Biomedical Informatics

Division Data Summary

Research and Training Details

Number of Faculty	11
Number of Joint Appointment Faculty	4
Number of Research Fellows	6
Number of Support Personnel	60
Direct Annual Grant Support	$5,036,202
Peer Reviewed Publications	41

Clinical Activities and Training

Number of Other Students	20

Division Photo
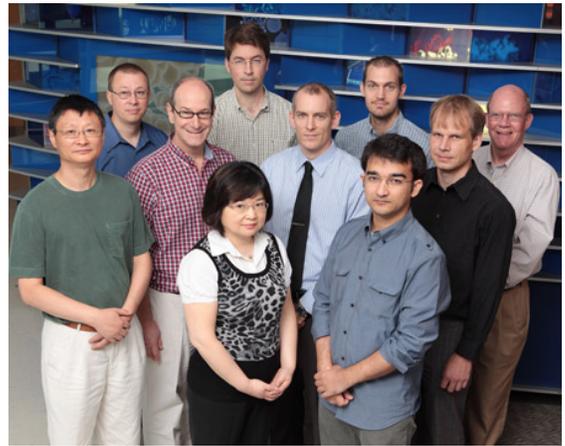
Row 1: Y Yu, K Komorov
Row 2: J Ma, B Aronow, E Kirkendall, M Kouril
Row 3: I Solti, M Wagner, K Marsolo, J Hutton

Significant Publications

Zhang M, Zhu C, Jacomy A, Lu LJ, Jegga AG. **The orphan disease networks**. *Am J Hum Genet*. 88(6):755-766. 2011.

Orphan or rare diseases are diseases of low prevalence (affecting fewer than 200,000 in the USA) which pose a major problem for the scientific research and health care. Because they are so rare, spending a large amount of resources studying them is difficult to rationalize. However, there are about 8000 known orphan diseases whose collective impact is on a large number of people. One way of tackling this is to establish connections between orphan diseases and identify shared features among two or more orphan diseases that will in turn facilitate managing a group of diseases together. Additionally, finding such links between different diseases would improve the current understanding of the underlying pathophysiology of the orphan diseases. To this effect, we created a network of orphan diseases (1772) and the genes (2124) that are mutated in them by taking into account functional similarities, protein interactions, and literature co-citations. Analyzing these networks, we found that the genes mutated in orphan diseases tend to serve as essential hubs in their network – a finding that differs vastly from what we know about mutations that have occurred in non-essential genes being drivers of common diseases. Based on the high connectivity between different orphan diseases and the causative gene mutants, we believe that the shared biological processes and pathways implied by this connectivity can serve as potential orphan drug targets.

Liu J, Ma J. **Fates-shifted is an F-box protein that targets Bicoid for degradation and regulates developmental fate determination in Drosophila embryos**. *Nat Cell Biol.* 13, 22-29. 2011.

Cheung D, Miles C, Kreitman M, Ma J. **Scaling of the Bicoid morphogen gradient by a volume-dependent production rate**. *Development.* 138, 2741-2749. 2011.

We had a burst of excellent publications that appeared in FY2011. Two of these publications deserve special mention. One, by Liu and Ma, was published in Nature Cell Biology in January 2011. In this paper, we provide

the first experimental demonstration that protein stability regulates the formation of a normal concentration gradient (of the morphogen protein Bicoid) in Drosophila embryos. Another paper, by Cheung et al., was published in Development in July 2011. Here we propose a first model for how embryonic patterns in Drosophila can be formed in a proportionate, or scaled, manner.

Division Collaboration

Allergy & Immunology/Gastroenterology, Hepatology & Nutrion » Dr. Pabo Abonia; Dr. James Franciosi; Dr. Marc Rothenberg

Keith Marsolo and the i2b2 team are leading the development of a multi-center registry focused on Eosinophilic Esophagitis. This registry takes advantage of functionality developed for Liver Transplant and also allows extracts from other sites to be uploaded into the registry. Another component of this registry is a module that allows for the administration and completion of surveys to collect patient reported outcomes (PROs) on quality of life (QoL) measures.

Developmental Biology » Dr. James Lessard; Dr. Steven Potter

Dr. Aronow's group collaborates with Potter and Lessard along with an international consortium on the use of genomics analyses to gain insight into the normal or abnormal development of the kidney and lower urinary tract.

Gastroenterology, Hepatology & Nutrition » Dr. Jorge Bezerra

Dr. Jegga collaborates with Bezerra Lab to understand the molecular basis of biliary atresia, a rare condition in newborn infants which if unrecognized could lead to liver failure. He provides bioinformatic support that includes data analysis, data-mining and hypothesis generation using systems biology-based approaches.

Gastroenterology, Hepatology & Nutrition » Dr. Jorge Bezerra

In his collaboration with Dr. Bezerra Dr. Aronow serves as the Bioinformatics Core Director on the Digestive Health Center: Bench to Bedside Research in Pediatric Digestive Disease grant project. His role is to aid or supervise in strategic planning, experimental designs, data analysis, and to generate a data portal for the genomics data and sample characterizations.

Gastroenterology, Hepatology & Nutrition » Dr. John Bucuvalas; Dr. Kathleen Campbell

Keith Marsolo and the i2b2 team have developed a research registry for Liver Transplant based on the i2b2 informatics framework. This registry, which is in the final stages of User Acceptance Testing, allows investigators to enter relevant data into the Epic electronic health record, after which it is transferred into i2b2, where it can be augmented, through the use of data entry screens, with research-specific variables not collected in the clinic. This registry is serving as a pilot template for other research registries throughout CCHMC.

Hematology/Oncology »

Dr. Pestian and his team are collaborating with clinicians and scientists to develop methods to identify the clinical needs of end-of-life patients.

Human Genetics » Dr. Daniel Prows

As a leading expert in the design and analysis of DNA microarrays, including Incyte and Affymetrix technologies, Dr. Aronow's collaboration efforts with Dr. Prows include microarray design, oversight in all aspects of microarray analysis, including data sorting, and data analysis. Additionally, Dr. Aronow oversees the in-depth *in silico* analyses and generates appropriate figures, tables, and the related text for manuscript preparation.

Human Genetics » Dr. William Nichols

In his collaboration with Dr. Nichols, Dr. Aronow provides complete interaction, and direction for the

interpretation of resulting data including statistically and biologically significant gene expression patterns associated with hypoxia and improved right ventricular function in chronic lung disease in the context of all available information that pertains to understanding of normal, disease, and developmental pathway and gene network based processes. He is also fully involved in the prediction and analysis of strain variant gene polymorphisms that appear to play modifier roles.

Immunobiology » Dr. H. Lee Grimes

Dr. Jegga collaborates with Grimes Lab in their continuing pursuits to characterize cancer proteins and understand the underlying regulatory mechanisms of oncogenic transformation of hematopoietic progenitor cells.

James M. Anderson Center of Excellence »

Keith Marsolo and the i2b2 team have worked extensively with colleagues in the Anderson Center in their efforts to operationalize hundreds of outcome measures as part of the Epic Outpatient implementation and to implement a system intended to document and operationalize all of the legacy outcome measures, the Performance Measurement and Reporting System (PMRS).

James M. Anderson Center of Excellence » Dr. Edward Donovan; Dr. Carole Lannon

Keith Marsolo and the BMI software development group have worked to design an infrastructure for data collection, reporting and analysis that will serve as a template for quality improvement networks that are part of the State of Ohio's BEACON initiative (Best Evidence for Advancing Childhealth in Ohio Now).

James M. Anderson Center of Excellence » Dr. Eric Kirkendall; Dr. Stephen Muething; Dr. Uma Kotagal

Dr. Solti's collaboration efforts with Dr. Kirkendall include the submission of an NIH grant application (PI: Solti) to develop new modules for cTAKES and the submission of an internal Trustee grant application (PI: Solti) to develop clinical NLP infrastructure.

Dr. Solti is collaborating with Drs. Kirkendall and Muething in preparing the EHR-based medication safety project.

Additionally Dr. Solti is collaborating with Dr. Kotagal of the Anderson Center preparing the EHR-based predictive modeling of clinical outcomes project.

James M. Anderson Center of Excellence; Emergency Medicine; Emergency Medicine » Dr. Evaline Alessandrini ; Dr. Holly Brodzinski ; Dr. Judith Dexheimer

Dr. Solti collaborates with the members of the Anderson Center and Emergency Medicine in the appendicitis risk stratification project. The divisions are developing an automated system to determine the risk of appendicitis in abdominal pain patients.

James M. Anderson Center of Excellence; Gastroenterology, Hepatology & Nutrition » Dr. Peter Margolis; Dr. Shehzad Saeed

Keith Marsolo and the i2b2 team are working to develop an i2b2-based registry to support the quality improvement and research efforts of the ImproveCareNow Network, which focuses on improving the outcomes of children with Inflammatory Bowel Disease (IBD). This registry will allow users to enter data directly into i2b2, or collect data directly in the medical record, after which it can be transferred to the registry, either by file upload or a database feed. Also included as part of this registry will be population management and monthly quality reports. These reports can be generated on demand and allow investigators to see data on patients from their own site as well as aggregate numbers from the collaborative as a whole.

James M. Anderson Center of Excellence; Pulmonary Medicine » Dr. Peter Margolis; Dr. Michael Seid

Keith Marsolo is helping to lead the design and development of the technical infrastructure needed to support

their growing C3N (Clinical Collaborative Care Network). This infrastructure is expected to include personal health records, the ability to visualize and display patient-specific health and outcomes data, the ability to conduct N of 1 trials, and social networking and data sharing functionality.

Molecular Immunology » Dr. Christopher Karp

Dr. Aronow's collaboration efforts with Dr. Karp and the Division of Molecular Immunology include the use of expression microarray and proteomic techniques for mechanistic definition of disease pathogenesis.

Neonatology and Pulmonary Biology » Dr. Yan Xu

Dr. Lu and his team work closely with Dr. Xu in developing statistical models to analyze gene expression during the development of mouse models with the goal of understanding the role of SREBP network in sufacatant lipid homeostasis and lung maturation.

Neurology » Dr. Tracy Glauser

Dr. Pestian and his team are collaborating with Dr. Glauser for the on going development of CHRISTINE, a clinical decision support system for identifying optimal drug therapy for patients with epilepsy, and ADHD.

Neurology » Dr. Anna Weber Byars

Dr. Pestian and his team are collaborating with Dr. Byars on innovations in neuropsychology research.

Neurology; Neurology; Neuroimaging Research Consortium » Dr. Tracy Glauser; Dr. Shannon Standridge; Dr. Scott Holland

Dr. Pestian and his team are collaborating with Drs. Glauser, Holland and Standridge to develop the advanced informatics system for The Comprehensive Epilepsy Center.

Neurology; Neuroimaging Research » Dr. Jennifer VanNest; Dr. Scott Holland

In his role of informatics lead on an NICHD contract ("Cincinnati MRI Imaging Neuronal Development", Scott Holland, PI), he collaborates with the PI and Dr. Jennifer VanNest (Div. of Neurology) to build and disseminate a database of fMRI images of normally developing brains.

Oncology » Dr. John Perentesis

Dr. Solti collaborates with Dr. Perentesis on the clinical trial announcement grant. Their collaboration efforts focus on extracting eligibility criteria for oncology patients.

Psychiatry » Dr. Robert Kowatch

Dr. Pestian and his team are collaborating with Dr. Robert Kowatch for the on going development of CHRISTINE, a clinical decision support system for identifying optimal drug therapy for patients with mood disorders.

Psychiatry; Emergency Medicine » Dr. Robert Kowatch; Dr. Jacqueline Grupp-Phelan

Dr. Pestian and his team are collaborating with Drs. Kowatch & Grupp-Phelan to develop methods to identify the likelihood of repeated suicide attempts.

Rheumatology » Dr. Hermine Brunner; Dr. Esi Morgan DeWitt; Dr. Daniel Lovel; Dr. Susan Thompson

Keith Marsolo and the i2b2 team are part of a joint development effort with colleagues at the Children's Hospital Boston to develop a distributed, virtual registry for pediatric rheumatic diseases. Dr. Marsolo and his team have focused on developing functionality to display quality reports and the visualization of patient outcomes.

Rheumatology » Dr. Esi Morgan DeWitt

Keith Marsolo and the i2b2 team are working to develop population management and monthly quality reports for a multi-center quality improvement collaborative focused on juvenile idiopathic arthritis. These reports will provide similar functionality to the ones developed for ImproveCareNow, meaning they can be generated on demand and allow investigators to see data on patients from their own site as well as aggregate numbers from

the collaborative as a whole.

Rheumatology » Dr. David Glass; Dr. John Harley; Dr. Susan Thompson

As Director of the Informatics Core of the NIAMS-sponsored Cincinnati Core Center for Rheumatic Diseases (Susan Thompson, PI), Michael Wagner collaborates closely with Rheumatology Investigators David Glass, Susan Thompson and John Harley on genome-wide analyses of variants contributing to juvenile rheumatic disease.

Reproductive Sciences » Dr. Sudhansu Dey

Dr. Jegga collaborates with Dey Lab in their mission to understand the signaling networks that influence uterine biology in the context of embryo-uterine interactions during pregnancy and delivery. He is specifically focusing on the miRNA-based regulation of labor.

Faculty Members

John Hutton, MD, Professor
Director, Division Chief
Research Interests

Bruce Aronow, PhD, Professor
Co-Director, Computational Medicine Center
Research Interests Gene Expression Analysis, Gene Regulation, Clinical Genomics, Functional Genomics of Development and Disease

Anil Jegga, MS, DVM, Assistant Professor
Research Interests Gene Regulatory Networks, Biomedical Ontologies, Integrative Genomics

Michal Kouril, PhD, Assistant Professor
Director, Research IT
Research Interests Computational Support, High-performance computing, Parallel Programming, High-end Data Storage

Long Jason Lu, PhD, Assistant Professor
Research Interests Bioinformatics, Machine Learning, Integrative Genomics, Biological Networks, Computational Modeling, Software Development

Jun Ma, PhD, Professor
Research Interests Development, Transcription, Morphogen Gradient, Embryo, Robustness, Quantitative Studies

Keith Marsolo, PhD, Assistant Professor
Director, Software Development and Data Warehouse
Research Interests i2b2, Data Integration, Data Warehousing and Data Management

John Pestian, PhD, MBA, Associate Professor
Director, Computational Medicine Center
Research Interests Natural Language Processing, Clinical Decision Support, Suicide Research, Pathology Research, Psychiatric Research

S. Andrew Spooner, MD, FAAP, Associate Professor
Chief Medical Information Officer
Research Interests Decision Support, Pharmacy Information Systems

Imre Solti, MD, PhD, MA, Assistant Professor
Research Interests Computational Linguistics

Michael Wagner, PhD, Associate Professor
Faculty Liaison
Research Interests Machine Learning, Proteomics, Genome-wide Association, Parallel Computing, Computational Infrastructure, Bioinformatics

Joint Appointment Faculty Members

Eric Hall, PhD, Instructor
Neonatology & Pulmonary Biology
Research Interests Clinical Informatics, Knowledge Discovery Tools, Data Mining and Warehousing

Mario Medvedovic, PhD, Associate Professor
UC Environmental Health
Research Interests Biostatistics

Jarek Meller, PhD, Associate Professor
UC Environmental Health
Research Interests Protein Modeling

Yan Xu, PhD, Associate Professor
Pulmonary Medicine

Trainees

- Jacek Biesiada, PhD, 2000, University of Silesia, Poland
- Feng He, PhD, 2009, Fudan University, Shanghai, China
- Louise Deleger, PhD, 2009, Pierre et Marie Curie University, Paris, France
- Junbo Liu, PhD, 2000, Fudan University, Shanghai, China
- Mayur Sarangdhar, PhD, 2011, University of Hull, Hull, UK
- Wei Wang, PhD, 2009, University of Cincinnati, Cincinnati, Ohio, USA

Significant Accomplishments

Linking Research Registries and Electronic Health Records

The Division of Biomedical Informatics (BMI) was awarded a three-year, $12 million grant from the Agency for Healthcare Research and Quality(AHRQ) to create a modular registry that can be populated with data directly from electronic health records (EHRs) to support comparative effectiveness and quality improvement research. Collaborating with the ImproveCareNow network, which serves children with inflammatory bowel disease (IBD), our developers are using the open-source SHRINE and i2b2 informatics platforms to create a registry that can be populated with data directly from sites' EHRs, removing the need for staff to perform the double data entry common to most research registries. Our team also is automating quality and population management reports so they can be generated on demand. Finally, we are enhancing the registries so they can be federated, making it possible for sites to keep their registry data at their own institution, but still share aggregate numbers across institutions. Once these developments are complete, these enhanced registries will be used to compare the effectiveness of alternative treatment strategies for IBD, with a special focus on the timing of biologic agents. John Hutton, MD, is principal investigator on the AHRQ grant and Keith Marsolo, PhD, is co-investigator.

Molecular Mechanisms Underlying Human Diseases

Jason Lu, PhD, is developing network and systems approaches to study of molecular mechanisms underlying human diseases. One focus of his research is identifying subspecies of blood lipoproteins such as HDL and their role in causing human atherosclerosis. So far, he has identified approximately 30 potential HDL subspecies. His approach also has proved useful in mapping transcriptional networks controlling surfactant homeostasis in the lung.

Making Meaningful Use of Electronic Medical Records

Andrew Spooner, MD, chief medical information officer at Cincinnati Children's, completed the institutional assessment and project team preparation for the federal "Meaningful Use" incentive program, with payments due to arrive in 2012. Spooner also participated as a clinical leader in the design, training and support for 11 ambulatory divisions that have gone live with Epic.

Spooner is leading projects to use electronic medical records to implement population management programs and to maintain compliance with medication reconciliation regulations. He has collaborated on an accepted manuscript report of the STEPSTools pediatric drug dosing clinical decision support project. Spooner actively participated in the Epic KidShare network as a presenter in multiple pediatric-focused presentations. He also presented educational sessions on health IT at the annual American Academy of Pediatrics meeting and the state chapter meeting.

Division Publications

1. Comstock CE, Augello MA, Schiewer MJ, Karch J, Burd CJ, Ertel A, Knudsen ES, Jessen WJ, Aronow BJ, Knudsen KE. **Cyclin D1 is a selective modifier of androgen-dependent signaling and androgen receptor function**. *J Biol Chem*. 2011; 286:8117-27.
2. Deng J, Deng L, Su S, Zhang M, Lin X, Wei L, Minai AA, Hassett DJ, Lu LJ. **Investigating the predictability of essential genes across distantly related organisms using an integrative approach**. *Nucleic Acids Res*. 2011; 39:795-807.
3. Giannini CM, Kim HK, Mortensen J, Marsolo K, Huppert J. **Culture of non-genital sites increases the detection of gonorrhea in women**. *Journal of pediatric and adolescent gynecology*. 2010; 23:246-52.
4. Gordon SM, Deng J, Lu LJ, Davidson WS. **Proteomic characterization of human plasma high density lipoprotein fractionated by gel filtration chromatography**. *J Proteome Res*. 2010; 9:5239-49.
5. Hamada N, Miyata M, Eto H, Ikeda Y, Shirasawa T, Akasaki Y, Miyauchi T, Furusho Y, Nagaki A, Aronow BJ, Tei C. **Loss of clusterin limits atherosclerosis in apolipoprotein E-deficient mice via reduced expression of Egr-1 and TNF-alpha**. *J Atheroscler Thromb*. 2011; 18:209-16.
6. He F, Ren J, Wang W, Ma J. **A multiscale investigation of bicoid-dependent transcriptional events in Drosophila embryos**. *PLoS One*. 2011; 6:e19122.
7. He F, Saunders TE, Wen Y, Cheung D, Jiao R, ten Wolde PR, Howard M, Ma J. **Shaping a morphogen gradient for positional precision**. *Biophys J*. 2010; 99:697-707.
8. He F, Wen Y, Cheung D, Deng J, Lu LJ, Jiao R, Ma J. **Distance measurements via the morphogen gradient of Bicoid in Drosophila embryos**. *BMC Dev Biol*. 2010; 10:80.
9. Huang H, Du G, Chen H, Liang X, Li C, Zhu N, Xue L, Ma J, Jiao R. **Drosophila Smt3 negatively regulates JNK signaling through sequestering Hipk in the nucleus**. *Development*. 2011; 138:2477-85.
10. Huang H, Yu Z, Zhang S, Liang X, Chen J, Li C, Ma J, Jiao R. **Drosophila CAF-1 regulates HP1-mediated epigenetic silencing and pericentric heterochromatin stability**. *J Cell Sci*. 2010; 123:2853-61.
11. Hummel TR, Jessen WJ, Miller SJ, Kluwe L, Mautner VF, Wallace MR, Lazaro C, Page GP, Worley PF, Aronow BJ, Schorry EK, Ratner N. **Gene expression analysis identifies potential biomarkers of**

neurofibromatosis type 1 including adrenomedullin. *Clin Cancer Res*. 2010; 16:5048-57.

12. Jegga AG, Schneider L, Ouyang X, Zhang J. **Systems biology of the autophagy-lysosomal pathway**. *Autophagy*. 2011; 7:477-89.

13. Kaimal V, Bardes EE, Tabar SC, Jegga AG, Aronow BJ. **ToppCluster: a multiple gene list feature analyzer for comparative enrichment clustering and network-based dissection of biological systems**. *Nucleic Acids Res*. 2010; 38:W96-102.

14. Kaimal V, Sardana D, Bardes EE, Gudivada RC, Chen J, Jegga AG. **Integrative systems biology approaches to identify and prioritize disease and drug candidate genes**. *Methods Mol Biol*. 2011; 700:241-59.

15. Kehat I, Accornero F, Aronow BJ, Molkentin JD. **Modulation of chromatin position and gene expression by HDAC4 interaction with nucleoporins**. *J Cell Biol*. 2011; 193:21-9.

16. Lee S, Hong SW, Min BH, Shim YJ, Lee KU, Lee IK, Bendayan M, Aronow BJ, Park IS. **Essential role of clusterin in pancreas regeneration**. *Dev Dyn*. 2011; 240:605-15.

17. Lin SA, Kolle G, Grimmond SM, Zhou Q, Doust E, Little MH, Aronow B, Ricardo SD, Pera MF, Bertram JF, Laslett AL. **Subfractionation of differentiating human embryonic stem cell populations allows the isolation of a mesodermal population enriched for intermediate mesoderm and putative renal progenitors**. *Stem Cells Dev*. 2010; 19:1637-48.

18. Liu J, Ma J. **Fates-shifted is an F-box protein that targets Bicoid for degradation and regulates developmental fate determination in Drosophila embryos**. *Nat Cell Biol*. 2011; 13:22-9.

19. Maldonado AR, Klanke C, Jegga AG, Aronow BJ, Mahller YY, Cripe TP, Crombleholme TM. **Molecular engineering and validation of an oncolytic herpes simplex virus type 1 transcriptionally targeted to midkine-positive tumors**. *J Gene Med*. 2010; 12:613-23.

20. Margolis DJ, Hoffstad O, Thom S, Bilker W, Maldonado AR, Cohen RM, Aronow BJ, Crombleholme T. **The differential effect of angiotensin-converting enzyme inhibitors and angiotensin receptor blockers with respect to foot ulcer and limb amputation in those with diabetes**. *Wound Repair Regen*. 2010; 18:445-51.

21. Mason E, Tronc G, Nones K, Matigian N, Kim J, Aronow BJ, Wolfinger RD, Wells C, Gibson G. **Maternal influences on the transmission of leukocyte gene expression profiles in population samples from Brisbane, Australia**. *PLoS One*. 2010; 5:e14479.

22. Perkins C, Yanase N, Smulian G, Gildea L, Orekov T, Potter C, Brombacher F, Aronow B, Wills-Karp M, Finkelman FD. **Selective stimulation of IL-4 receptor on smooth muscle induces airway hyperresponsiveness in mice**. *J Exp Med*. 2011; 208:853-67.

23. Pestian J, Nasrallah H, Matykiewicz P, Bennett A, Leenaars A. **Suicide Note Classification Using Natural Language Processing: A Content Analysis**. *Biomed Inform Insights*. 2010; 2010:19-28.

24. Popkie AP, Zeidner LC, Albrecht AM, D'Ippolito A, Eckardt S, Newsom DE, Groden J, Doble BW, Aronow B, McLaughlin KJ, White P, Phiel CJ. **Phosphatidylinositol 3-kinase (PI3K) signaling via glycogen synthase kinase-3 (Gsk-3) regulates DNA methylation of imprinted loci**. *J Biol Chem*. 2010; 285:41337-47.

25. Rankin SA, Kormish J, Kofron M, Jegga A, Zorn AM. **A gene regulatory network controlling hhex transcription in the anterior endoderm of the organizer**. *Dev Biol*. 2011; 351:297-310.

26. Sardana D, Vasa S, Vepachedu N, Chen J, Gudivada RC, Aronow BJ, Jegga AG. **PhenoHM: human-mouse comparative phenome-genome server**. *Nucleic Acids Res*. 2010; 38:W165-74.

27. Thompson SD, Sudman M, Ramos PS, Marion MC, Ryan M, Tsoras M, Weiler T, Wagner M, Keddache M, Haas JP, Mueller C, Prahalad S, Bohnsack J, Wise CA, Punaro M, Zhang D, Rose CD, Comeau ME, Divers J, Glass DN, Langefeld CD. **The susceptibility loci juvenile idiopathic arthritis shares with other autoimmune diseases extend to PTPN2, COG6, and ANGPT1**. *Arthritis Rheum*. 2010; 62:3265-76.

28. Tsai WW, Wang Z, Yiu TT, Akdemir KC, Xia W, Winter S, Tsai CY, Shi X, Schwarzer D, Plunkett W, Aronow B, Gozani O, Fischle W, Hung MC, Patel DJ, Barton MC. **TRIM24 links a non-canonical histone signature to**

breast cancer. *Nature*. 2010; 468:927-32.

29. Uzuner O, Solti I, Cadag E. **Extracting medication information from clinical text**. *J Am Med Inform Assoc*. 2010; 17:514-8.

30. Uzuner O, Solti I, Xia F, Cadag E. **Community annotation experiment for ground truth generation for the i2b2 medication challenge**. *J Am Med Inform Assoc*. 2010; 17:519-23.

31. van Berlo JH, Elrod JW, van den Hoogenhof MM, York AJ, Aronow BJ, Duncan SA, Molkentin JD. **The transcription factor GATA-6 regulates pathological cardiac hypertrophy**. *Circ Res*. 2010; 107:1032-40.

32. Widdice LE, Bernstein DI, Leonard AC, Marsolo KA, Kahn JA. **Adherence to the HPV vaccine dosing intervals and factors associated with completion of 3 doses**. *Pediatrics*. 2011; 127:77-84.

33. Xu Y, Zhang M, Wang Y, Kadambi P, Dave V, Lu LJ, Whitsett JA. **A systems approach to mapping transcriptional networks controlling surfactant homeostasis**. *BMC Genomics*. 2010; 11:451.

34. Xu YH, Jia L, Quinn B, Zamzow M, Stringer K, Aronow B, Sun Y, Zhang W, Setchell KD, Grabowski GA. **Global gene expression profile progression in Gaucher disease mouse models**. *BMC Genomics*. 2011; 12:20.

35. Yang L, Wang K, Chen J, Jegga AG, Luo H, Shi L, Wan C, Guo X, Qin S, He G, Feng G, He L. **Exploring off-targets and off-systems for adverse drug reactions via chemical-protein interactome--clozapine-induced agranulocytosis as a case study**. *PLoS Comput Biol*. 2011; 7:e1002016.

36. Yang L, Wang KJ, Wang LS, Jegga AG, Qin SY, He G, Chen J, Xiao Y, He L. **Chemical-protein interactome and its application in off-target identification**. *Interdiscip Sci*. 2011; 3:22-30.

37. Zender M, P.Pestian J, Glauser TA. **Visual language system for representing medical concepts**. *Information Design Journal*. 2010; 18:184-197.

38. Zhang M, Deng J, Fang C, Zhang X, Lu LJ. **Biomolecular Network Analysis and Applications**. *Knowledge based bioinformatics : from analysis to interpretation.* Chichester, West Sussex, U.K.: John Wiley & Sons; 2010: 253-288. .

39. Zhang M, Lu LJ. **Investigating the validity of current network analysis on static conglomerate networks by protein network stratification**. *BMC Bioinformatics*. 2010; 11:466.

40. Zhang M, Zhu C, Jacomy A, Lu LJ, Jegga AG. **The orphan disease networks**. *Am J Hum Genet*. 2011; 88:755-66.

41. Zhang X, Wang X, Zhu H, Zhu C, Wang Y, Pu WT, Jegga AG, Fan GC. **Synergistic effects of the GATA-4-mediated miR-144/451 cluster in protection against simulated ischemia/reperfusion-induced cardiomyocyte death**. *J Mol Cell Cardiol*. 2010; 49:841-50.

Grants, Contracts, and Industry Agreements

Grant and Contract Awards	Annual Direct / Project Period Direct

ARONOW, B

Cincinnati Center for Clinical & Translational Sciences and Training - Translational and Molecular Disease Modeling
National Institutes of Health(University of Cincinnati)

UL1 RR 026314 04/03/2009-03/31/2014	$31,761

Defining Preadipocyte Signature Genes
National Institutes of Health(Univ of Toledo Health Science Campus)

R21 DK 083643 09/20/10-08/31/12	$13,109

Digestive Health Center: Bench to Bedside Research in Pediatric Digestive Disease (Bioinformatics Core)
National Institutes of Health

P30 DK 078392 08/01/07-05/31/12	$110,942

Exploiting Advances in Biotechnology for Force Protection

United States Air Force (University of Cincinnati)

FA865008C6832   07/01/09-06/30/14 $318,160

Molecular Signatures of Cancer Metastasis

Department of Defense

W81XWH-10-1-0325   05/01/10-04/30/13 $98,036

Nextgen Dissection of the Genomic Basis of Kidney Development

NIH

RC4 DK 090891   09/30/10-09/29/13 $101,580

Risk Stratification & Identification of Immunogenetic and Microbial Markers of Complicated Disease Course In Pediatric Crohn's Disease

Crohn's and Colitis Foundation of America (Emory University)

      07/09/09-06/30/13 $12,793

HE, F

Dissecting the Roles of dCBP in the Drosophila

American Heart Association

      07/01/10-06/30/12 $43,000

HUTTON, J

Building Modular Pediatric Chronic Disease Registries for QI and CE Research

Agency for Healthcare Research and Quality

R01 HS 020024   09/30/10-09/29/13 $2,924,060

Cincinnati Center for Clinical and Translational Sciences and Training (Biomedical Informatics)

National Institutes of Health(University of Cincinnati)

UL1 RR 026314   04/03/09-03/31/14 $84,880

HRSA Equipment

Health Resources & Services Admin

      07/01/10-06/30/11 $495,000

LU, L

Developing a Statisitical Framework to Improve the Accuracy of Essential Gene Assignments by Transposon Mutagenesis

University of Cincinnati

      07/01/10-06/30/11 $20,000

The Molecular Basis for High Density Lipoprotein Heterogenity

National Institutes of Health(University of Cincinnati)

R21 HL 104136   08/15/10-06/30/12 $38,983

MA, J

Evolution of Canalizing Mechanisms in Gene Expression

NIH (University of Chicago)

R01 GM 78381   07/16/2009-06/30/2011 $38,117

Probing the Robustness of a Developmental System

NSF

IOS-0843424   05/15/2009-04/30/2013 $196,572

MARSOLO, K

CARRA: Accelerating Toward an Evidence Based Culture in Pediatric Rheumatology

National Institutes of Health(Duke University)

RC2 AR 058934   09/30/09-08/31/11 $190,442

PESTIAN, J

Shared Task 2010 Analysis of Suicide Notes for Subjective Information

National Library of Medicine

R13 LM 010743   07/15/10-07/14/11 $19,600

SOLTI, I

Increasing Clinical Trial Enrollment: A Semi-Automated Patient Centered Approach
National Library of Medicine
R00 LM 010227   10/02/10-10/01/13 $163,145

WAGNER, M

Cincinnati Rheumatic Diseases Core Center (Core 4-Informatics)
National Institutes of Health
P30 AR 047363   09/01/06-06/30/11 $57,743

	Current Year Direct	$4,957,923

Industry Contracts

PESTIAN

Eisai Europe Ltd $78,279

	Current Year Direct Receipts	$78,279

Funded Collaborative Efforts

ARONOW, B

Immunobiology of IFRD1, a gene modifying CF lung disease
National Institutes of Health
Karp, C   08/01/09-07/31/13   5%
Genetic Analysis of Hyperoxia Induced Acute lung Injury
National Institutes of Health
Prows, D   05/01/09-04/30/13   5%
Global Gene Expression atlas of Craniofacial Development
National Institutes of Health
Potter, S   09/21/09-04/30/14   5%
Cincinnati Ctr for Clinical and Translational Sciences and Training
National Institutes of Health
Heubi, J   04/03/09-03/31/14   10%
Genetic Analysis of Murine Chronic Hypoxia-Induce Pulmonary Hypertension
National Institutes of Health
Nichols, W   04/01/10-03/31/14   5%
Glomerulosclerosis in Human FSGS and Animal Models
National Institutes of Health
Potter, S   09/14/09-09/13/11   5%
Cincinnati Cell Characterization Core
National Institutes of Health
Malik   09/01/10-04/30/12   5%
Cincinnati Center for Excellence in Molecular Hematology
National Institutes of Health
Zheng, Y   09/30/10-06/30/15   5%

JEGGA, A

Biological Basis of Phenotypes & Clinical Outcomes
National Institutes of Health
Bezerra, J   09/01/09-08/31/13   5%
Epigenetic Manipulation of Leukemia
Alex's Lemonade Stand Foundation
Grimes, L   07/01/09-06/30/12   5%
Epigenetic Manipulation of Leukemia
National Cancer Institute
Grimes, L   07/01/09-06/30/11   5%
Molecular Signatures of Cancer Metastatsis
Department of Defense

Aronow, B	05/01/10-04/30/13		10%
Cincinnati Cell Characterization Core			
University of Maryland			
Malik, P	09/01/10-04/30/12		5%

KOURIL, M

Cincinnati Ctr for Clinical and Translational Sciences and Training			
National Institutes of Health			
Heubi, J	04/03/09-03/31/14		15%

LU, L

Cincinnati Ctr for Clinical and Translational Sciences and Training			
National Institutes of Health			
Heubi, J	04/03/09-03/31/14		10%

MARSOLO, K

Open Source Science: Transforming Chronic Illness Care			
National Institutes of Health			
Margolis, P	09/30/09-08/31/14		15%
Comparative Effectiveness of Pediatric Eosinophilic Esophagitis			
National Institutes of Health			
Rothenberg, M	09/30/09-08/31/12		25%
Cincinnati Ctr for Clinical and Translational Sciences and Training			
National Institutes of Health			
Heubi, j	04/03/09-03/31/14		10%
Leveraging EPIC for Quality Improvement in Rheumatology			
Cincinnati Children's Hospital Medical Center			
Morgan Dewitt, E	07/01/10-06/30/12		5%
Perinatal Quality Improvement Project and Data Insfastructure Development Project			
Ohio State University			
Donovan, E	01/04/11-06/30/11		5%

PESTIAN, J

Cincinnati Ctr for Clinical and Translational Sciences and Training			
National Institutes of Health			
Heubi, J	04/03/09-03/31/14		10%
Impact of Initial Therapy and Response on Long Term Outcome			
National Institutes of Health			
Glauser, T	09/01/10-08/31/14		30%
Improved Diagnosis and Treatment of Pediatric Mood Disorder			
The Oxley Foundation			
Kowatch, R	03/01/09-02/28/12		20%

WAGNER, M

Cincinnati Ctr for Clinical and Translational Sciences and Training			
National Institutes of Health			
Heubi, J	04/03/09-03/31/14		15%
Pediatric Functional Neuroimaging Research Network			
National Institutes of Health			
Holland, S	09/28/09-09/27/14		20%
Genetic Linkage in Lupus			
National Institutes of Health			
Harley, J	09/07/10-02/28/15		10%

		Total	**$5,036,202**