From the front cover

**1.** Left ventricular stress/strain analyses using high-resolution echocardiography (Visualsonics Vevo 2100). In this particular case, the mouse displays apical akinesia/dyskinesia after a large myocardial infarction. Regional velocity data are shown in all panels, with vectors at the top left and color-coded on the right. (Courtesy of Maike Krenz Laboratory)

**2.** (Courtesy of Lane Clarke Lab)

**3.** Imaging the mitochondrial network. Mouse embryonic fibroblasts were immunostained for the mitochondrial matrix protein complement 1q binding protein (C1qbp) to reveal that mitochondria are not single entities but rather form a reticular network. (Courtesy of Christopher Baines Laboratory)

**4.** (Courtesy of Eileen Hasser Lab)

**5.** (Courtesy of Shinghua Ding Lab)

**6.** Structure of small renal arteries as shown by 3D confocal microscopy and image processing. Red staining shows the distribution of the extracellular matrix protein, elastin and green highlights nuclei of smooth muscle (horizontal) and endothelial (vertical) cells. Significant elastin staining between smooth muscles cells (upper panels) is characteristic of renal blood vessels. Holes/fenestræ in the internal elastic lamina are evident in the lower left panel. (Courtesy of Michael Hill Laboratory)

**7.** (Courtesy of Michael Hill Lab)
From the Director

The Dalton Cardiovascular Research Center (DCRC) supports the objectives of the University of Missouri in its mission of teaching, research and service. Yet it is unique in its commitment to interdisciplinary collaborative research and teaching among various colleges, schools and departments across the Columbia campus. Under the auspices of DCRC, scientists from the fields of biochemistry, biological engineering, biological sciences, biomedical sciences, electrical engineering, medicine, pharmacology, physiology, physics, and veterinary medicine and surgery all come together and apply their particular expertise to research problems.

Our commitment to collaboration is grounded in the belief that interactions among scientists of diverse backgrounds will lead to multidisciplinary research producing meaningful, far-reaching results. Research programs at DCRC include investigations into cardiac functions, cystic fibrosis, exercise, kidney failure, membrane transport, muscular dystrophy, neurohumoral control of the circulation, shock, vascular wall biology, diabetes, hypertension, biomedical engineering, protein-protein interactions, and tumor angiogenesis. Because the mission of DCRC is to promote interaction and collaboration, no single group completely defines the research activity of its members.

The center is committed to excellence in cardiovascular research and in the education of students and fellows. Our investigators provide service to the University, the State of Missouri, and the nation through memberships on committees, peer review panels and editorial boards of scientific journals.

The Dalton Cardiovascular Research Center is accredited by both the American Association for the Advancement of Laboratory Animal Care and the American Association of Laboratory Animal Sciences.

Michael A. Hill, PhD
Director, Dalton Cardiovascular Research Center
Professor, Medical Pharmacology & Physiology

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12. Publications
### Investigators

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### Patents-Applications/Issued

- Applications: 5
- Issued: 2

### Invention Disclosures-Filed/Licensed

- Filed: 3
- Licensed: 4

### Scholarly and Professional Service Activities

**01/16-07/16**

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### Interdisciplinary Research Interest Groups

- Biomedical Engineering
- Microcirculation
- Exercise/Inactivity
- Vascular Biology
- Membrane Transport
- Cystic Fibrosis
- Tumor Angiogenesis
- Neurohumoral Control of Circulation
- Cardiac Muscle, Development & Disease

### Facilities

- Erected 1967-1969
- 33,456 Square Feet
- 21 Research Labs
## Sponsored Research Funding FY16

- **FY16 New Awards**: $8,093,921
- **FY16 Funded**: $4,709,961
- **FY16 Cumulative Funding**: $20,369,800
- **FY16 Expended**
  - Salaries: $1,592,435
  - Benefits: $461,961
  - Dept Operating: $441,437
  - Student Aid: $17,946
  - Animal Care: $181,042
  - F&A Indirects: $1,134,924
  - Expended Totals: $3,829,745

### FY16 New Awards, $8,093,921

- **Federal**: $6,150,727
- **Foundation**: $246,156
- **Internal**: $51,463
- **Universities**: $846,110
- **Association**: $304,000
- **Corporation**: $495,465
Academic Partners

College of Arts and Science
  Physics & Astronomy

College of Engineering
  Bioengineering, Electrical & Computer Engineering

College of Veterinary Medicine
  Biomedical Sciences

School of Medicine
  Biochemistry
  Center for Gender Physiology
  Medical Pharmacology & Physiology
  Internal Medicine
  Pathology and Anatomical Sciences

Nutrition & Exercise Physiology

External Sector Collaborations

Domestic

  Cornell University
  Tensive Controls, Inc
  Exocytronics, LLC
  Case Western Univ.
  ABBVIE Inc.
  Washington University, St Louis
  Univ. of IL Urbana, Champaign
  TX A&M Engineering Experiment Station
  Vertex Pharmaceuticals, Inc.
  Gilead Sci, Inc.
  Tufts University
  Flatley Discovery Lab
  Univ. of IL, Chicago

International

  Univ. of Oxford (UK)
  Sichuan University (CN)
  Univ. of Calgary (CA)
  Univ. of Sheffield (UK)
  RMIT Univ. (Australia)
RESIDENT INVESTIGATORS

Christopher P. Baines, PhD
Associate Professor, Department of Biomedical Sciences

Edward H. Blaine - Emeritus Professor
Department of Medical Pharmacology and Physiology

Lane L. Clarke, DVM, PhD, Professor
Department of Biomedical Sciences

Shinghua Ding, PhD
Associate Professor, Biological Engineering

Kevin D. Gillis, DSc, Professor Biological Engineering
Professor Medical Pharmacology and Physiology

Li-Qun (Andrew) Gu, PhD
Associate Professor, Bioengineering

Chetan P. Hans, Ph.D.
Assistant Professor, Department of Medicine-Cardiology
Eileen M. Hasser, PhD
Professor, Department of Biomedical Sciences
Adjunct Professor, Medical Pharmacology and Physiology

Cheryl M. Heesch, PhD, Professor,
Department of Biomedical Sciences

Michael A. Hill, PhD
Interim Director, Dalton Cardiovascular Research Center
Professor, Department of Medical Pharmacology and Physiology

Tzyh-Chang Hwang, PhD
Professor, Department of Medical Pharmacology and Physiology

Salman M. Hyder, PhD
Zalk Missouri Professor of Tumor Angiogenesis
Professor, Department of Biomedical Sciences

David D. Kline, PhD
Associate Professor, Department of Biomedical Sciences

Maike Krenz, M.D.
Associate Professor, Department of Medical Pharmacology and Physiology
Yayun Liang, PhD  
Research Associate Professor, Department of Biomedical Sciences, Investigator, Dalton Cardiovascular Research Center

Luis Martinez-Lemus, PhD, DVM  
Associate Professor, Department of Medical Pharmacology and Physiology

Gerald A. Meininger, PhD  
Margaret Proctor Mulligan Professor in Medical Research Professor, Department of Medical Pharmacology and Physiology  
Adjunct Professor, Department of Biomedical Sciences  
Adjunct Professor, Department of Biological Engineering

Luis Polo-Parada, PhD  
Associate Professor, Department of Medical Pharmacology and Physiology

Zhe Sun, PhD  
Assistant Research Professor, Dalton Cardiovascular Research Center

Xiaqin Zou, PhD  
Professor, Department of Physics and Department of Biochemistry
Non-Resident Investigators

Shawn B. Bender, Ph.D.
Assistant Professor, Department of Biomedical Sciences

Silvia G. Bompadre, PhD
Assistant Professor, Department of Physics & Astronomy

Frank W. Booth, PhD
Professor, Department of Biomedical Sciences

Douglas K. Bowles, PhD
Professor, Department of Biomedical Sciences
Adjunct Professor, Department of Medical Pharmacology and Physiology

Nicola J. Brown, Ph.D.
Adjunct Dalton Investigator
Sheffield Cancer Research Centre

Chandrasekar Bysani, D.V.M., Ph.D.
Margaret Proctor Mulligan Endowed Professor
Non- Resident Investigators

Kevin J. Cummings, Ph.D.
Assistant Professor, Department of Biomedical Sciences

George E. Davis, MD, PhD
Professor of Medical Pharmacology and Physiology
Margaret Proctor Mulligan Professor in Medical Research

Michael J. Davis, PhD
Professor and Associate Department Head, Department of Medical Pharmacology and Physiology

William P. Fay, M.D.
Professor of Internal Medicine and Medical Pharmacology & Physiology

Shubra Gangopadhyay, PhD
LaPierre Chair and Joint Professor, Departments of Electrical Engineering, Biological Engineering and Physics

Kenneth A. Gruber, Ph.D.
Adjunct Professor, Department of Medical Pharmacology and Physiology
Non-Resident Investigators

Virginia H. Huxley, PhD
Director, National Center for Gender Physiology
Professor, Department of Medical Pharmacology and Physiology
Adjunct Professor, Department of Biomedical Sciences

Ronald J. Korthuis, PhD
Bolm Distinguished Professor
Chairman, Department of Medical Pharmacology and Physiology

M. Harold Laughlin, PhD
Professor and Chair, Department of Biomedical Sciences
Adjunct Professor, Department of Medical Pharmacology and Physiology

Mark A. Milanick, PhD
Professor, Department of Medical Pharmacology and Physiology

Nicole L. Nichols, Ph.D.
Assistant Professor, Department of Biomedical Sciences

Jaume Padilla, Ph.D.
Assistant Professor Nutrition & Exercise Physiology
Non-Resident Investigators

Leona J. Rubin, PhD
Associate Professor, Department of Biomedical Sciences
Adjunct Professor, Department of Medical Pharmacology and Physiology

Steven S. Segal, PhD
Professor of Medical Pharmacology and Physiology

Yoshiro Sohma, MD, PhD
Visiting Professor, Dalton Cardiovascular Research Center

James R Sowers, M.D.
Vice Chair, Professor of Medicine


Pre-B-cell colony-enhancing factor protects against apoptotic neuronal death and mitochondrial damage in ischemia. Wang X, Li H, **Ding S**. Sci Rep. 2016 Aug 31;6:32416. doi: 10.1038/srep32416. PMID: 27576732
Publications


Investigators at Dalton Cardiovascular Research Center seek understanding and information about some of the most prevalent health issues of the day - hypertension; heart disease; adult-onset (Type II) diabetes; obesity; muscular dystrophy; cystic fibrosis; and breast, uterine and prostate cancer. Teams of investigators from medicine, engineering, biomedical sciences, veterinary medicine, physiology and other disciplines work together to find answers to questions that will directly affect the understanding of disease prevention and treatment. Your contribution to Dalton supports this work.

You can now give directly to Dalton Cardiovascular Research Center and the Franklin Lecture Endowment by going to our Giving to Mizzou page.

Dalton welcomes partnerships with the private sector. Please contact Dr. Michael Hill at hillmi@missouri.edu or 573-882-9482 to learn more.