecular Genetic Diagnostics

Robert Hopkin, MD, Associate Professor

Leadership Director, Genetic Residency Programs

Research Interests Fabry Disease; Robin Sequence; 22q11 deletion; Neurofibromatosis; craniofacial genetics; chromosomal anomalies

Taosheng Huang, MD, PhD, Professor

Leadership Director, Program of Mitochondrial Medicine; Associate Director, Molecular Diagnostic Laboratory

Research Interests Disease-causing gene discovery with next generation sequencing and iPS cell therapy

Mehdi Keddache, PhD, Assistant Professor

Leadership Leader, DNA Sequencing and Genotyping Core

Research Interests DNA Sequencing / Genotyping Core/Linkage and Association analyses

Ronghua Li, PhD, Instructor

Research Interests Cell-specific models of mitochondrial diseases and mitochondrial epigenetics

Xia Li, PhD, Assistant Professor

Leadership Associate Director, Clinical Cytogenetics Laboratory

Research Interests The role of molecular markers in hematological disorders for prediction, treatment, and monitoring.

Lisa Martin, PhD, Professor

Leadership Biostatistics and Epidemiology

Research Interests Improving the understanding of human genetic variation through the integration of statistical genetics with biology and epidemiology especially how it relates to pediatric heart conditions, allergic disorders and obesity.

Melanie Myers, PhD, MS, CGC, Associate Professor

Leadership Director, The Genetic Counseling Graduate Program

Research Interests Clinical utility of family health history and other genomic tools in health promotion

Derek Neilson, MD, Assistant Professor

Research Interests Genetic and pathogenesis of Ehlers Danlos as well as genetics of neurologic disorders

Manoj Pandey, PhD, Instructor

Research Interests Immunobiology of the lysosomal storage disease

Carlos Prada, MD, Assistant Professor

Research Interests Inborn errors of metabolism with emphasis in newborn screening technologies and implementation; biomarkers of disease progression of lysosomal storage disorders and neurofibromatosis.

Daniel R Prows, PhD, Associate Professor

Research Interests Mouse models of complex human diseases, with specific interest in mouse models of acute lung injury; use of quantitative trait locus analysis to identify regions linked to complex traits

Howard Saal, MD, Professor

Leadership Director, Clinical Genetics; Medical Director, Cytogenetics Laboratory; Director, Cincinnati Children's Craniofacial Center

Research Interests The natural history of genetic disorders, especially as they relate to craniofacial disorders; developing treatment and management protocols for craniofacial disorders, and treatment of tongue based airway disorders.

Iris Sageser, RDH, MS, Associate Professor

Leadership Craniofacial Center

Research Interests Multidisciplinary management of individuals affected by craniofacial abnormalities

Elizabeth K Schorry, MD, Professor

Leadership Director, Neurofibromatosis Clinic

Research Interests Psychosocial and orthopedic aspects of neurofibromatosis; Clinical drug trials for NF1, and Ehlers Danlos syndrome

Teresa A Smolarek, PhD, Associate Professor

Leadership Director, Clinical Cytogenetics Laboratory; Director, Clinical Cytogenetics Fellowship Program

Research Interests Application of SNP microarrays to determine constitutional and acquired DNA copy number changes; the genetic basis of pulmonary lymphangioleiomyomatosis.

Rolf W Stottmann, PhD, Assistant Professor

Research Interests Genetic analysis of congenital malformations affecting the brain and face

Ying Sun, PhD, Associate Professor

Research Interests The pathological mechanisms of lysosomal storage diseases.

C. Alexander Valencia, PhD, Assistant Professor

Leadership Assistant Director, Molecular Genetics Laboratory

Research Interests Clinical genomics and proteomics: A systems biology view in human genetics

You-hai Xu, MD, PhD, Professor Emeritus

Research Interests Molecular and pathophysiological mechanisms of Gaucher Disease, particularly of neuronopathic Gaucher Disease

Ge Zhang, MD, PhD, Assistant Professor

Research Interests Genome-wide association studies and mathematical modeling of human genetic variations

Kejian Zhang, MD, MBA, Associate Professor

Leadership Director, Molecular Genetics Laboratory

Research Interests Molecular defects and molecular diagnosis of primary immunodeficiency diseases; Genetic aspects of predictive personalized medicine, eg., Pharmacogenetics

Joint Appointment Faculty Members

Artem Barski, PhD, Assistant Professor (Allergy & Immunology)

Research Interests Chromatin biology; epigenomic and transcriptional regulation of immune response; use of epigenomic data to augment genome –wide association studies

John Greinwald, MD, Associate Professor (Otolaryngology)

Research Interests Genetics of Hearing Loss

Kenneth Kaufman, PhD, Professor (Center for Autoimmune Genomics and Etiology)

Research Interests Genetics of complex diseases such as systemic lupus erythematosus

Kakajan Komurov, PhD, Assistant Professor (Exp. Hem. & Cancer Bio.)

Research Interests Interested in identifying global molecular network models of cancer progression

Stephanie Ware, MD, PhD, Adjunct (Molecular Cardiovascular Biology)

Research Interests Genetic disorders of cardiac structure and function

Clinical Staff Members

- **Laurie Bailey, MS, LGC**,
  Coordinator, Clinical Research Program ;Coordinator, Cincinnati STAR Center for Lysosomal Diseases
- **Michelle Baric, MS, LGC**
- **Judy Belli, RN**
- **Patricia Bender, RN, MSN**
- **Lisa Berry, MS, LGC**
- **Chinmayee Bhimarao Nagaraj, MS, LGC**
- **Beverly Blosser, MS**
- **Ashley Brazil, MS, LGC**
- **Anne Burroughs, RN**
- **Kathleen Collins, MS, LGC**
- **Jessica Connor, MS**
- **Jennifer Glass, MS, LGC**
- **Carol Hetteburg, RN, MSN**
- **Holle Jennifer, MS, LGC**
- **Hopper Jennifer, MS, LGC**
- **Judy Johnson, MS**
- **Sandy Kaiser, LPN**
- **Emily King, MS, LGC**
- **Sara Knapke, MS, LGC**,
  Hereditary Cancer Program;Clinical Manager
- **Betty Leech, MS, LGC**
- **Anne Lovell, RN, MSN, APN**
- **Abigail Masunga, MS, LGC**
- **Kimberly Page, RD**
- **Cynthia Prows, MSN,CNS**
- **Jodie Rueger-Johnson, MS, LGC**
- **Megan Shearouse, MS**
- **Rebecca Sisson, MS, LGC**
- **Christine Spaeth, MS, LGC**
- **Elizabeth Ulm, MS, LGC**
- **Emily Wakefield, MS**
- **Martha Walker, MS, LGC**
- **Connie Wehmeyer, RN**
- **Katie Wusik, MS, LGC**

Trainees

- **Lisa Dyer, PhD**, PGY7, Clinical Fellow Cytogenetics
- **Sophia Hufnagel, MD**, PGY4, Pediatrics/Genetics Combined Residency
- **Rob Hufnagel, MD, PhD**, PGY3, Pediatrics/Genetics Combined Residency

- **Harry Lesmana, MD**, PGY2, Pediatrics/Genetics Combined Residency
- **Xia Li, PhD**, PGY7, Clinical Fellow Molecular Genetics
- **Rachel Lombardo, MD**, PGY1, Pediatrics/Genetics Combined Residency
- **Stephanie Peters Santoro, MD**, PGY5, Pediatrics/Genetics Combined Residency
- **Bianca Russell, MD**, PGY1, Pediatrics/Genetics Combined Residency
- **K. Nicole Weaver, MD**, PGY5, Pediatrics/Genetics Combined Residency
- **Fanngeng Zou, PhD**, PGY7, Clinical Fellow Molecular Genetics

Division Collaboration

"Research project finding genetic causes of hematopoietic stem cell transplantation-associated thrombotic microangiopathy (Amber Hogart-Begtrup, PhD)"

Bone Marrow Transplantation and Immune Deficiency » Sonata Jodele, MD

"Genetic Pharmacology Services (Amber Hogart-Begtrup, PhD)"

Clinical Pharmacology » Sander Vinks, PharmD, PhD, FCP

"Developing a clinical assays for the genetic diagnosis of Epidermolysis Bullosa (Amber Hogart-Begtrup, PhD)"

Pediatric Dermatology » Anne Lucky, MD

"Developing of Next-generation sequencing-based molecular screening test for atypical hemolytic uremic syndrome and blood coagulation disorders (Amber Hogart-Begtrup, PhD)"

Experimental Hematology » Ralph A. Gruppo, MD

"Developing comprehensive genetic assays for the diagnosis of Hereditary Spherocytosis and other inherited hemolytic anemias (Amber Hogart-Begtrup, PhD)"

Hematology » Theodosia Kalfa, MD, PhD

"Launch of the testing program for hemoglobin disorders, e.g. Sickle cell and alpha and beta Thalassemia (Amber Hogart-Begtrup, PhD, Kejian Zhang, MD, MBA)"

Hematology » Charles Quinn, MD, MS

"Co-directs the genodermatoses clinic which focus on diagnosis, management, and clinical research of individuals with genetic disorders having significant dermatologic involvement (T. Andrew Burrow, MD)"

Pediatric Dermatology » Kara Shah, MD, PhD

"Co-directs the neurometabolic clinic which focus on diagnosis, management, and clinical research of patients with neurometabolic conditions (T. Andrew Burrow, MD)"

Neurology » Barbara Hallinan, MD, PhD

"Study: How well pediatricians follow the AAP Guidelines for monitoring Down syndrome (Robert J. Hopkin, MD)"

Cincinnati Children's Pediatrics » Community Pediatricians

"Utility of chromosomal analysis in twin-twin transfusion syndrome (Robert J. Hopkin, MD)"

Fetal Care Center » Foong-Yen Lim, MD, and William Polzin, MD

"Prenatal diagnosis of skeletal dysplasias (Robert J. Hopkin, MD)"
Radiology » Beth Kline-Fath, MD

"Stone Center Clinic (Robert J. Hopkin, MD)"
Nephrology and Hypertension » William DeFoor, MD, MPH, Prasad Devarajan, MD, Elizabeth Jackson, MD, and Eugene Minevich, MD

"DSD Clinic (Robert J. Hopkin, MD, Howard M. Saal, MD)"

Pediatric and Adolescent Gynecology » Lesley Breech, MD
Endocrinology » Meilan Rutter, MD
Pediatric Urology » Pramod Reddy, MD

"CHARGE Syndrome Program/Clinic (Robert J. Hopkin, MD, Howard M. Saal, MD)"
Developmental & Behavioral Pediatrics » Susan Wiley, MD
Otolaryngology » Daniel Choo, MD

"Long term outcomes of Pierre Robin sequence (Robert J. Hopkin, MD, Howard M. Saal, MD)"
Plastic Surgery » Christopher Gordon, MD
Pulmonary Medicine » Barbara Chini, MD

"Stottmann R01 Grant Project: Forward Genetics Analysis of Congenital Defects in Cortical Circuits & Structure (Robert J. Hopkin, MD, Rolf W. Stottmann, PhD)"
Neurology » Don Gilbert, MD, MS

"Genetics of Cortical Circuits and movement disorders (Robert J. Hopkin, MD, Rolf Stottmann, PhD)"
Neurology » Don Gilbert, MD, MS

"mtDNA mutation and premature birth (Taosheng Huang, MD, PhD)"
Center for Prevention of Preterm Birth » Louis J. Muglia, MD, PhD

"Deletion of the mitochondrial phosphate carrier desensitizes the mitochondrial permeability transition pore and causes cardiomyopathy (Taosheng Huang, MD, PhD)"
Molecular Cardiovascular Biology » Jeff Molkentin, PhD

"Barth syndrome, OPA1 & mitochondrial diseases associate with compound heterozygous mutation of ACAD9 (Taosheng Huang, MD, PhD)"
Molecular Cardiovascular Biology » Zaza Khuchua, PhD

"Creatinine deficiency and mental retardation (Taosheng Huang, MD, PhD)"
Neurology » Matthew R. Skelton, PhD

"Characterization of Bst mice (Taosheng Huang, MD, PhD)"
Ophthalmology » Richard Lang, PhD

"NARS2 mutations and hearing loss (Taosheng Huang, MD, PhD)"
Ophthalmology » Zubair Ahmed, PhD
Otolaryngology - Head and Neck Surgery » Saima Riazuddin, PhD

"Analysis interfaces for NGS data (Mehdi Keddache, PhD)"
Biomedical Informatics » Bruce Aronow, PhD

"Mutation discovery in clinical Exome testing (Mehdi Keddache, PhD)"
Center for Autoimmune Genetics and Etiology » Ken Kaufman PhD

"Low Grade Glioma subgrouping assay development (Mehdi Keddache, PhD)"
Cancer and Blood Diseases Institute » Maryann Fouladi, MD

"Maintained the PSCF ordering website and billing system for the iPSC core until switched to CORES billing system (Mehdi Keddache, PhD)"
Developmental Biology » Jim Wells, PhD, and Chris Mayhew, PhD

"Helping CEH and C4 researchers with DNA Sequencing experimental designs (Mehdi Keddache, PhD)"
Cancer and Blood Diseases Institute » Cancer Biology Research
Experimental Hematology » Punam Malik, MD

"Assist DHC researchers with DNA Sequencing experimental designs (Mehdi Keddache, PhD)"
Gastroenterology, Hepatology and Nutrition Research » Jorge Bezerra MD, and Cindy Wetzel PhD

"Designed CLIA test for clinical microbiology (Mehdi Keddache, PhD)"
Pathology and Laboratory Medicine » Joel Mortensen, PhD, and David Witte, MD

"Collaborated to study mitochondrial dysfunctions in cancer cells (Ronghua Li, PhD)"
Oncology » Bilap Dasgupta, PhD, MS

"Collaborated to study the change of mitochondrial function after overexpression of FOXM1 gene (Ronghua Li, PhD)"
Pulmonary Biology » Tatiana Kalin, MD, PhD

"BRAF Mutation Analysis, ABL1 mutation analysis (Xia Li, PhD)"
Bone Marrow Transplantation » Ashish Kumar, MD
Oncology » Maryam Fouladi, MD
Pathology and Laboratory Medicine » David Witte, MD, Mikako Warren, MD, and Ashish Kumar, MD

"Diagnosis of Spitzoid Melanoma using FISH panel (Xia Li, PhD)"
Pediatric Dermatology » Kara Shah, MD, PhD
Oncology » James Geller, MD

"Statistical genetic analyses for Dr. Rothenberg's NIH grant (Lisa J. Martin, PhD)"
Allergy and Immunology » Marc Rothenberg, MD, PhD

"The genetics of opioid and morphine related side effects and analgesia (Lisa J. Martin, PhD)"
Anesthesiology » Senthil Sadhasivam MD, MPH

"Providing statistical assistance for grant development, and a biostatistical core for a U19 (Lisa J. Martin, PhD)"
Asthma Research » Gurjit (Neeru) K. Khurana Hershey , MD, PhD

"Statistical analysis on various manuscripts (Lisa J. Martin, PhD) "
Biostatistics and Epidemiology » Jessica Woo, MHSA, PhD

"NIH funded project using next generation sequence data (Lisa J. Martin, PhD)"
Cardiology » Jeff Towbin, MD, and Stephanie Ware, MD, PhD, FACMG

"Genetics of recovery from traumatic brain injury (Lisa J. Martin, PhD)"
Physical Medicine and Rehabilitation » Brad Kurowski, MD, MS

"Geocoding for eMERGE biobank supplement (Melanie F. Myers, PhD, MS)"
Biomedical Informatics » Keith Marsolo, PhD

"Student thesis project (Melanie F. Myers, PhD, MS)"
Cardiology » Erin Miller, MS

"eMERGE biobank supplement, student thesis project, interviewer for research ethicist candidates (Melanie F. Myers, PhD, MS)"
Ethics Center » Armand Antommaria, MD, PhD, FAAP

"Student thesis project, GCP neurogenetics course (Melanie F. Myers, PhD, MS)"
Neurology » Hans Greiner MD, and Paul Horn, PhD

"Return of eMERGE Research Results and eMERGE Biobank supplement (Melanie F. Myers, PhD, MS)"
Center for Autoimmune Genetics and Etiology » John Harley MD, PhD

"Gene-environment interactions in autism (William C. Nichols, PhD)"
Biostatistics and Epidemiology » Daniel Lin, MD, PhD

"Right heart catheterization in mouse models of sickle cell disease (William C. Nichols, PhD)"
Experimental Hematology » Experimental Hematology

"Co-Investigators on Genetic analysis of murine chronic hypoxia-induced pulmonnary hypertension (William C. Nichols, PhD)"
Biomedical Informatics » Bruce Aronow, PhD
Pulmonary Biology » Tim Le Cras, PhD

"Co-Investigators on the National Biological Sample and Data Repository for PAH (William C. Nichols, PhD)"
Biomedical Informatics » Keith Marsolo, PhD
Center for Autoimmune Genetics and Etiology » John Harley, MD, PhD

Biomarker Laboratory » Michael Barnes, PhD

"Co-Investigators on the submitted RO-1 Grant (Role of C5a in induction of inflammation in Gaucher disease) (Manoj K. Pandey, PhD)"
Immunobiology » Joerg Koehl, MD

"Pre-emptive Genotyping of Children and Adolescents (Cynthia Prows, MSN, RN) "
Anesthesiology » Senthil Sadhasivam MD, MPH

"eMERGE (Cynthia Prows, MSN, RN)"
Biomedical Informatics » Rick Ittenbach, PhD

"Return of eMERGE Research Results (Cynthia Prows, MSN, RN)"
Center for Autoimmune Genetics and Etiology » John Harley MD, PhD

"Genetic Pharmacology Services (Cynthia Prows, MSN, RN)"
Clinical Pharmacology » Sander Vinks, PharmD, PhD, FCP

"To expand Dr. Froehlich's work with CES1-methylphenidate response results across eMERGE. (Cynthia Prows, MSN, RN)"
Developmental and Behavioral Pediatrics » Tanya Froehlich, MD, MS, FAAP

"Student project, interviewer for research ethicist candidates, Bioethics conference planning team (Cynthia Prows, MSN, RN)"
Ethics Center » Armand Antommaria, MD, PhD, FAAP

"EPIC –Genetic Pharmacology Services results templates and clinical decision support alerts (Cynthia Prows, MSN, RN)"
Information Services » Shanti Smith

"Theses RACs, Divisional Scientific Review, Beginning plans for preparing Patient Services workforce for translation of planned Genomic Center research in clinical care. (Cynthia Prows, MSN, RN)"
Patient Services Center for Professional Excellence » Rita H. Pickler, PhD, RN, PNP-BC, FAAN

"Genomic research aimed at identifying predisposition to bipolar disorder (Cynthia Prows, MSN, RN)"
Psychiatry » Drew Barzman, MD, and Melissa Delbello, MD

"Detailed pathological analysis of recent heart failure mutants (Daniel Prows, PhD) "
Pathology and Laboratory Medicine » Shiva Kumar Shanmukhappa DVM, PhD

"Assessing lung pathology following several acute injuries, including ozone or hyperoxia inhalation, and lung infection models (Daniel Prows, PhD)"
Pulmonary Biology » Steve Glasser, PhD

"Velopharyngeal insufficiency (VPI) clinic (Howard M. Saal, MD, FACMG) "

ENT and Speech Pathology » David Willging, MD, and Ann Kummer, PhD.

"Eye genetics research and identifying genes for new and rare eye disorders (Howard M. Saal, MD, FACMG)"
Ophthalmology » Zubair Ahmed, PhD, and Virginia Utz, MD

"Skeletal Dysplasia Clinics (Howard M. Saal, MD, FACMG)"
Orthopaedics » James McCarthy, MD

"Exome analyses for studies to identify genes important for to craniofacial and brain development (Howard M. Saal, MD, FACMG)"
Plastic Surgery » Samantha Brugmann, PhD
Developmental Biology » Rulang Jiang, PhD, and Steven Potter, PhD

"Provides basic science expertise as the basis for NF clinical trials (Elizabeth Schorry, MD)"
Experimental Hematology and Cancer Biology Research » Nancy Ratner, PhD

"Participate in multi-disciplinary Tuberous Sclerosis clinic and collaborated with Dr. Krueger to develop a plan for a future Rasopathy clinical and research program. (Elizabeth Schorry, MD)"
Neurology » Darcy Krueger, MD, PhD and David Neal Franz, MD

"Development and implementation of the drug trials for plexiform neurofibromas, optic nerve gliomas, and MPNST (Elizabeth Schorry, MD) "
Neurology » Darcy Krueger, MD, PhD,
Oncology » Brian Weiss MD

"Monosomy 7 project (Teresa Smolarek, PhD)"
Cancer and Blood Diseases Institute » Stella Davies, MBBS, PhD, MRCP, Parinda Mehta, MD, Jim Mulloy, PhD, and Jose Cancelas Perez, MD, PhD

"Working to develop a FISH panel for atypical spitzoid tumors/melanomas (Teresa Smolarek, PhD)"
Pediatric Dermatology » Kara Shah, MD, PhD

"FISH project looking at certain probes in the genome in glioblastomas (Teresa Smolarek, PhD)"
Oncology » Bilap Dasgupta, PhD, MS

"Development of fluorescence in situ hybridization (FISH) probes to more accurately diagnose specific translocations in pediatric renal cell carcinoma (Teresa Smolarek, PhD)"
Oncology » Jim Geller, MD

"Renal Tumor research (Teresa Smolarek, PhD)"
Pediatric General and Thoracic Surgery » Greg Tiao, MD
Oncology » Jim Geller, MD
Pathology » Anita Gupta, MD, and Mikako Warren, MD

"Molecular mechanisms underlying a novel, causal mutation in patients with microcephaly identified in DHG human

exome analysis protocol (Rolf W. Stottmann, PhD)"
Oncology » Bilap Dasgupta, PhD, MS

"Molecular mechanisms of hydrocephalus in the prh mouse mutant (Rolf W. Stottmann, PhD)"
Neurology » June Goto, PhD, and Francesco Mangano, DO, FACS, FACOS

"Evaluating a new mouse model of congenital forebrain malformations that has learning and memory defects as well as epileptic seizure activity (Rolf W. Stottmann, PhD)"
Neurobiology » Steve Danzer, PhD
Neurology » Charles Vorhees, PhD, and Michael T. Wiliams, PhD

"Studying the role of primary cilia in regulating growth and patterning of the embryonic forebrain and craniofacial structures (Rolf W. Stottmann, PhD)"
Plastic Surgery » Samantha Brugmann, PhD

"Generating induce pluripotent stem cells from human fibroblasts (Ying Sun, PhD)"
Developmental Biology » Chris Mayhew, PhD

"Neuronopathic Gaucher disease treatment (Ying Sun, PhD)"
Experimental Hematology and Cancer Biology Research » Dao Pan, PhD

"Consultations for mouse and human tissue pathology (Ying Sun, PhD)"
Pathology and Laboratory Medicine » David Witte, MD

"Assessment of neurobehavioral in our mouse models with neurologic defect. (Ying Sun, PhD, Kejian Zhang, MD, MBA)"
Neurology » Matthew Skelton, PhD, Charles Vorhees, PhD, and Michael William, PhD

"Characterizing novel granzyme B substrates, through functional assays (C. Alexander Valencia, PhD)"
Allergy and Immunology » Kimberly Risma, MD, PhD

"Functional characterization of candidate genes identified by exome sequencing (C. Alexander Valencia, PhD)"
Gastroenterology, Hepatology and Nutrition Research » Alexander Miethke, MD

"Testing whether mRNA-display can identify transcription factors that can bind in the regulatory regions of lupus susceptibility genes (C. Alexander Valencia, PhD)"
Rheumatology » Matthew T. Weirauch, PhD

"To establish The March of Dimes Prematurity Research Center at CCHMC. Involved in the (Genetics of unique human populations), which seeks to identify genetic variants in human birth timing control by genome-wide analysis in human populations as well as cross-species comparisons and microevolutionary approaches. (Ge Zhang, MD, PhD)"
Perinatal Institute » Louis J. Muglia, MD, PhD

"Investigating causal relationships among multiple cardiometabolic traits that are involved in cardiovascular

diseases (Ge Zhang, MD, PhD)"
Environmental Health Department » Ranjan Deka, PhD

"Stratification of clinical septic shock (Ge Zhang, MD, PhD)"
Critical Care Medicine » Hector Wong, MD

"Genetic predispositions for bipolar disorder (Ge Zhang, MD, PhD)"
Psychiatry » Drew Barzman, MD

"Study of “Improving Acute Pediatric Pain Management Using Neurogenomics”. (Kejian Zhang, MD, MBA)"
Anesthesiology » Senthil Sadhasivam MD, MPH

"Molecular diagnoses of patients with immunodeficiency (Kejian Zhang, MD, MBA)"
Bone Marrow Transplantation and Immune Deficiency » Stella M Davies, MBBS, PhD, MRCP, and Alexandra Filipovich, MD

"Introduced four Next-generation based panel testing: SCN, HLH, ALPS, EBSeq, TMA, aHUS disorders. (Kejian Zhang, MD, MBA)"
Bone Marrow Transplantation and Immune Deficiency » Stella M Davies, MBBS, PhD, MRCP, and Alexandra Filipovich, MD

"Pharmacogenetics of IMPDH in Kidney Transplant Patients which is an extension of our on-going study of genetic effect of UGT2B7, 1A8 and 1A9 on the pharmacogenetics of MPA on patients underwent kidney transplant (Kejian Zhang, MD, MBA)"
Clinical Pharmacology » Sander Vinks, PharmD PhD, FCP

"Genetic study for Epidermolysis Bullosa (Kejian Zhang, MD, MBA)"
Pediatric Dermatology » Anne Lucky, MD

"Genetic test for patients with diabetes and hypoglycemia (Kejian Zhang, MD, MBA)"
Endocrinology » Lawrence M. Dolan, MD

"Neonatal Jaundice testing program (Kejian Zhang, MD, MBA)"
Gastroenterology, Hepatology and Nutrition Research » Jorge A. Bezerra, MD, and Alexander Miethke, MD

"Develop clinical panel testing for “Red Cell Skeleton" disorders (Kejian Zhang, MD, MBA)"
Hematology » Theodosia Kalfa,MD, PhD, and Malik Putnam, MD

"For the development of aHUS testing program (Kejian Zhang, MD, MBA)"
Hematology » Ralph Gruppo, MD,
Bone Marrow Transplantation and Immune Deficiency » Sonata Jodele, MD

"MetaboSeq genetic testing (Kejian Zhang, MD, MBA)"
Cardiology » Arnold W. Strauss, MD

" Launched the expand CYP2D6 and 2C19 GPS panel (Kejian Zhang, MD, MBA)"

Clinical Pharmacology » Sander Vinks, PhD

Neurology » Tracy Glauser, MD

"To develop a new pediatric oncology testing program. (Kejian Zhang, MD, MBA)"

Oncology » John Perentesis, MD, FAAP

"Long time collaboration has resulted in nationally recognized molecular diagnostic program (Kejian Zhang, MD, MBA)"

Otolaryngology » Daniel I. Choo, MD, and John Greinwald Jr., MD, FAAP

"To uncover the relationship between defects in Munc13-4 gene and Macrophage Activation Syndrome in patients with sJIA (Kejian Zhang, MD, MBA)"

Rheumatology » Alexi Grom, MD

"Develop and implement the Whole Exome Sequencing technology and analyses for clinical services (Kejian Zhang, MD, MBA)"

Center for Autoimmune Genetics and Etiology » John Harley, MD, PhD, and Kenneth Kaufman, PhD

"Develop and implement the Whole Exome Sequencing technology and analyses for clinical services (Kejian Zhang, MD, MBA)"

Center for Autoimmune Genetics and Etiology » John Harley, MD, PhD, and Kenneth Kaufman, PhD

Grants, Contracts, and Industry Agreements

Grant and Contract Awards		Annual Direct
GRABOWSKI, G		
Cincinnati Regional Genetics Center		
Health Resources & Services Admin(Ohio Department of Health)		
03130011GS0613	07/01/12-03/31/16	$349,000
Improved Diagnosis and Treatment of Pediatric Mood Disorders through Integrated Clinical Genomics		
The Oxley Foundation		
	12/01/11-11/30/14	$23,028
LDN: Epidemiology and Natural History of Wolman and Cholesteryl Ester Storage Disease		
National Institutes of Health(University of Minnesota)		
U54 NS 065768	9/30/09-08/31/14	$38,462
GRABOWSKI, G / PAN, D (MPI)		
Gaucher Disease: Treatment of Neurodegenerative Disease		
National Institutes of Health		
R01 NS 086134	09/01/13-05/31/18	$270,887
KEDDACHE, M		
Digestive Health Center: Bench to Bedside Research in Pediatric Digestive Disease - Sequencing Core		

National Institutes of Health

P30 DK 078392	06/01/12-06/31/17	$42,618

LESLIE, N

Defining the Natural History of Inborn Errors of Metabolism
National Institutes of Health(Michigan Public Health Institute)

R01 HD 069039	04/15/11-03/31/16	$24,560

MARTIN, L

Epithelial Genes in Allergic Inflammation (AADCRC Core)
National Institutes of Health

U19 AI 070235	09/01/11-08/30/16	$87,790

MYERS, M

Type 2 Diabetes and Social Networks
National Institutes of Health

HHSN268201200237P	07/01/12-06/30/14	$37,026

NICHOLS, W

National Biological Sample and Data Repository for PAH
National Institutes of Health

R24 HL 105333	03/03/12-02/28/17	$1,433,971

SCHORRY, E

NF Consortium Infrastructure
Department of Defense(University of Alabama-Birmingham)

W81XWH120155	05/15/12-05/14/15	$37,534

Neurofibromatosis Therapeutic Acceleration Program
Johns Hopkins University

	02/01/14-01/31/16	$42,869

STOTTMANN, R

Forward Genetic Analysis of Congenital Defects in Cortical Circuits and Structure
National Institutes of Health

R01 NS 085023	05/15/14-02/01/15	$261,046

The Role of the Intraflagellar Transport Gene Ttc21b in Neural Ciliopathic Disease
March of Dimes

5FY13194	02/01/13-01/31/15	$68,386

Current Year Direct **$2,717,177**

Industry Contracts

BURROW, T

Genzyme Corporation	$102,934
Synageva BioPharma Corp	$18,223
GRABOWSKI, G	
Genzyme Corporation	$129,945
Shire Human Genetic Therapies	$68,641
HOPKIN, R	
Genzyme Corporation	$76,039
LESLIE, N	
BioMarin Pharmaceutical, Inc.	$2,310
Genzyme Corporation	$77,016
SAAL, H	
Alexion Pharma International	$49,489
SUN, Y	
Genzyme Corporation	$57,635
ZHANG, K	
Synageva BioPharma	$35,497
Current Year Direct Receipts	**$617,729**
Total	**$3,334,906**