

Division Details

Division Data Summary

Research and Training Details

Number of Faculty	11
Number of Joint Appointment Faculty	1
Number of Research Fellows	25
Number of Research Students	12
Number of Support Personnel	22
Direct Annual Grant Support	\$5,296,767
Peer Reviewed Publications	50

Division Photo

No Photo information has been entered yet.

Significant Publications

Goonasekera SA, Hammer K, Auger-Messier M, Bodi I, Chen X, Zhang H, Reiken S, Elrod JW, Correll RN, York AJ, Sargent MA, Hofmann F, Moosmang S, Marks AR, Houser SR, Bers DM, **Molkentin JD**. **Decreased cardiac L-type Ca(2) channel activity induces hypertrophy and heart failure in mice.** *J Clin Invest.* 122(1):280-90. Jan 3 2012.

The results of the current study suggest that L-type calcium channel inhibitors, that are widely used to treat hypertension, are pathologic for the heart and induce secondary remodeling and hypertrophy long-term through a myocyte autonomous function. Such results suggest caution when prescribing L-type calcium channel blockers in heart failure patients.

Jeyaraj D, Haldar SM, Wan X, McCauley MD, Ripperger JA, Hu K, Lu Y, Eapen BL, Sharma N, Ficker E, Cutler MJ, **Gulick J**, Sanbe A, **Robbins J**, Demolombe S, Kondratov RV, Shea SA, Albrecht U, Wehrens XH, Rosenbaum DS, Jain MK. **Circadian rhythms govern cardiac repolarization and arrhythmogenesis.** *Nature.* 483(7387):96-9. Mar 1 2012.

The time of day or night has a dramatic influence on the frequency at which sudden death occurs. In this paper, we provide molecular evidence that links circadian rhythms to vulnerability in ventricular arrhythmias. Our findings identify circadian transcription of ion channels as a mechanism for cardiac arrhythmogenesis.

Lee MP, **Yutzey KE**. **Twist1 directly regulates genes that promote cell proliferation and migration in developing heart valves.** *PLoS One.* 6(12):e29758. 2011.

Previous studies from the Yutzey lab reported that the transcription factor Twist1 regulates heart valve progenitor cell proliferation, migration, and differentiation. In addition, Twist1 expression is reactivated in pediatric and adult valve disease, but its function is unknown. The current study identifies genes regulated directly by Twist1 that are involved in valve progenitor cell proliferation and migration. This finding establishes Twist1 as a master regulatory gene in the early stages of valve progenitor cell development with implications for molecular mechanisms of heart valve disease progression.

Lynch JM, **Maillet M**, Vanhoutte D, Schloemer A, Sargent MA, Blair NS, Lynch KA, Okada T, Aronow BJ, Osinska H, Prywes R, Lorenz JN, Mori K, Lawler J, **Robbins J**, **Molkentin JD**. **A Thrombospondin-Dependent Pathway for a Protective ER Stress Response.** *Cell.* 149(6):1257-68. Jun 8 2012.

Thrombospondin (Thbs) proteins are induced during tissue damage or active remodeling in coordination with the endoplasmic reticulum (ER) stress response in all tissues and cell types. Here we described a novel function for Thbs' as ER resident effectors of an adaptive ER stress response. Thbs4 cardiac-specific transgenic mice were protected from myocardial injury while *Thbs4*^{-/-} mice were sensitized to cardiac maladaptation. The results suggest that upregulation of Thbs proteins will protect any cell or tissue undergoing ER stress or healing. Numerous medical applications are under investigation.

Sadayappan S, **Gulick J**, Osinska H, Barefield D, Cuello F, Avkiran M, Lasko VM, Lorenz JN, **Maillet M**, Martin JL, Brown JH, Bers DM, **Molkentin JD**, **James J**, **Robbins J**. **A critical function for Ser-282 in cardiac Myosin binding protein-C phosphorylation and cardiac function.** *Circ Res.* 109(2):141-50. Jul 8 2011.

Cardiovascular disease, particularly ischemia, myocardial infarction, and heart failure, constitutes a growing health and economic problem, afflicting approximately five million people in the United States each year at an estimated cost of \$29.6 billion. Here we show that modification of a protein that is important in cardiac muscle function can dramatically impact on how the heart is able to respond to environmental stress.

Division Publications

1. Accornero F, van Berlo JH, Benard MJ, Lorenz JN, Carmeliet P, Molkentin JD. **Placental growth factor regulates cardiac adaptation and hypertrophy through a paracrine mechanism.** *Circulation research.* 2011; 109:272-80.
2. Azhar M, Brown K, Gard C, Chen H, Rajan S, Elliott DA, Stevens MV, Camenisch TD, Conway SJ, Doetschman T. **Transforming growth factor Beta2 is required for valve remodeling during heart development.** *Developmental dynamics : an official publication of the American Association of Anatomists.* 2011; 240:2127-41.
3. Bedard JE, Haaning AM, Ware SM. **Identification of a novel ZIC3 isoform and mutation screening in patients with heterotaxy and congenital heart disease.** *PloS one.* 2011; 6:e23755.
4. Cast AE, Gao C, Amack JD, Ware SM. **An essential and highly conserved role for Zic3 in left-right patterning, gastrulation and convergent extension morphogenesis.** *Developmental biology.* 2012; 364:22-31.
5. Chakraborty S, Yutzey KE. **Tbx20 regulation of cardiac cell proliferation and lineage specialization during embryonic and fetal development in vivo.** *Developmental biology.* 2012; 363:234-46.
6. Cheek JD, Wirrig EE, Alfieri CM, James JF, Yutzey KE. **Differential activation of valvulogenic, chondrogenic, and osteogenic pathways in mouse models of myxomatous and calcific aortic valve disease.** *Journal of molecular and cellular cardiology.* 2012; 52:689-700.
7. Czosek RJ, Goldenberg P, Miller EM, Spicer R, Towbin JA, Ware SM. **Cardiac electrical system involvement in Alstrom syndrome: uncommon causes of dilated cardiomyopathies.** *Cardiogenetics.* 2012; 2:e2.
8. Dohn TE, Waxman JS. **Distinct phases of Wnt/beta-catenin signaling direct cardiomyocyte formation in zebrafish.** *Developmental biology.* 2012; 361:364-76.
9. Goonasekera SA, Hammer K, Auger-Messier M, Bodi I, Chen X, Zhang H, Reiken S, Elrod JW, Correll RN, York AJ, Sargent MA, Hofmann F, Moosmang S, Marks AR, Houser SR, Bers DM, Molkentin JD. **Decreased cardiac L-type Ca(2) channel activity induces hypertrophy and heart failure in mice.** *The Journal of clinical investigation.* 2012; 122:280-90.
10. Goonasekera SA, Molkentin JD. **Unraveling the secrets of a double life: contractile versus signaling Ca²⁺ in a cardiac myocyte.** *J Mol Cell Cardiol.* 2012; 52:317-22.
11. Haghighi K, Pritchard T, Bossuyt J, Waggoner JR, Yuan Q, Fan GC, Osinska H, Anjak A, Rubinstein J,

- Robbins J, Bers DM, Kranias EG. **The human phospholamban Arg14-deletion mutant localizes to plasma membrane and interacts with the Na/K-ATPase.** *Journal of molecular and cellular cardiology.* 2012; 52:773-82.
12. Hom JR, Quintanilla RA, Hoffman DL, de Mesy Bentley KL, Molckentin JD, Sheu SS, Porter GA, Jr.. **The permeability transition pore controls cardiac mitochondrial maturation and myocyte differentiation.** *Developmental cell.* 2011; 21:469-78.
 13. Houser SR, Margulies KB, Murphy AM, Spinale FG, Francis GS, Prabhu SD, Rockman HA, Kass DA, Molckentin JD, Sussman MA, Koch WJ. **Animal Models of Heart Failure: A Scientific Statement From the American Heart Association.** *Circ Res.* 2012; 111:131-150.
 14. James J, Kinnett K, Wang Y, Ittenbach RF, Benson DW, Cripe L. **Electrocardiographic abnormalities in very young Duchenne muscular dystrophy patients precede the onset of cardiac dysfunction.** *Neuromuscular disorders : NMD.* 2011; 21:462-7.
 15. Jeyaraj D, Haldar SM, Wan X, McCauley MD, Ripperger JA, Hu K, Lu Y, Eapen BL, Sharma N, Ficker E, Cutler MJ, Gulick J, Sanbe A, Robbins J, Demolombe S, Kondratov RV, Shea SA, Albrecht U, Wehrens XH, Rosenbaum DS, Jain MK. **Circadian rhythms govern cardiac repolarization and arrhythmogenesis.** *Nature.* 2012; 483:96-9.
 16. Kindel SJ, Miller EM, Gupta R, Cripe LH, Hinton RB, Spicer RL, Towbin JA, Ware SM. **Pediatric cardiomyopathy: importance of genetic and metabolic evaluation.** *J Card Fail.* 2012; 18:396-403.
 17. Ladage D, Tilemann L, Ishikawa K, Correll RN, Kawase Y, Houser SR, Molckentin JD, Hajjar RJ. **Inhibition of PKCalpha/beta With Ruboxistaurin Antagonizes Heart Failure in Pigs After Myocardial Infarction Injury.** *Circulation research.* 2011; 109:1396-400.
 18. Le TT, Conley KW, Mead TJ, Rowan S, Yutzey KE, Brown NL. **Requirements for Jag1-Rbpj mediated Notch signaling during early mouse lens development.** *Developmental dynamics : an official publication of the American Association of Anatomists.* 2012; 241:493-504.
 19. Lee MP, Yutzey KE. **Twist1 directly regulates genes that promote cell proliferation and migration in developing heart valves.** *PloS one.* 2011; 6:e29758.
 20. Li J, Horak KM, Su H, Sanbe A, Robbins J, Wang X. **Enhancement of proteasomal function protects against cardiac proteinopathy and ischemia/reperfusion injury in mice.** *The Journal of clinical investigation.* 2011; 121:3689-700.
 21. Li X, Chan TO, Myers V, Chowdhury I, Zhang XQ, Song J, Zhang J, Andrel J, Funakoshi H, Robbins J, Koch WJ, Hyslop T, Cheung JY, Feldman AM. **Controlled and cardiac-restricted overexpression of the arginine vasopressin V1A receptor causes reversible left ventricular dysfunction through Galphaq-mediated cell signaling.** *Circulation.* 2011; 124:572-81.
 22. Liao X, Sluimer JC, Wang Y, Subramanian M, Brown K, Pattison JS, Robbins J, Martinez J, Tabas I. **Macrophage autophagy plays a protective role in advanced atherosclerosis.** *Cell metabolism.* 2012; 15:545-53.
 23. Liu Q, Chen Y, Auger-Messier M, Molckentin JD. **Interaction Between NFkappaB and NFAT Coordinates Cardiac Hypertrophy and Pathological Remodeling.** *Circulation research.* 2012; 110:1077-86.
 24. Liu Q, Molckentin JD. **Protein kinase Calpha as a heart failure therapeutic target.** *J Mol Cell Cardiol.* 2011; 51:474-8.
 25. Lynch JM, Maillet M, Vanhoutte D, Schloemer A, Sargent MA, Blair NS, Lynch KA, Okada T, Aronow BJ, Osinska H, Prywes R, Lorenz JN, Mori K, Lawler J, Robbins J, Molckentin JD. **A Thrombospondin-Dependent Pathway for a Protective ER Stress Response.** *Cell.* 2012; 149:1257-68.
 26. Makarewich CA, Correll RN, Gao H, Zhang H, Yang B, Berretta RM, Rizzo V, Molckentin JD, Houser SR. **A caveolae-targeted L-type Ca(2) channel antagonist inhibits hypertrophic signaling without reducing cardiac contractility.** *Circulation research.* 2012; 110:669-74.

27. McBride KL, Ware SM. **Modifying mendel: approaches for identification of susceptibility alleles for human cardiovascular malformations.** *Circ Cardiovasc Genet.* 2012; 5:274-6.
28. McLendon PM, Robbins J. **Desmin-related cardiomyopathy: an unfolding story.** *American journal of physiology. Heart and circulatory physiology.* 2011; 301:H1220-8.
29. Mead TJ, Yutzey KE. **Notch signaling and the developing skeleton.** *Advances in experimental medicine and biology.* 2012; 727:114-30.
30. Mead TJ, Yutzey KE. **Notch pathway regulation of neural crest cell development in vivo.** *Developmental dynamics : an official publication of the American Association of Anatomists.* 2012; 241:376-89.
31. Miller EM, Hopkin R, Bao L, Ware SM. **Implications for genotype-phenotype predictions in Townes-Brocks syndrome: case report of a novel SALL1 deletion and review of the literature.** *American journal of medical genetics. Part A.* 2012; 158A:533-40.
32. Muili KA, Ahmad M, Orabi AI, Mahmood SM, Shah AU, Molкетин JD, Husain SZ. **Pharmacological and genetic inhibition of calcineurin protects against carbachol-induced pathological zymogen activation and acinar cell injury.** *American journal of physiology. Gastrointestinal and liver physiology.* 2012; 302:G898-905.
33. Mun JY, Gulick J, Robbins J, Woodhead J, Lehman W, Craig R. **Electron microscopy and 3D reconstruction of F-actin decorated with cardiac myosin-binding protein C (cMyBP-C).** *Journal of molecular biology.* 2011; 410:214-25.
34. Palmer BM, Sadayappan S, Wang Y, Weith AE, Previs MJ, Bekyarova T, Irving TC, Robbins J, Maughan DW. **Roles for cardiac MyBP-C in maintaining myofilament lattice rigidity and prolonging myosin cross-bridge lifetime.** *Biophysical journal.* 2011; 101:1661-9.
35. Pattison JS, Osinska H, Robbins J. **Atg7 induces basal autophagy and rescues autophagic deficiency in CryABR120G cardiomyocytes.** *Circulation research.* 2011; 109:151-60.
36. Pattison JS, Robbins J. **Autophagy and proteotoxicity in cardiomyocytes.** *Autophagy.* 2011; 7:1259-60.
37. Quinn ME, Haaning A, Ware SM. **Preaxial polydactyly caused by Gli3 haploinsufficiency is rescued by Zic3 loss of function in mice.** *Human molecular genetics.* 2012; 21:1888-96.
38. Robbins J. **Twenty years of gene targeting: what we don't know.** *Circulation research.* 2011; 109:722-3.
39. Sadayappan S, Gulick J, Osinska H, Barefield D, Cuello F, Avkiran M, Lasko VM, Lorenz JN, Maillet M, Martin JL, Brown JH, Bers DM, Molкетин JD, James J, Robbins J. **A critical function for Ser-282 in cardiac Myosin binding protein-C phosphorylation and cardiac function.** *Circulation research.* 2011; 109:141-50.
40. Sciarretta S, Zhai P, Shao D, Maejima Y, Robbins J, Volpe M, Condorelli G, Sadoshima J. **Rheb is a critical regulator of autophagy during myocardial ischemia: pathophysiological implications in obesity and metabolic syndrome.** *Circulation.* 2012; 125:1134-46.
41. Sengupta A, Chakraborty S, Paik J, Yutzey KE, Evans-Anderson HJ. **FoxO1 is required in endothelial but not myocardial cell lineages during cardiovascular development.** *Developmental dynamics : an official publication of the American Association of Anatomists.* 2012; 241:803-13.
42. Sheridan RM, Michelfelder EC, Choe KA, Divanovic A, Liu C, Ware S, Stanek J. **Ductus arteriosus aneurysm with massive thrombosis of pulmonary artery and fetal hydrops.** *Pediatric and developmental pathology : the official journal of the Society for Pediatric Pathology and the Paediatric Pathology Society.* 2012; 15:79-85.
43. Sorrell MR, Waxman JS. **Restraint of Fgf8 signaling by retinoic acid signaling is required for proper heart and forelimb formation.** *Developmental biology.* 2011; 358:44-55.
44. Tariq M, Belmont JW, Lalani S, Smolarek T, Ware SM. **SHROOM3 is a novel candidate for heterotaxy identified by whole exome sequencing.** *Genome Biol.* 2011; 12:R91.
45. Tariq M, Le TT, Putnam P, Kindel SJ, Keddache M, Ware SM. **Targeted capture and massively parallel sequencing in pediatric cardiomyopathy: development of novel diagnostics.** *Cardiogenetics.* 2012; 2:e7.

46. Tranter M, Liu Y, He S, Gulick J, Ren X, Robbins J, Jones WK, Reineke TM. **In vivo delivery of nucleic acids via glycopolymer vehicles affords therapeutic infarct size reduction in vivo.** *Molecular therapy : the journal of the American Society of Gene Therapy.* 2012; 20:601-8.
47. van Berlo JH, Elrod JW, Aronow BJ, Pu WT, Molkentin JD. **Serine 105 phosphorylation of transcription factor GATA4 is necessary for stress-induced cardiac hypertrophy in vivo.** *Proceedings of the National Academy of Sciences of the United States of America.* 2011; 108:12331-6.
48. Ware SM, Aygun MG, Hildebrandt F. **Spectrum of clinical diseases caused by disorders of primary cilia.** *Proceedings of the American Thoracic Society.* 2011; 8:444-50.
49. Weith A, Sadayappan S, Gulick J, Previs MJ, Vanburen P, Robbins J, Warshaw DM. **Unique single molecule binding of cardiac myosin binding protein-C to actin and phosphorylation-dependent inhibition of actomyosin motility requires 17 amino acids of the motif domain.** *Journal of molecular and cellular cardiology.* 2012; 52:219-27.
50. Xiang SY, Vanhoutte D, Del Re DP, Purcell NH, Ling H, Banerjee I, Bossuyt J, Lang RA, Zheng Y, Matkovich SJ, Miyamoto S, Molkentin JD, Dorn GW, 2nd, Brown JH. **RhoA protects the mouse heart against ischemia/reperfusion injury.** *The Journal of clinical investigation.* 2011; 121:3269-76.

Faculty, Staff, and Trainees

Faculty Members

Jeffrey Robbins, PhD, Professor

Leadership Executive Co-Director, The Heart Institute; Associate Chair of the Cincinnati Children's Hospital Medical Center; Endowed Chair for Molecular Cardiovascular Biology

Research Interests Mechanisms of Normal and Abnormal Cardiovascular function

James Gulick, MS, Instructor

Research Interests Molecular interactions between certain cardiac contractile proteins and how such interactions can be altered by mutations that are associated with cardiomyopathies

Jeanne James, MD, Associate Professor

Leadership Director, Pediatric Cardiology Fellowship Program

Research Interests Manifestations and etiologies of misfolded protein response and echocardiography

Zaza Khuchua, PhD, Associate Professor

Research Interests Congenital cardiac disorders caused by inborn errors in mitochondrial energy-producing enzymes, and model systems to study molecular mechanisms of these diseases

Marjorie Maillet, PhD, Instructor

Research Interests Understanding signaling pathways that lead to heart disease

Jeffery Molkentin, PhD, Professor

Leadership Howard Hughes Medical Institute Investigator

Research Interests Molecular pathways that underlie heart disease and muscular dystrophy

Sudarsan Rajan, PhD, Assistant Professor

Research Interests Understanding contractile and regulatory proteins' gene expression and their role in maintaining normal cardiovascular function

Johannes van Berlo, MD, PhD, Instructor

Stephanie Ware, MD, PhD, Associate Professor

Leadership Director of Research and Development, Associate Medical Director, The Heart Institute Diagnostic Laboratory; Co-Director, Cardiovascular Genetics

Research Interests Genetics of pediatric heart disease

Joshua Waxman, PhD, Assistant Professor

Research Interests Molecular Genetics of Heart Development

Katherine Yutzey, PhD, Professor

Research Interests Heart development and disease mechanisms

Joint Appointment Faculty Members

D Woodrow Benson, MD, PhD, Professor (Cardiology)

Research Interests Genetic basis of pediatric heart disease

Trainees

- **Federica Accornero, PhD**, University of Turin, Italy
- **Md. Shenuarin Bhuiyan, PhD**, Tohoku University, Japan
- **Caitlin Braitsch, BS**, Xavier University
- **Adam Burr, BS**, University of Minnesota, Twin Cities
- **Santanu Chakraborty, PhD**, Miami University
- **Rajshekhar Chatterjee, PhD**, Washington University
- **Charles Cole, MD**, University of Cincinnati
- **Robert Nathan Correll, PhD**, University of Kentucky
- **Jason Cowan, MS**, University of Miami
- **Enrico D'Aniello, PhD**, Marine Zoological Station Anton Dohrn, Italy
- **Jennifer Davis, PhD**, University of Michigan, Ann Arbor
- **Tracy Dohn, BS**, Wittenberg University
- **Petra Eder, PhD**, University of Graz, Austria
- **John Elrod, PhD**, Albert Einstein College of Medicine
- **Ming Fang, MS**, Boise State University
- **Maria Gomez, BS**, Xavier University
- **Ambrose Goonasekera, PhD**, University of Rochester
- **Manish Gupta, PhD**, University of Cincinnati
- **Onur Kanisicak, PhD**, University of Connecticut
- **Jason Karch, BA**, Dakota Wesleyan University
- **Jennifer Kwong, PhD**, Weill Medical College of Cornell University
- **Julie Lander, BS**, Brigham Young University
- **Mary Lee, MS**, Ball State University
- **Ruijie Liu, PhD**, University of Illinois at Urbana Champaign
- **Jeffrey Lynch, PhD**, University of Alberta, Canada
- **Patrick McLendon, PhD**, Virginia Polytechnical Institute and State University
- **Md. Abdur Razzaque, PhD**, Tokyo Women's Medical University, Japan
- **Ariel Rydeen, BS**, University of Minnesota
- **Tobias Schips, PhD**, Ulm University, Germany
- **Arunima Sengupta, PhD**, Miami University
- **Mardi Sutherland, BS**, University of Massachusetts, Boston
- **Muhammad Tariq, PhD**, Quaid-I-Azam University, Pakistan
- **Andoria Tjondrokoesoemo, PhD**, University of Medicine & Dentistry of New Jersey

- **Jop van Berlo, MD, PhD**, University Hospital Maastricht, Netherlands
- **Davy Vanhoutte, PhD**, University of Leuven, Belgium
- **Elaine Wirrig, PhD**, Medical University of South Carolina
- **Erin Wissing, BA**, DePauw University

Grants, Contracts, and Industry Agreements

Grant and Contract Awards	Annual Direct
ACCORNERO, F	
PGF Role in Regulating Cardiac Remodeling American Heart Association 11POST7530035	07/01/11-06/30/13 \$43,000
BHUIYAN, S	
Functional Significance and Regulation of cMyBP-C Binding to Actin American Heart Association 11POST7590181	07/01/11-06/30/13 \$43,000
CORRELL, R	
Regulation of Cardiac Gene Expression by the L-type Calcium Channel, CaV1.2 National Institutes of Health F32 HL 097551	09/07/09-01/06/12 \$18,989
GUPTA, M	
Role of Myosin Binding Protein-C Phosphorylation in Cardiac Function American Heart Association 11POST7590026	07/01/11-06/30/13 \$43,000
HORN, M	
Differential Twist1 Dimer Function and Gene Regulation in Valve Progenitor Cells American Heart Association 11PRE7240023	07/01/11-06/30/13 \$23,000
KARCH, J	
The Role of Bax and Bak in Necrotic Cell Death American Heart Association	07/01/10-06/30/12 \$23,000
KHUCHUA, Z	
A Mouse Model of Barth Syndrome, a Mitochondrial Cardiolipin Disorder National Institutes of Health R01 HL 108867	07/07/11-03/31/15 \$250,000
KRISHNAMURTHY, V	
Aortic Root Structure-Function Relationships in a Mouse Model of Aortic Valve Disease and Aortopathy American Heart Association 11PRE7210044	07/01/11-06/30/12 \$23,000
MCLENDON, P	
The Role of Impaired Protein Degradation Pathways in CryABR120G-Mediated Desmin-R National Institutes of Health F32 HL 112558	01/11/12-01/10/14 \$51,326

MOLKENTIN, J**Calcium as a Molecular Signal in the Heart**

National Institutes of Health(Temple University School of Medicine)

R01 HL 089312 08/15/07-06/30/12 \$239,303

Cardiac Hypertrophic Intracellular Signaling Pathways

National Institutes of Health

R01 HL 062927 02/01/09-12/31/13 \$222,750

Molecular Pathways Controlling Cardiac Gene Expression

National Institutes of Health

R37 HL 060562 07/01/08-06/30/13 \$250,000

Mechanisms of TGF Regulated Fibrosis in Muscular Dystrophy

National Institutes of Health(The University of Chicago)

P01 NS 072027 07/01/11-06/30/16 \$225,000

Thrombospondin 4 Regulates Adaptive ER Stress Response

National Institutes of Health

R01 HL 105924 01/01/11-12/31/11 \$315,000

Ca Signaling Domains Programming Cardiac Hypertrophy

National Institutes of Health(The Regents of the University of California)

PO1 HL 080101 08/01/11-05/31/16 \$271,987

RAJAN, S**Translational and Post-Translational Regulation of Tropomyosin in Normal and Cardiomyopathic Hearts**

American Heart Association

11SDG4980029 08/01/11-12/31/14 \$76,370

ROBBINS, J**Cardiac Myosin Binding Protein-C: Structure, Function and Regulation**

National Institutes of Health(University of Vermont)

P01 HL 059408 02/01/10-01/31/15 \$349,278

Proteotoxicity: An Unappreciated Mechanism of Heart Disease

Fondation Leducq

10/01/11-09/30/16 \$168,182

Signaling Processes Underlying Cardiovascular Function

National Institutes of Health

P01 HL 069779 01/11/08-12/31/12 \$1,219,260

SENGUPTA, A**FOXO Function in Cardiomyocytes During Development and Disease**

American Heart Association

11POST7210026 07/01/11-06/30/13 \$43,000

VAN BERLO, J**Functional Relevance and Extent of Endogenous Cardiac Regeneration by C-Kit Positive Stem Cells**

National Institutes of Health

K99 HL 112852 06/04/12-06/03/17 \$121,660

GATA-6 Function is Crucial for Cardiac Hypertrophy to Prevent Heart Failure

American Heart Association

07/01/10-06/30/12 \$45,000

WARE, S**Genetic Causes of Congenital Heart Defects**

March of Dimes National

06/01/10-05/31/13 \$79,590

Role of the Embryonic Node in Cardiac Development and Congenital Heart Disease

National Institutes of Health

R01 HL 088639 04/01/07-03/31/12 \$250,000

Uncovering Novel Genetic Causes and Risk in Congenital Heart Disease Patients

Burroughs Wellcome Foundation(University of Cincinnati)

BWF #1008496

07/01/09-06/30/15

\$150,000

WAXMAN, J**Elucidation of Molecular Networks Required to Limit Cardiac Cell Number**

National Institutes of Health

R00 HL 091126

07/15/10-05/31/13

\$162,745

Illumination of Mechanisms Controlling Atrial Cell Formation

March of Dimes National

02/01/11-01/31/13

\$69,327

YUTZEY, K**Student Undergraduate Research Fellowship**

American Heart Association

12UFEL9990000

02/01/12-01/31/14

\$20,000

Twist 1 Regulation of Valve Progenitors

National Institutes of Health

R01 HL 082716

07/01/10-05/31/15

\$250,000

Wnt Signaling in Heart Valve Development and Disease

National Institutes of Health

R01 HL 094319

04/15/12-02/28/16

\$250,000

Current Year Direct**\$5,296,767****Total****\$5,296,767**