\section*{Significant Accomplishments}

\subsection*{Study Identifies Regulators of Eosinophilic Inflammation in Inflammatory Bowel Disease}

Simon P. Hogan, PhD, Research Director for our Division, identified a new role for the innate inflammatory cell macrophage and NFkB signaling pathway in the regulation of eosinophilic inflammation in inflammatory bowel disease (IBD). Employing a murine model of colitis and mice with NFkB signaling deleted selectively in macrophages, Hogan identified a requirement for NFkB signaling in inflammatory macrophages for secretion of the eosinophil-selective chemokine CCL11, eosinophilic inflammation and the histopathology of experimental colitis (DSS-induced model). Molecular and cellular analyses revealed a link between expression of calprotectin (S100a8/S100a9), Ccl11 expression and eosinophil numbers in the DSS-treated colon. The results indicate that myeloid cell–specific NF-kB-dependent pathways play an unexpected role in CCL11 expression and maintenance of eosinophilic inflammation in experimental colitis. These data were published in the \textit{Journal of Immunology} and indicate that targeting myeloid cells and NFkB-dependent pathways may be of therapeutic benefit for the treatment of eosinophilic inflammation and histopathology in IBD.

\subsection*{Method Developed to Directly Evaluate Eosinophil Tracking In Vivo}

Most in vivo studies of granulocytes draw conclusions about their trafficking based on examination of their steady-state tissue/blood levels, which result from a combination of tissue homing, survival and egress rather than direct examination of cellular trafficking. Ting Wen, PhD, and Marc Rothenberg, MD, PhD, Division Director, developed a unique cell transfer system involving the adoptive transfer of a genetically labeled, bone-marrow-derived unique granulocyte population (eosinophils) into an elicited inflammatory site, the allergic lung.
As published in the *Proceedings of the National Academy of Sciences*, a dual polychromatic FACS-based biomarker-labeling system based on the IL4-eGFP transgene (4get) or Cd45.1 allele was used to track IV-transferred eosinophils into the airway following allergen or T(H)2-associated stimuli in the lung in multiple mouse strains. The system was amenable to reverse tagging of recipients, thus allowing transfer of nonlabeled eosinophils and competitive tracking of multiple populations of eosinophils in vivo. This unique eosinophil transfer system provides an unprecedented opportunity to examine airway eosinophil migration without the need for extensive efforts to acquire donor source and time-consuming genetic crossing and has already been used to identify a long eosinophil half-life in the allergic lung and a definite role for ST2 in regulating eosinophil trafficking.

**Faculty Recognized For Research Endeavors**

The American College of Allergy, Asthma & Immunology (ACAAI) unanimously voted Amal Assa'ad, MD, the Clinical Director, to receive the ACAAI Woman in Allergy Award for 2013. This prestigious award recognizes her dedication in advancing the specialty by her work in food allergy and science. Recently appointed faculty member Patricia Fulkerson, MD, PhD, was awarded a 2013 ARTrust™ Faculty Development Award by the American Academy of Allergy, Asthma and Immunology (AAAAI) for her eosinophil progenitor research. This is the academy’s most prestigious award. The funding supports Fulkerson’s research investigating the regulation of eosinophil progenitors by Toll-like receptors, which may support development of therapeutics for eosinophil-associated disorders such as asthma and eosinophilic gastrointestinal disorders. Recently appointed faculty member Joseph Sherrill, PhD, was awarded the Thrasher Research Fund Early Career Award in recognition of his promise as an investigator. His work employs a functional genomics approach to understand the genetic etiology of inflammatory diseases such as eosinophilic gastrointestinal disorders.

**Research Highlights**

**New Leadership for Division Research**

**Simon P. Hogan, PhD** was recently appointed as the Director of Research of the Division of Allergy/Immunology. He joins the Division Director, **Marc E. Rothenberg, MD, PhD**, and Amal H. Assa'ad, MD, Associate Division Director and Division Clinical Director, in leading the division to new heights to improve the health of children with allergic and immune conditions through innovative research, outstanding clinical care and education of the current and next generation of leaders in healthcare and research.

**New Leadership for Allergy/Immunology Fellowship Program**

**Kimberly A. Risma, MD, PhD** has assumed the role of Fellowship Director of the Allergy/Immunology Fellowship Program. Risma is dedicated to teaching our future allergists in this combined pediatric and adult fellowship program (via partnership with the University of Cincinnati). This program is an integral part of our division's mission to improve the health of children with allergic and immune conditions through the education of the current and next generation of leaders in healthcare and research.

**New Leadership for Advancing Mechanistic Allergy and Asthma Research**

**Nives Zimmermann, MD** has assumed the position of Vice Chair of the Mechanism of Allergy and Asthma interest section of the American Academy of Allergy, Asthma and Immunology (AAAAI). In this position, she will provide leadership to the constituents with an interest in mechanistic research and a central role in the planning of the AAAAI annual conference.
Division Researcher Appointed President at the University of Cincinnati

University of Cincinnati President Santa J. Ono, PhD, Professor within the Division of Allergy and Immunology, was appointed as the 28th President at the University of Cincinnati. Prior to his presidency, Ono served for two years as the Senior Vice President for Academic Affairs and Provost. In addition to his institutional leadership and service, Ono leads an active research program. His principal research interests focus on transcriptional regulation in the human immune system, mechanisms of mast-cell dependent inflammation on the ocular surface, and the immune component of age-related macular degeneration.

Director, Registry for Eosinophilic Disorders (REGID)

J. Pablo Abonia, MD assesses the clinical biology and regulation of mast cells and their role in diseases, such as eosinophilic esophagitis, eosinophilic gastrointestinal disorders and primary mast cell disease. He conducts translational research and clinical trials in conjunction with developing patient databanks and bioinformatic approaches to further understand allergic disease. A member of the Cincinnati Center for Eosinophilic Disorders, Abonia was recently appointed the Director of the Registry for Eosinophilic Gastrointestinal Disorders (REGID), a national not-for-profit collaboration of medical centers, professionals, families and individuals dedicated to improving the knowledge, research and outcomes for people living with eosinophilic gastrointestinal disorders.

Division Director Discovers miRNAs Controlling Eosinophilopoiesis

Marc E. Rothenberg, MD, PhD has identified roles for two miRNAs, miR-21 and miR-223, in controlling eosinophilopoiesis, the generation of eosinophils. miR-21 has previously been shown to regulate T-cell polarization and activation in preclinical models and to be dysregulated in an miRNA signature that correlates with disease activity for eosinophilic esophagitis (EoE), a severe food allergy. miR-21 is one of the most upregulated miRNAs in multiple allergic diseases associated with eosinophilia and has long been shown to positively correlate with eosinophil levels. Using a murine interleukin-5 (IL-5)-driven eosinophil differentiation model and gene expression microarray analysis, Rothenberg showed that targeted ablation of miR-21 in decreased eosinophil progenitor cell growth. In a related study, Rothenberg demonstrated a similarly important role for miR-223 in regulating eosinophil progenitor growth and differentiation, with miR-223 deficiency increasing eosinophil progenitor proliferation. Identification of the role miRNAs in eosinophilopoiesis and the specific miRNAs involved are critical advancements for the development of biomarkers, therapies and eventual cures for allergic disease.

Division Research Director Furthers Understanding of Intestinal Epithelial Barrier Homeostasis

Simon P. Hogan, PhD identified a role for the mast cell–derived serine protease chymase in the regulation of intestinal epithelial barrier homeostasis. As published in the American Journal of Physiology - Gastrointestinal and Liver Physiology, Hogan employed in vitro model systems to delineate the molecular pathways involved in chymase-mediated intestinal epithelial barrier dysfunction and demonstrated that chymase-mediated modulation of intestinal epithelial barrier was characterized by chymase-induced protease-activated receptor (PAR)-2 activation and matrix metalloproteinase (MMP)-2 expression and activation. Importantly, pharmacological and small interfering RNA-mediated antagonism of PAR-2 and MMP-2 significantly attenuated chymase-stimulated barrier dysfunction. Collectively, these results suggest that mast cell/chymase-mediated intestinal epithelial barrier function is mediated by PAR-2/MMP-2-dependent pathways.

Division Researcher Investigates Epigenomics of Immunology

Artem Barski, PhD is interested in the epigenetic and transcriptional regulation of gene expression and
contributed to the development of ChIP-Seq, a revolutionary method that combines chromatin immunoprecipitation (ChIP) with the next-generation sequencing (Seq). Epigenomics is a cutting-edge field that elucidates the importance of how reversible modifications of DNA or histones can alter expression of genes or genetic variants during homeostasis or disease. Using ChIP-Seq and other sequencing-based genome-wide methods, Barski investigates the role of chromatin modifications in gene regulation, including his recent work with chromatin regulation of genes transcribed by RNA polymerase III and the discovery of gene poising in T cells. He is currently researching the epigenetic basis of T-cell activation, memory and tolerance.

Division Researcher Discovers Mechanism of Eosinophil Cell Death

Nives Zimmermann, MD was the senior author for “Mechanism of Siglec-8-mediated cell death in IL-5-activated eosinophils: role for reactive oxygen species-enhanced MEK/ERK activation”, which was recently published in the Journal of Allergy and Clinical Immunology. This study, led by Gen Kano, MD, PhD and performed in collaboration with Dr. Bruce Bochner from Johns Hopkins University, discovered a novel mechanism of cell death in activated eosinophils. This finding is significant because eosinophil cell death, accompanied by release of toxic granule content in tissue, contributes to the pathophysiology of multiple diseases, including allergic diseases. The ability to inhibit this novel pathway of regulated necrosis could lead to improved therapies for these diseases. As a result of this study and its potential impact, Zimmermann was awarded a grant from the American Heart Association to study the molecular mechanisms of eosinophil cell death, in collaboration with Dr. Margaret Collins, Department of Pathology.

Division Clinician Researcher Pursues Development of High-Throughput Screening Assay for Hemophagocytic Lymphohistiocytosis Therapeutics

Kimberly A. Risma, MD, PhD developed and executed the first known microplate assay screen for small-molecule enhancers of natural killer (NK) cell and cytotoxic T lymphocyte function. This study provided critical preliminary data that will permit adaptation and execution of a much larger high-throughput screen this year, in collaboration with the NIH Molecular Libraries Program. Using patient-derived primary NK cells, Risma will screen a library of FDA-approved compounds for cytotoxic enhancers of NK cell function in an attempt to repurpose drugs already in clinical use. This research effort has great potential to ultimately change the outcome for children with inherited defects in cytotoxic function associated with the potentially fatal disorder, hemophagocytic lymphohistiocytosis (HLH). More broadly, the results of this research may eventually provide alternative treatments in cancer and/or chronic viral infections.

Division Clinician Researcher Dedicated to Fungal Spore Research

Michelle B. Lierl, MD is conducting a study investigating the role of outdoor fungal and myxomycete spores as aeroallergens; this study involves allergy skin testing with myxomycete and basidiomycete spore extracts to identify whether they are previously unrecognized aeroallergens. As no extracts of these spores were commercially available, Lierl collects the spores herself and makes the extracts for the allergy skin testing. Having discovered the lack of photographs available of these microscopic spores, she also maintains a website to share photographs of spores of basidiomycetes, ascomycetes, and myxomycetes as a reference source for others for fungal species identification.

Division Clinical Director Supports Cincinnati Children’s National and Global Mission

Amal H. Assa’ad, MD has exemplified the national and global mission of Cincinnati Children’s through her far-reaching dedication and valued efforts to improve child health. She has represented Cincinnati Children’s as an invited speaker at plenary sessions and international symposia at four international meetings, in Israel, Italy,
Mexico, and India. In addition, she serves as an elected member of the American Academy of Allergy, Asthma and Immunology (AAAAI) Board of Directors; chaired and organized the 2012 American College of Allergy, Asthma & Immunology (ACAAI) Food Allergy Symposium; and co-authored a well-received publication in the Journal of Allergy and Clinical Immunology about preventing allergic disease through nutritional interventions. Her efforts abroad are coupled with her local leadership in clinical care and clinical research trials, with her work in food allergy being recognized with the prestigious Louisa Bousinco Lectureship and Award by the ACAAI.

Significant Publications


Most in vivo studies of granulocytes draw conclusions about their trafficking based on examination of their steady-state tissue/blood levels, which result from a combination of tissue homing, survival, and egress, rather than direct examination of cellular trafficking. Wen *et al.* developed a unique cell transfer system involving the adoptive transfer of a genetically labeled, bone marrow–derived unique granulocyte population (eosinophils) into an elicited inflammatory site, the allergic lung. The system was amenable to reverse tagging of recipients, thus allowing transfer of nonlabeled eosinophils and competitive tracking of multiple populations of eosinophils in vivo.

This unique eosinophil transfer system provides an unprecedented opportunity to examine airway eosinophil migration without the need for extensive efforts to acquire donor source and time-consuming genetic crossing and has already been used to identify a long eosinophil half-life in the allergic lung and a definite role for ST2 in regulating eosinophil trafficking.


Interleukin 13 (IL-13)-induced epithelial gene and protein expression changes are central to the pathogenesis of multiple allergic diseases. Using human esophageal squamous and bronchial columnar epithelial cells, Lu *et al.* identified microRNAs (miRNAs) that were differentially regulated after IL-13 stimulation, including a conserved pattern of downregulation of miR-375. In a human disease characterized by IL-13 overproduction, the allergic disorder eosinophilic esophagitis (EoE), miR-375 expression levels reflected disease activity, normalized with remission, and inversely correlated with the degree of allergic inflammation. These and further results of this study support a key role of miRNAs, particularly miR-375, in regulating and fine-tuning IL-13–mediated responses, which may have key implications for future therapeutic development for allergic conditions.

**Waddell A, Ahrens R, Tsai YT, Sherrill JD, Denson LA, Steinbrecher KA, Hogan SP. Intestinal CCL11 and eosinophilic inflammation is regulated by myeloid cell-specific RelA/p65 in mice.** Journal of Immunology. May 1 2013;190(9):4773-4785.

Waddell *et al.* identified a new role for the innate inflammatory cell macrophage and NFκB signaling pathway in the regulation of eosinophilic inflammation in inflammatory bowel disease (IBD). Employing a murine model of colitis and mice with NFκB signaling deleted selectively in macrophages and molecular and cellular analyses, the researchers demonstrated a requirement for NFκB signaling in inflammatory macrophages for secretion of the eosinophil-selective chemokine CCL11, eosinophilic inflammation and the histopathology of experimental colitis (DSS-induced model and revealed a link between expression of calprotectin (S100a8/S100a9), Ccl11 expression and eosinophil numbers in the DSS-treated colon. The results indicate that myeloid cell–specific NFκB-dependent pathways play an unexpected role in CCL11 expression and maintenance of eosinophilic...
inflammation in experimental colitis. These data indicate that targeting myeloid cells and NFkB-dependent pathways may be of therapeutic benefit for the treatment of eosinophilic inflammation and histopathology in IBD.


Recently, microRNAs have been shown to be involved in hematopoietic cell development, but their role in eosinophilopoiesis has not yet been described. Lu et al. demonstrated a contributory role for miR-223 in regulating eosinophil progenitor growth and differentiation, with miR-223 deficiency increasing eosinophil progenitor proliferation and whole-genome microarray analysis demonstrating specific enrichment of genes that regulate hematopoiesis in miR-223–deficient eosinophil progenitors compared to wild-type eosinophil progenitors. These results demonstrate that microRNAs regulate the development of eosinophils by influencing eosinophil progenitor growth and differentiation and identify a contributory role for miR-223 in this process. Identification of the role miRNAs in eosinophilopoiesis and the specific miRNAs involved are critical advancements for the development of biomarkers, therapies and eventual cures for allergic disease.


Accumulating evidence points to crosstalk between FceRI and CC chemokine receptor (CCR)-mediated signaling pathways in mast cells. Toda et al. demonstrate that vimentin, a protein comprising type III intermediate filaments, is a component in such crosstalk for CCL2/monocyte chemotactic protein 1 (MCP-1) production in mast cells, which is a mechanism for allergic inflammation. Their data suggest that disassembled vimentin interacting with phosphorylated p38 MAPK could mediate CCL2 production in mast cells upon FceRI and CCR1 activation, with vimentin possibly being a component inducing optimal CCL2 production in mast cells. As increased expression of CCL2 has been observed in tissues of allergic patients, these findings could provide clues to unraveling detailed molecular mechanisms underlying allergic inflammation.

Division Publications

6. Davis BP, Rothenberg ME. Antigen presentation by eosinophils in eosinophilic esophagitis?. J


23. Lu TX, Lim EJ, Wen T, Plassard AJ, Hogan SP, Martin LJ, Aronow BJ, Rothenberg ME. MiR-375 is downregulated in epithelial cells after IL-13 stimulation and regulates an IL-13-induced epithelial


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**Faculty, Staff, and Trainees**

**Faculty Members**

**Marc E. Rothenberg, MD, PhD,** Professor  
**Leadership** Director, Division of Allergy and Immunology; Director, Cincinnati Center for Eosinophilic Disorders  
**Research Interests** Elucidating the mechanisms of allergic responses in mucosal tissues such as the lung and the gastrointestinal tract with a focus on eosinophilic esophagitis

**J. Pablo Abonia, MD,** Associate Professor  
**Research Interests** Investigates eosinophilic esophagitis and focuses on informatics analysis of medical records and the Registry of Eosinophilic Gastrointestinal Disorders (REGID)

**Amal H. Assa'ad, MD,** Professor  
**Leadership** Clinical Director  
**Research Interests** Investigates food allergy (natural history of IgE-mediated food allergy, diagnostic tools, association with cardiovascular morbidity) and conducts clinical trials of novel therapies for atopic disorders (food allergy, eosinophilic disorders, asthma)

**Artem Barski, PhD,** Assistant Professor  
**Research Interests** Investigates chromatin biology and epigenomic and transcriptional regulation of immune responses and uses epigenomic data to augment genome-wide association studies

**Thomas J. Fischer, MD,** Adjunct  
**Research Interests** Focuses on the pharmacologic management of asthma and immune deficiency diseases

**Patricia C. Fulkerson, MD, PhD,** Assistant Professor  
**Research Interests** Researches the biology of the eosinophil-lineage committed progenitor (EoP). Aiming to identify novel therapeutic targets to block eosinophil production for the treatment of patients with eosinophilic disorders

**Simon P. Hogan, PhD,** Associate Professor
Leadership
Research Director

Michelle B. Lierl, MD, Adjunct
Research Interests Studies allergies, food allergies, eosinophil biology and gastrointestinal inflammation

Anil Mishra, MD, PhD, Associate Professor
Research Interests Investigates the role of basidiomycete fungal spores and myxomycete spores as aeroallergens and conducts allergen component testing for food allergies

Terri M. Moncrief, MD, Instructor
Research Interests Investigates cytokine receptor signaling in mucosal inflammation to identify immunological mechanisms and pharmacological targets

Santa J. Ono, PhD, Professor
Research Interests Focuses on the transcriptional regulation in the human immune system, mechanisms of mast cell-dependent inflammation on the ocular surface and the immune component of age-related macular degeneration

Kimberly A. Risma, MD, PhD, Assistant Professor
Leadership Director, Allergy and Immunology Division Fellowship Program
Research Interests Develops novel diagnostic/therapeutic approaches to improve outcomes for children with hemophagocytic lymphohistiocytosis, an inflammatory disease caused by genetic defects in the cytotoxic pathways of natural killer cells and cytotoxic T lymphocytes

Joseph D. Sherrill, PhD, Instructor
Research Interests Functional analysis of genetic variants affecting epithelial homeostasis in allergic disease

Karl F. von Tiehl, MD, Assistant Professor
Research Interests Conducts clinical research on the relation of egg allergy to the influenza vaccine and on eosinophilic disorders

Yui-Hsi Wang, PhD, Assistant Professor
Research Interests Investigating how inflammatory mediators regulate the function of adaptive CD4+ T-helper cells and innate effector cells in order to understand whether the interplay between these cells contributes to allergic responses in the airway and gut

Nives Zimmermann, MD, Associate Professor
Research Interests Focuses on deciphering the mechanisms of eosinophilia and eosinophil survival and death in allergic inflammation and asthma

Li Zuo, MD, Assistant Professor
Research Interests Investigates mechanisms and new therapeutic options for food allergy and food allergy-related disorders

Joint Appointment Faculty Members
Gurjit Khurana Hershey, MD, PhD, Professor (Asthma Research)

Research Interests Utilizing a transdisciplinary approach that integrates clinical, translational, and basic research to achieve the overall goal of delineating the mechanism underlying asthma pathogenesis and improving the health of children with asthma

Alexandra H. Filipovich, MD, Professor (Hematology/Oncology Diagnostic Laboratory)

Research Interests Primary immunodeficiencies; BMT for primary immunodeficiencies; Hemophagocytic lymphocytosis; Post-BMT immune reconstruction

Clinical Staff Members

Harpinder K. Kalra, MD, Staff Physician

Trainees

Andrew W. Lindsley, MD, PhD, PGY-6, Indiana University School of Medicine, Indianapolis, IN
Benjamin P. Davis, MD, PGY-5, University of Iowa, Des Moines, IA
Jinzhu Li, MD, PhD, PGY-5, Wayne State University, Detroit, MI
Maya Nanda, MD, PGY-5, Albany Medical College, Albany, NY
David Morris, MD, PGY-4, Wright State University, Dayton, OH
Nurit P. Azouz, PhD, Tel Aviv University, Tel Aviv, Israel
Carine Bouffi, PhD, University of Montpellier, Montpellier, France
Chun-Yu Chen, PhD, University of Rochester, Rochester, NY
Adrienne E. Hontz, PhD, University of Kansas Medical Center, Kansas City, KS
Svetlana S. Itskovich, PhD, Tel Aviv University, Tel Aviv, Israel
Jee-Bong Lee, PhD, Ewha Womans University, Seoul, South Korea
Kan Liu, PhD, Beijing Institute of Genomics, Beijing, China
Rituraj Niranjan, PhD, Jawaharlal Nehru University, New Delhi, India
Alexandra A. Vrazo, PhD, Northwestern University, Evanston, IL
Ting Wen, PhD, Rutgers University/University of Medicine and Dentistry of New Jersey, New Brunswick, NJ
Gen Kano, PhD, Kyoto Prefectural University of Medicine, Kyoto, Japan
Rahul D’Mello, Johns Hopkins University, Baltimore, MD
Bo Liu, Tsinghua University, Beijing, China
Thomas X. Lu, MD, University of Cincinnati, Cincinnati, OH
Jared B. Travers, University of Cincinnati, Cincinnati, OH
Nithin Banda, Johns Hopkins University, Baltimore, MD
Tiffany Brooks, University of Cincinnati, Cincinnati, OH
Sam Coffey, Ball State University, Muncie, IN
Archit Sahai, Ohio State University, Columbus, OH
Michael Stephens, Thomas More College, Crestview Hills, KY
Haitong Tai, Xavier University, Cincinnati, OH
Leah Yuan, Washington University in St. Louis, St. Louis, MO
Christopher Zust, Xavier University, Cincinnati, OH
Netali Ben-Baruch Morgenstern, Tel Aviv University, Tel Aviv, Israel
Ryo Nakahata, Sycamore High School, Cincinnati, OH
Paul Nguyen, University of Cincinnati, Cincinnati, OH
Ahmad H. Saqr, University of Cincinnati, Cincinnati, OH
Division Collaboration

Cincinnati Center for Eosinophilic Disorders (CCED) » Margaret H. Collins, MD, Lisa J. Martin, PhD, Vincent A. Mukkada, MD, Philip E. Putnam, MD, and Nicole E. Zahka, PhD

The Cincinnati Center for Eosinophilic Disorders (CCED) is the international leader in both caring for patients with eosinophilic conditions and researching the best treatments and cure. The CCED was the first center established that brings together experts in allergy / immunology, gastroenterology, social work, nutrition and pathology to evaluate, treat and study these chronic medical problems in children and adults. The CCED’s multidisciplinary team has extensive experience with these disorders and aims to provide personalized care and learn from each patient. Several of the faculty of the Division of Allergy and Immunology are physicians and researchers on the CCED’s multidisciplinary team: Marc E. Rothenberg, MD, PhD; J. Pablo Abonia, MD; Patricia C. Fulkerson, MD, PhD; Simon P. Hogan, PhD; Kimberly A. Risma, MD, PhD; and Joseph D. Sherrill, PhD.

Digestive Health Center » Jorge A. Bezerra, MD and Kasper Hoebe, PhD

The Digestive Health Center (DHC) is focused on bench-to-bedside research in pediatric digestive disease and is one of only 17 Silvio O. Conte Digestive Diseases Research Core Centers in the nation supported by the National Institute of Diabetes and Digestive and Kidney Diseases. Artem Barski, PhD, Simon P. Hogan, PhD and Marc E. Rothenberg, MD, PhD are all investigators of this center, and Patricia C. Fulkerson, MD, PhD, Yui-Hsi Wang, PhD and Nives Zimmermann, MD are associate members.

Division of Asthma Research » Gurjit Khurana Hershey, MD, PhD

The Division of Asthma Research at Cincinnati Children’s focuses its research efforts on individual variations in asthma presentation, treatment response and outcomes. Faculty of the Division of Asthma Research and the Division of Allergy and Immunology frequently collaborate as evidenced by a shared NIH U19 AADCRC grant. Our Asthma and Allergic Diseases Cooperative Research Center (AADCRC) is one of only 12 such centers in the United States. Marc E. Rothenberg, MD, PhD, is a project principal investigator for this center, which received a renewal of its NIH-funded U19 grant in 2011. The center’s overarching hypothesis is that epithelial cell genes play a central role in the pathogenesis of allergic disorders.

Division of Asthma Research » Gurjit Khurana Hershey, MD, PhD

Mechanism of Airway Acidification in Asthma (Nives Zimmermann, MD)

Division of Behavioral Medicine and Clinical Psychology » Kevin A. Hommel, PhD

Behavioral Functioning, Treatment Adherence and Symptom Assessment in Pediatric Eosinophilic Gastrointestinal Disorders (Marc E. Rothenberg, MD, PhD)

Division of Biomedical Informatics » Bruce J. Aronow, PhD

MicroRNA Signatures and Regulation of IL-13 Mechanisms in Eosinophilic Esophagitis (Marc E. Rothenberg, MD, PhD)

Division of Cardiology / Division of Human Genetics / Heart Institute » Stephanie M. Ware, MD, PhD, FACMG

Human Genetics and Relationship of Connective Tissue Disorders and Eosinophilic Gastrointestinal Disorders (Marc E. Rothenberg, MD, PhD)

Division of Gastroenterology, Hepatology and Nutrition » Jose M. Garza, MD, MS, Philip E. Putnam, MD, and Noah F. Shroyer, PhD

The Division of Gastroenterology, Hepatology and Nutrition at Cincinnati Children’s specializes in treatment and
research for gastrointestinal, liver and nutritional disorders. Faculty of the Division of Gastroenterology, Hepatology and Nutrition and the Division of Allergy and Immunology, such as Marc E. Rothenberg, MD, PhD and Simon P. Hogan, PhD, frequently collaborate in areas of research including eosinophilic gastrointestinal disorders and inflammatory bowel diseases.

**Division of Gastroenterology, Hepatology and Nutrition** » Lee A. Denson, MD and Kris A. Steinbrecher, PhD
Role of Eosinophils in Pediatric Inflammatory Bowel Diseases (Simon P. Hogan, PhD)

**Division of General and Community Pediatrics; Division of Biostatistics and Epidemiology** » Andrew F. Beck, MD, Bin Huang, PhD, Robert S. Kahn, MD, MPH, and Jeffrey M. Simmons, MD
Social Home Environment and Asthma Morbidity (Terri M. Moncrief, MD, MS)

**Division of Immunobiology** » Fred Finkelman, MD
Mechanisms of Allergy, Asthma, and Immunology (Marc E. Rothenberg, MD, PhD)
Mechanisms of Food Allergy and Anaphylaxis (Simon P. Hogan, PhD, Yui-Hsi Wang, PhD)
Intestinal Innate Helper Cells and Food Allergy (Yui-Hsi Wang, PhD)

**Division of Immunobiology** » Fred Finkelman, MD
The Division of Immunobiology at Cincinnati Children’s conducts research toward understanding the cellular, molecular and genetic mechanisms that drive immunologically mediated disorders in children. Fred Finkelman, MD, of the Division of Immunobiology actively collaborates, publishes and co-mentors with faculty of the Division of Allergy and Immunology. Two of our faculty serve as directors for the Immunobiology Graduate Program: Simon P. Hogan, PhD, is the Director of Admissions, and Nives Zimmermann, MD, is the Director of the Master's Track.

**Division of Orthopedics** » Charles T. Mehlman, DO, MPH and Peter F. Sturm, MD
Metal Sensitivity in Patients with Scoliosis (Michelle B. Lierl, MD)
Can Pre-surgical Skin Patch Testing for Metal Hypersensitivity to Nickel and Other Metals Present in Surgical Stainless Steel Help Prevent Post Surgical Complications in Patients with Scoliosis? (Michelle B. Lierl, MD)

**Division of Pathology** » Margaret H. Collins, MD
Molecular Mechanism of Eosinophil Cell Death (Nives Zimmermann, MD, Marc E. Rothenberg, MD, PhD)

**Division of Reproductive Sciences** » Satoshi H. Namekawa, PhD
RNF8 directs active epigenetic modifications and escape gene expression from inactive sex chromosomes in male germ cells. (Artem Barski, PhD)

**Division of Rheumatology / Center for Autoimmune Genomics and Etiology (CAGE)** » John B. Harley, MD, PhD, Kenneth M. Kaufman, PhD, and Matthew T. Weirauch, PhD
Epigenomics of Lupus (Artem Barski, PhD)

**Division of Rheumatology / Center for Autoimmune Genomics and Etiology (CAGE)** » John B. Harley, MD, PhD
Consortium of Food Allergy Research (CoFAR) - Eosinophilic Esophagitis and Food Allergy (Marc E. Rothenberg, MD, PhD)
Collaborative Mentoring of Postdoctoral Fellow (Marc E. Rothenberg, MD, PhD)

**Division of Rheumatology / Center for Autoimmune Genomics and Etiology (CAGE)** » Kenneth M. Kaufman, PhD
Genetics of Eosinophilic Esophagitis (Marc E. Rothenberg, MD, PhD)
# Grants, Contracts, and Industry Agreements

## Grant and Contract Awards

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Exploration into the Genetics of Food Allergy
Department of Defense (Children's Hospital of Philadelphia)
W81XWH-10-GSFARP-1A 09/30/11-03/31/13 $3,900

Expression and Function of Paired Immunoglobulin-Like Receptor B in Eosinophils
US-Israel Binational Science Foundation
2011244 10/01/12-09/30/16 $5,217

IL-13 Associated Eosinophil Lung Responses
National Institutes of Health
R01 AI 083450 08/20/09-07/31/14 $245,025

Immunobiology of Peanut Allergy and its Treatment: A Prototype
National Institutes of Health (Mount Sinai Medical Center)
U19 AI 066738 07/01/10-06/30/15 $345,405

Regulation of Gastrointestinal Eosinophils
National Institutes of Health
R37 AI 045898 12/01/10-11/30/14 $209,385

Epithelial Genes in Allergic Inflammation (Project 2)
National Institutes of Health
U19 AI 070235 09/01/2012-08/31/2013 $267,544

Genetic Dysregulation of Desmoglein-1 Enhances Allergic Sensitization in Eosinophilic Esophagitis
Thrasher Research Fund
03/01/12-02/28/14 $12,500

Child Health Research Career Development Award
National Institutes of Health
K12 HD 028827 12/01/11-11/30/15 $273,143

Regulation of TH2 Memory/Effecter Cells during Allergic Inflammation
National Institutes of Health
R01 AI 090129 05/01/10-04/30/15 $232,650

Current Year Direct $2,517,042

Industry Contracts

ABONIA, J
Ception Therapeutics, Inc $114,028
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<th>Company</th>
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<tr>
<td>Cephalon, Inc</td>
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<td>DBV Technologies</td>
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<td>Genentech, Inc.</td>
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<td>GlaxoSmithKline</td>
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<td><strong>Current Year Direct Receipts</strong></td>
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<td><strong>$2,686,159</strong></td>
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