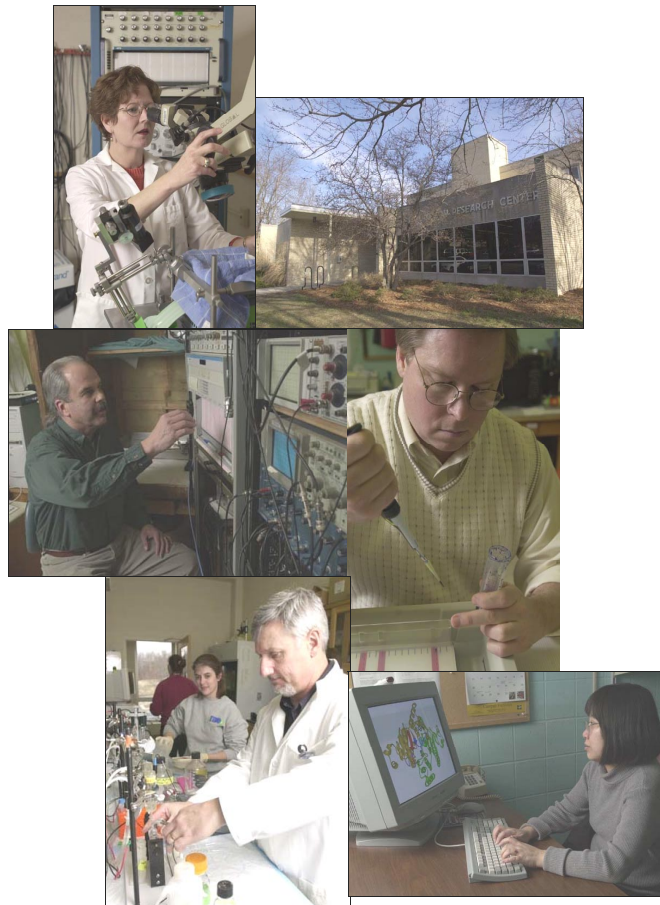




Dalton Cardiovascular Research Center

Committed to Collaboration in Research and Teaching



Annual Report 2001



The University of Missouri-Columbia

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Summary of Accomplishments

Publications and Presentations

104 articles published
114 abstracts published
65 invited presentations

Awards and Peer Review

14 awards received
14 investigators serve on editorial boards of 10 scientific journals
21 investigators review articles for 66 scientific journals
10 investigators review grant applications for 13 granting agencies
7 investigators serve on nine national study sections

Education and Training

38 postdoctoral fellows
16 graduate students
10 undergraduate students
3 high school students

Overview

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 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 sciences, electrical engineering, medicine, physiology, pharmacology, veterinary biomedical sciences, and veterinary medicine and surgery 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 function, cystic fibrosis, exercise, kidney failure, membrane transport, muscular dystrophy, neurohumoral control of the circulation, shock, vascular wall biology, and biomedical engineering. 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. Twenty-seven Dalton investigators provide service to the University, the State of Missouri, and the nation through membership on committees,

peer review panels, and editorial boards of scientific journals. During the period of this report, our investigators published over 104 manuscripts in nationally recognized journals and books and gave over 60 scientific presentations.

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.

DCRC Internal Advisory Board

Lex Akers, Ph.D., Professor and Chair of Electrical Engineering
John D. David, Ph.D., Professor and Chair of Biological Sciences
Robert Hall, Ph.D., J.D., Vice Provost for Research (Interim)
Gerald L. Hazelbauer, Ph.D., Professor and Chair of Biochemistry
Allan W. Jones, Ph.D., Professor and Chair of Physiology
M. Harold Laughlin, Ph.D., Professor and Chair of Veterinary Biomedical Sciences
Cecil P. Moore, Ph.D., Professor and Chair of Veterinary Medicine and Surgery
Arnold L. Smith, M.D., Professor and Chair of Molecular Microbiology and Immunology
Jinglu Tan, Ph.D., Professor and Chair of Biological Engineering

DCRC External Advisory Board

Kenneth Baldwin, Ph.D., Professor of Physiology & Biophysics, University of California at Irvine
Alan Kim Johnson, Ph.D., Professor of Pharmacology & Psychology, University of Iowa
Saulo Klahr, M.D., Professor of Medicine and Director of Nephrology, Washington University School of Medicine
Luis Reuss, M.D., Professor and Chair, Physiology and Biophysics, University of Texas Medical Branch

Dalton Investigators

Edward H. Blaine, PhD, DSc(Hon): Director of Dalton Cardiovascular Research Center, Professor of Physiology and of Pharmacology

Frank W. Booth, PhD: Professor of Veterinary Biomedical Sciences

Douglas K. Bowles, PhD: Assistant Professor of Veterinary Biomedical Sciences

Chang Wen Chen, PhD: Assistant Professor of Electrical Engineering

Lane L. Clarke, DVM, PhD: Associate Professor of Veterinary Biomedical Sciences

J. Thomas Cunningham, PhD: Assistant Professor of Physiology

Joseph L. Dixon, PhD: Research Associate Professor, Dalton Cardiovascular Research Center

Kevin D. Gillis, DSc: Assistant Professor of Electrical Engineering and of Physiology

Calvin C. Hale, PhD: Associate Professor of Veterinary Biomedical Sciences

Marc Hamilton, PhD: Assistant Professor of Veterinary Biomedical Sciences

Eileen M. Hasser, PhD: Associate Professor of Veterinary Biomedical Sciences

Meredith Hay, PhD: Associate Professor of Veterinary Biomedical Sciences; Director, Center for Gender Physiology and Environmental Adaptation, University of Missouri School of Medicine

Cheryl M. Heesch, PhD: Associate Professor of Veterinary Biomedical Sciences

Virginia H. Huxley, PhD: Professor of Physiology

Tzyh-Chang Hwang, PhD: Associate Professor of Physiology

Allan W. Jones, PhD: Associate Director, Dalton Cardiovascular Research Center; Professor and Chair of Physiology

Joe N. Kornegay, DVM, PhD: Professor and Dean of the College of Veterinary Medicine

M. Harold Laughlin, PhD: Professor and Chair of Veterinary Biomedical Sciences, Professor of Physiology

Mark A. Milanick, PhD: Professor of Physiology

Elmer M. Price, PhD: Associate Professor of Veterinary Biomedical Sciences

Michael J. Rovetto, PhD: Professor of Physiology

Leona Rubin, PhD: Associate Professor of Veterinary Biomedical Sciences

James C. Schadt, PhD: Associate Professor of Veterinary Biomedical Sciences

Arnold L. Smith, MD: Professor and Chair of Molecular Microbiology and Immunology

Ronald L. Terjung, PhD, Dhc: Professor and Associate Chair, Veterinary Biomedical Sciences

Richard Tsika, PhD: Associate Professor of Veterinary Biomedical Sciences and of Biochemistry

Xiaoqin Zou, PhD: Research Assistant Professor, Dalton Cardiovascular Research Center and Department of Biochemistry

Research Areas

Biomedical Engineering

Investigators: Chen, Gillis, Huxley, Hwang, Jones, Milanick, Rubin, Sullivan, Zou

Cardiovascular Imaging

Investigators: Chen

Cystic Fibrosis

Investigators: Clarke, Hwang, Milanick, Price, Smith

Exercise/Inactivity Including Atherosclerosis, Muscle Biology, Obesity, Type II Diabetes, and Vascular Biology

Investigators: Booth, Bowles, Dixon, Hale, Hamilton, Hasser, Huxley, Jones, Laughlin, Price, Rubin, Terjung, Tsika

Membrane Transport

Investigators: Clark, Gillis, Hale, Huxley, Hwang, Milanick, Price, Rovetto, Rubin, Zou

Muscular Dystrophy

Investigators: Kornegay

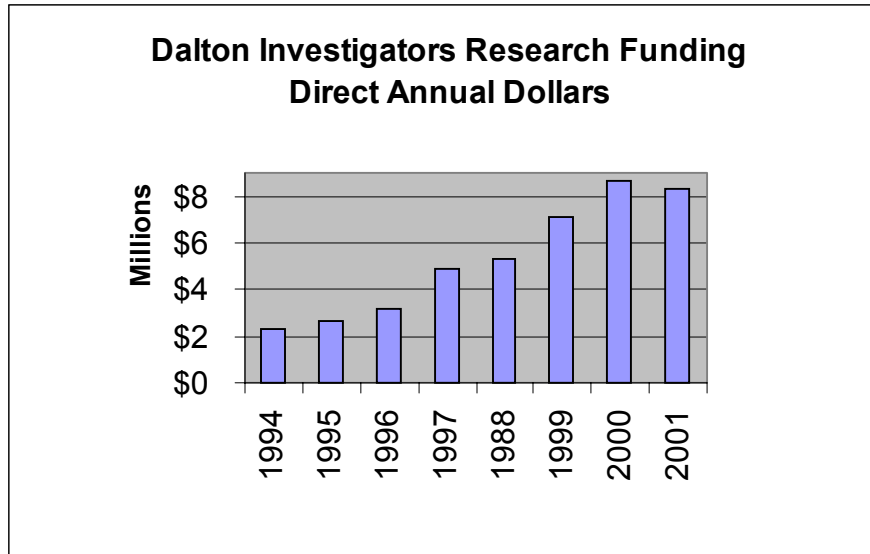
Nephrology Including Hypertension, Renal Failure, Diabetic Nephrology, and Peritoneal Dialysis

Investigators: Blaine, Dale, Khanna, Nolph, Twardowski

Neurohumoral Control of the Circulation Including Hypertension, Heart Failure, and Salt and Water Homeostasis

Investigators: Blaine, Cunningham, Hasser, Heesch, Hay, Milanick, Price, Schadt, Sullivan

Funding

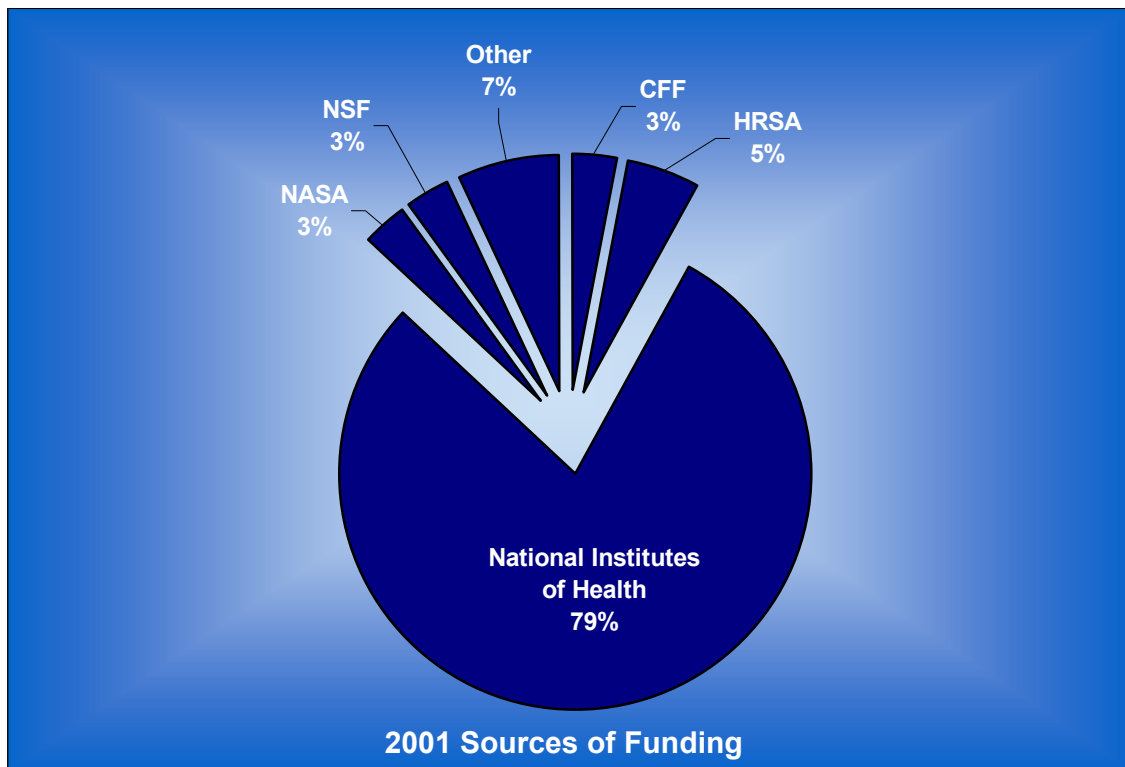


Year 2001 Investigator Funding

Grant Funds – Direct Costs	\$8,314,038
Grant Funds – Indirect Costs	\$2,552,585
Fellowships – Direct Costs	\$350,603
Total Funding	\$11,217,226

Year 2001 Funding Distribution

Resident Investigators Direct Costs	\$4,355,573
Resident Shared Credit Direct Costs	\$137,178
Non-resident Investigators Direct costs	\$4,171,890
Total Direct Costs (Includes Fellowships)	\$8,664,641



Principal Investigator Research Grants

(Year 2001 Total Costs)

American Heart Association

“Central Cardiovascular Control During Blood Loss” James Schadt \$38,251

“Role of Ubiquitin-Proteasome Pathway in Vascular Wall Metabolism and Atherosclerosis” Joseph Dixon \$39,976

Association Française contre les Myopathies

“Cellular Effects of Prednisone Treatment in Canine Dystrophy” Joe Kornegay \$35,802

Baylor College of Medicine

“Role of Growth Hormone Secretagogues and Exercise on Muscle Homeostasis under Microgravity” Frank Booth \$67,131

Chiron Corporation

“Collateral Blood Flow Increases with FGF-2 in Rats with Peripheral Arterial Insufficiency: Influence of Dosing Regimens Protocol” Ronald Terjung \$134,501

Cystic Fibrosis Foundation

“Intramolecular Regulation of CFTR” Elmer Price \$60,000

“NBF1 and Restoration of Anion Secretion in F508 Cells” Lane Clarke \$42,958

“Role of Human Beta-Defensin-2 in Cystic Fibrosis Bronchitis” Arnold Smith \$93,920

Health Resources and Services Administration

“Dalton Cardiovascular Research Center Construction/Renovation” Edward Blaine \$610,257

Muscular Dystrophy Association

“Cellular Effects of Prednisone Treatment in Canine Dystrophy” Joe Kornegay \$101,364

NASA

“Genomics of Human Skeletal Muscle During Bedrest & Exercise” (administered by Baylor College of Medicine) Marc Hamilton \$120,012

“Mobile Wireless Access to Low Resolution Picture Taking (LRPT) NOAA Weather Images” Chang Wen Chen \$50,000

“Signaling of Muscle Atrophy with Unloading” Frank Booth \$157,611

“Vascular Control of Skeletal Muscle Blood Flow After Simulated Microgravity” Harold Laughlin \$22,000

National Institutes of Health

“Adenine Nucleotide Metabolism in Skeletal Muscle” Ronald Terjung \$324,551

“Altered Mechanical Loads and Skeletal Muscle Phenotype” Richard Tsika \$340,750

“Angiogenic Growth Factors in Exercising Skeletal Muscle” Ronald Terjung \$35,315

“Baroreceptor Neurons - Metabotropic Receptor Modulation” Meredith Hay \$95,400

“Ca Sensing for Exocytosis” Kevin Gillis \$181,250

“Cardiovascular and Renal Physiology, Pharmacology and Biochemistry” Virginia Huxley \$195,680

“Cardiovascular Regulation-Hindlimb Unweighted Animals” Eileen Hasser \$231,995

“Central Cardiovascular Control During Blood Loss” James Schadt \$253,750

“CFTR and Duodenal Anion Transport” Lane Clarke \$217,500

“Circumventricular Organs: Gender & Hypertension” Meredith Hay \$250,415

“Control of Sodium Intake in the Hindlimb Unweighted Rat” Thomas Cunningham \$198,585

“Conversion of Shell Space -- Dalton Cardiovascular Research Center” Edward Blaine \$518,000

“Cystolic Modulation of Plasma Membrane Ion Transport” Mark Milanick \$206,755

“Exercise and Coronary Adenosine Activated K Currents” Douglas Bowles \$93,468

“Exercise Hypertrophy and Control of Myosin Induction” Richard Tsika \$152,026

“Exercise Training and Peripheral Arterial Insufficiency” Ronald Terjung \$362,500

“Exercise-Induced Growth of Skeletal Muscle” Frank Booth \$204,450

“Failed Rescue of Old Skeletal Muscle from Atrophy” Frank Booth \$263,000

“Gating of the CFTR Cl Channel by ATP Hydrolysis” Tzyh-Chang Hwang \$253,750

“Hypertension Mechanisms and Vascular Ion Exchange” Allan Jones \$215,742

“Invasive Noncapsulated H. Influenza” Arnold Smith \$290,000

“Metabotropic Glutamate Receptors and Baroreflex Function” Eileen Hasser \$279,326

“Molecular Aspects of Microbial Pathogenesis” Arnold Smith \$175,526

“Molecular Pathophysiology of Cystic Fibrosis” Tzyh-Chang Hwang \$209,633

“Neural Regulation of Vasopressin Release” Thomas Cunningham \$181,250

“Neural Systems Regulating Vasopressin Release” Thomas Cunningham \$67,500

“Ovarian Hormone Metabolites and Neural Circulatory Control” Cheryl Heesch \$164,388

“Proteomics: Inactivity-induced Muscle Insulin Resistance” Frank Booth \$72,500

“Regulation of Baroreceptor Afferent Transmission” Meredith Hay \$151,719

“Regulation of Single Capillary Permeability Properties” Virginia Huxley \$200,979

“Regulation of the Secretion of ApoB-Lipoprotein” Joseph Dixon \$253,750

“Role of Angiotensin II in Skeletal Muscle Hypertrophy” Frank Booth \$13,188

“Running Induced Increase in Muscle LPL mRNA” Marc Hamilton \$219,544

“Satellite Stem Cell Biology” Frank Booth \$181,604

“Training: Muscle Blood Flow and Capillary Dynamics” Harold Laughlin \$237,738

“Vascular Biology: Exercise Training and Coronary Disease” Harold Laughlin
\$1,526,811

National Science Foundation

“Cellular Electrophysiology on a Chip” Kevin Gillis \$280,516

Parent Project, Muscular Dystrophy

“Investigative Therapeutics in a Canine Model of Duchenne Muscular Dystrophy”
Joe Kornegay \$105,332

Proctor & Gamble

“VEGF-Mediated Collateral Blood Flow” Ronald Terjung \$42,860

University of Missouri Research Board

“Energetics of Ligand-Protein Interaction” Xiaoqin Zou \$49,926

Fellowships

American Heart Association

“Mutation of the XIP Domain of the Cardiac-Sodium Exchanger” Julie Bossuyt
(Calvin Hale, sponsor) \$28,000

“Regulation of the Electroneutral Salt and Water Absorption in Intestinal Epithelium”
Lara Gawenis (Lane Clarke, sponsor) \$16,000

American Physiological Association

“Regulation of Lipoprotein Lipase mRNA by the 3' Untranslated Region” Grady
Campbell (Frank Booth, sponsor) \$28,912

Cystic Fibrosis Foundation

“A Novel Model and System for Studying CFTR Processing” Stacie Raymond
(Elmer Price, sponsor) \$37,600

“Ion Transport Deregulation in the Murine CF Intestine, Study of Sodium Chloride
Absorption” Xavier Stien (Lane Clarke, sponsor) \$37,600

“Molecular Biophysics of the CFTR Channel Pore” Zhen Zhou (Tzyh-Chang
Hwang, sponsor) \$36,500

National Institutes of Health

“Central Mechanisms of Area Postrema Sympathoinhibition” Patrick Mueller (Eileen
Hasser, sponsor) \$45,560

“Changes in Angiogenic Growth Factor Content and Expression” Pam Lloyd
(Ronald Terjung, sponsor) \$35,315

“Remodeling of Collateral Vessels after Femoral Artery Occlusion” Barry Prior
(Ronald Terjung, sponsor) \$50,116

United Negro College Fund

“Regulation of CFTR Gating by cAMP-Dependent Protein Kinase Phosphorylation”
Allan Powe (Tzyh-Chang Hwang, sponsor) \$35,000

Postdoctoral Fellows

Fellow	Advisor
Tomohiko Ai Physiology	Dr. Tzyh-Chang Hwang
Layla Al-Nakkash Veterinary Biomedical Sciences	Dr. Leona Rubin
Ranan Aktas Biological Sciences	Dr. Joseph Dixon
Lionel Bey Veterinary Biomedical Sciences	Dr. Marc Hamilton
Silvia Bompadre Physiology	Dr. Tzyh-Chang Hwang
Julie Bossuyt Veterinary Biomedical Sciences	Dr. Calvin Hale
Casey Childers Veterinary Biomedical Sciences	Dr. Joe Kornegay
Arvinder Dhalla Veterinary Biomedical Sciences	Dr. Leona Rubin
Zhiqiang Fan Veterinary Biomedical Sciences	Dr. Frank Booth
Charles Foley Veterinary Biomedical Sciences	Dr. Cheryl Heesch and Dr. Eileen Hasser
Lara Gawenis Veterinary Biomedical Sciences	Dr. Lane Clarke
Scott Gordon Veterinary Biomedical Sciences	Dr. Frank Booth
Cristine Heaps Veterinary Biomedical Sciences	Dr. Douglas Bowles
Hyunsik Kang Veterinary Biomedical Sciences	Dr. Marc Hamilton
Natalia Karasseva Veterinary Biomedical Sciences	Dr. Richard Tsika

Lyudmyla Kvochina Veterinary Biomedical Sciences	Dr. Cheryl Heesch
Zeyi Li Veterinary Biomedical Sciences	Dr. Ronald Terjung
Mingxiang Liao Veterinary Biomedical Sciences	Dr. Richard Tsika
Hao-Yang Liu Dalton Cardiovascular Research Center	Dr. Xiaoqin Zou
Jocelyn Liu Veterinary Biomedical Sciences	Dr. Joe Kornegay
Pam Lloyd Veterinary Biomedical Sciences	Dr. Ronald Terjung
Chun-Min Lo Dalton Cardiovascular Research Center	Dr. Joseph Dixon
Shuichi Machida Veterinary Biomedical Sciences	Dr. Frank Booth
Carol Okamura Veterinary Biomedical Sciences	Dr. Joe Kornegay
Jayabala Pamidimukkala Veterinary Biomedical Sciences	Dr. Meredith Hay
Allan Powe Physiology	Dr. Tzyh-Chang Hwang
Barry Prior Veterinary Biomedical Sciences	Dr. Ronald Terjung
Stacie Raymond Dalton Cardiovascular Research Center	Dr. Elmer Price
Jie Ren Veterinary Biomedical Sciences	Dr. Ronald Terjung
James Rush Veterinary Biomedical Sciences	Dr. Elmer Price
Espen Spangenburg Veterinary Biomedical Sciences	Dr. Frank Booth
Xavier Stien Dalton Cardiovascular Research Center	Dr. Lane Clarke
Dharmesh Vyas Veterinary Biomedical Sciences	Dr. Frank Booth

Christopher Woodman
Veterinary Biomedical Sciences

Dr. Elmer Price

Elzbieta Wysocka
Physiology

Dr. Joseph Dixon

Bao Jian Xue
Veterinary Biomedical Sciences

Dr. Meredith Hay

Theodore Zderic
Veterinary Biomedical Sciences

Dr. Marc Hamilton

Zhen Zhou
Physiology

Dr. Tzyh-Chang Hwang

Graduate Students

Student	Advisor
Kirk Abraham Veterinary Biomedical Sciences	Dr. Ronald Terjung
Aaron Aaker Veterinary Biomedical Sciences	Dr. Harold Laughlin
Bhavani Akunuri Computer Science	Dr. Marc Hamilton
Kathryn Arns Veterinary Biomedical Sciences	Dr. Lane Clarke
Jeffrey Brault Veterinary Biomedical Sciences	Dr. Ronald Terjung
Peng Chen Electrical Engineering	Dr. Kevin Gillis
Xiaohui Chen Electrical Engineering	Dr. Kevin Gillis
James Dunning Electrical Engineering	Dr. Kevin Gillis
Chad Hancock Veterinary Biomedical Sciences	Dr. Ronald Terjung
Caroline Hoang Veterinary Biomedical Sciences	Dr. Meredith Hay

Sonia Houston
Physiology

Dr. Virginia Huxley

David Kump
Physiology

Dr. Frank Booth

J. Scott Pattison
Physiology

Dr. Frank Booth

Bill Schrage
Physiology

Dr. Harold Laughlin

Heidi Shafford
Veterinary Biomedical Sciences

Dr. James Schadt

JianJie Wang
Physiology

Dr. Virginia Huxley

Undergraduate Students

Student	Advisor
Beth Baumann Biological Sciences	Dr. Marc Hamilton
Tony Cova Biological Sciences	Dr. Lane Clarke
Cathy Galle Biological Sciences	Dr. Douglas Bowles
Amanda Holferty Biological Engineering	Dr. Kevin Gillis
Anamika Pandya Arts & Sciences	Dr. Lane Clarke
Chirag Parghi Chemical Engineering	Dr. Marc Hamilton
Andrea Sano Arts & Sciences	Dr. Marc Hamilton
Bonnie Taylor Biological Sciences	Dr. Calvin Hale
Chris Wheatley Biochemistry	Dr. Marc Hamilton
Andrew Wheeler Nutritional Sciences	Dr. Leona Rubin

High School Students

Student	Advisor
Mariam Eldeib	Dr. Joseph Dixon
Jonathan Tan	Dr. Kevin Gillis
Shengxin Sun	Dr. Virginia Huxley

Seminar Series

“Heterogeneous Distribution of Receptors on Autonomic Neurons”

Sue Aicher, PhD
Neurological Sciences Institute,
Oregon Health Sciences University

“The Journey of the Iodide Transporter (NIS): From its Molecular Identification to its Role in Breast Cancer”

Nancy Carrasco, MD
Department of Molecular Pharmacology,
Albert Einstein College of Medicine

“The Intracellular Journey of the GLUT4 Glucose Transporter in Muscle Cells”

Amira Klip, PhD
Programme in Cell Biology,
Hospital for Sick Children

“Formation and Assembly of an Archaeal Rhodopsin”

Mark P. Krebs, PhD
Division of Biological Sciences,
Illinois State University

“Studies with New Markers of the Cellular Mechanisms Behind Muscle Regeneration”

Terence Partridge, PhD
MRC Muscle Cell Biology Group,
Imperial College School of Medicine

“Modulation of the Calcium Signal Transducer Troponin C: Effects on Contraction and Relaxation in Skeletal Muscle”

Jack Rall, PhD
Department of Physiology and Cell Biology,
Ohio State University

“Gap-Junctional Hemichannels: Do They Play a Role in Cell Death”

Luis Reuss, MD
Department of Physiology and Biophysics,
University of Texas Medical Branch

“Glucocorticoids and Neural Control of the Circulation”

Deborah Scheuer, PhD
Division of Pharmacology,
University of Missouri-Kansas City

“Molecular Regulation of Phospholamban Function and Expression in Cardiac Sarcoplasmic Reticulum”

Michihiko Tada, MD, PhD
Department of Medicine and Pathophysiology,
Osaka University Medical School

“Alterations in Risk Factors for Cardiovascular Disease and Diabetes in Exercise Training: The Heritage Family Study”

Jack Wilmore, PhD
Department of Health and Kinesiology,
Texas A&M University

Abstracts

Booth

- Booth FW, Vyas D. The human gene map for performance and health-related fitness phenotypes. *Med Sci Sports Exerc* 33:868, 2001.
- Chakravarthy, MV, E.E. Spangenburg, and F.W. Booth. The molecular responses of skeletal muscle satellite cells to continuous expression of IGF-I: Implications for the rescue of induced muscular atrophy in aged rats. *Int. J. Sport Nutr. Exerc. Metabol.* 11:S42-S46, 2001.
- E. Spangenburg and F. Booth. Myogenic satellite cells: Physiology to molecular biology *J. Appl. Physiol.* 91: 533-533, 2001.
- Booth, F.W. and D.R. Vyas. Genes, environment and exercise. In *Proceedings of the 12th Hypoxia Symposium*, Edited by RC Roach, PD Wagner, and PH Hackett. *Adv Exp Med Biol* 502:13-20, 2001.

Bowles

- Heaps, C.L. and D.K. Bowles. Gender-specific K⁺ channel contribution to adenosine-induced relaxation in porcine coronary microvessels. *FASEB J.* 15 (4): A50, 2001.
- Bowles, D.K. Gender influences coronary Ca²⁺ current density and adaptation to exercise training in miniature swine. *Physiologist*, 44 (4) 276, 2001.
- Bowles, D.K. Hypercholesterolemia decreases coronary L-type Ca²⁺ current in macro-, not microcirculation. *FASEB J.* In press, 2002.
- Bowles, D.K., L. Bey, M. Hamilton and M. Hay. Estrogen effects on myocardial gene expression. *FASEB J.* In press, 2002.
- Heaps, C.L. and D.K. Bowles. Hypercholesterolemia abolishes voltage-dependent K⁺ (K_v) channel contribution to adenosine-mediated relaxation in coronary arterioles. *FASEB J.* In press, 2002.

Clarke

- Gawenis, LR, Walker, NM, Stien, X and Clarke, LL. CFTR contributes to cAMP-mediated inhibition of Na⁺/H⁺ exchange in murine jejunum. *Gastroenterology* 115: A552. 102nd Annual Meeting of the American Gastroenterological Association, Digestive Disease Week, Atlanta, GA. May 19 - 24, 2001.
- Stien, X, Gawenis, LR, Schultheis, P, Shull, GE, and Clarke, LL. NHE3 mRNA expression is unregulated in the NHE2 knockout jejunum. *Gastroenterology* 115: A554. 102nd Annual Meeting of the American Gastroenterological Association, Digestive Disease Week, Atlanta, GA. May 19 - 24, 2001.
- Gawenis, LR, Walker, NM, Stien, X, Franklin, CL and Clarke, LL. CFTR-mediated inhibition of intestinal Na⁺ absorption may be secondary to changes in epithelial cell volume. *Pediatr. Pulmonol. Suppl.* 22: 205. 15th Annual North American Cystic Fibrosis Conference, Orlando, FL. October 25 - 28, 2001.
- Stien, X, Walker, NM, and Clarke, LL. Apical membrane chloride-bicarbonate exchange in the duodenum of cystic fibrosis mice. *Pediatr. Pulmonol. Suppl.* 22: 213. 15th Annual North American Cystic Fibrosis Conference, Orlando, FL. October 25 - 28, 2001.

- Clarke, LL, Walker, NM, Phillips, TE and Franklin, CL. Nonabsorbable osmolyte (PEG) prevents mucous casts in the crypts and submucosal glands of the CF murine intestine. *Pediatr. Pulmonol. Suppl.* 22: 241. 15th Annual North American Cystic Fibrosis Conference, Orlando, FL. October 25 - 28, 2001.
- N.M. Walker, L. Judd, B.A. Palmer G.E. Shull, and L.L. Clarke. Compromise of innate immunity in the intestine of cystic fibrosis (CF) mice. 103rd Annual Meeting of the American Gastroenterological Association, Digestive Disease Week, San Francisco, CA. May 19 - 22, 2002. Poster of distinction.
- L.R. Gawenis, B.A. Palmer, E.M. Bradford, G.E. Shull, and L.L. Clarke. Intestinal Na⁺ absorption and anion secretion are regulated in parallel. 103rd Annual Meeting of the American Gastroenterological Association, Digestive Disease Week, San Francisco, CA. May 19 - 22, 2002.

Cunningham

- Bruno, S.B., Cornelius, J., Foley, C.M. Hasser E.M. & Cunningham, J.T. (2002) Increased Sodium Intake is Maintained in 2 Week Hindlimb Unloaded (HU) Rats. *FASEB J.*
- Sullivan, M.J., Hasser, E.M., Moffitt, J.A., Bruno, S.B. & Cunningham J.T. (2002). Changes in Salt Intake, Plasma Volume and Aldosterone during 24 Hindlimb Unloading in Male Rats. *FASEB J.*
- Penny, M., Higgs, K.A.N., Cornelius, J. and Cunningham, J.T. (2002). Fos B staining in rat supraoptic nucleus (SON) after hypertonic saline injection. *FASEB J.*
- Mueller, P.J., Cunningham, J.T., Grindstaff, R.R., Laughlin M.H., & Hasser, E.M. (2002) Hypotension-induced Fos in the hypothalamus of exercise trained rats. *FASEB J.*
- Mueller, P.J., Cunningham, J.T., Grindstaff, R.R., Zheng, H., Patel K.P., & Hasser, E.M. (2002) NADPH-diaphorase positive neurons in the hypothalamus of hindlimb unweighted rats. *FASEB J.*

Dixon

- Dixon, J. L., Otis, C., Fang, J., Lee, D. L , Bilhorn, K., Laughlin, M.H. and Sturek, M. One high fat meal per day leads to a more atherogenic lipoprotein profile than twice per day feeding. *FASEB J.* 15(4):A395, 2001
- Wysocka, E., Reddy, H.K., Sturek, M. and Dixon, J.L. Central role of liver in development of atherosclerosis in diabetic pigs. *FASEB J.* 15(4):A605, 2001.
- Dixon, J.L., Wamhoff, B.R., Turk, J.R., Reddy, H.K. and Sturek, M. Complex atherosclerotic lesions in diabetic dyslipidemic pigs are associated with large remnant apolipoprotein B particles. *Arterioscler. Thromb. Vasc. Biol.* 21:653, 2001.
- Wysocka, E., Dixon, J.L., Reddy, H.K., and Sturek, M. Hepatic Free Cholesterol Concentration is highly correlated with coronary atheroma in diabetic dyslipidemic pigs. *Arterioscler. Thromb. Vasc. Biol.* 21:644, 2001.
- Sturek, M., Lee, D.L., Wamhoff, B.R., Katwa, L.C., Reddy, H.K., Voelker, D.J., and Dixon, J.L. Increased endothelin-induced Ca²⁺ signaling, tyrosine phosphorylation, and coronary artery disease in diabetic dyslipidemic swine are prevented by atorvastatin. *Arterioscler. Thromb. Vasc. Biol.* 21:691, 2001.

Sturek, M., Otis, C., Wamhoff, B.R., Dixon, J. L., Turk, J.R. and Reddy, H.K.
Dyslipidemia, not hyperglycemia, is the main factor eliciting coronary artery disease in Yucatan swine. *Arterioscler. Thromb. Vasc. Biol.* 21:644, 2001.
Wamhoff, B., J.L. Dixon, and M. Sturek. Exercise training prevents altered coronary smooth muscle L-type calcium channel function in diabetic dyslipidemia. *Circulation* 104, II-157, 2001.

Gillis

Udayasankar, S., Dunning, J.E., and Gillis, K.D. A small pool of vesicles in adrenal chromaffin cells with high sensitivity to calcium. *Biophys. J.* 82: 618A, 2002.
Chen, P., Xu, B., Tokranova, N., Feng, X., Castracane, J., and Gillis, K.D.
Amperometric detection of quantal catecholamine release on micromachined silicon chips. *Biophys. J.* 82: 618A, 2002.

Hale

Hale, C.C., Bossuyt, J., Hill, C.K., Price, E.M., Schulze, D.H., Lederer, W.J., Poljak, R., and Braden, B.C., 2001, High Level Expression and Purification Leads to Sodium-Calcium Exchanger Crystals. *Biophysical J.* 80:39a.
Bossuyt, J. Hill, C.K., Price, E.M., and C.C. Hale, 2001, Mutational Analysis of the Exchange Inhibitory Protein Binding Site on the Cardiac Sodium-Calcium Exchanger. *Biophysical J.* 80:39a
Bossuyt, J., Taylor, B.E., James-Kracke, M., and C.C. Hale, 2001, The cardiac sodium-calcium exchanger associates with caveolin-3. *The Physiologist* 44:227.
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Bossuyt, J. Taylor, B.E., James-Kracke, M., and C.C. Hale, 2002, Cardiac Sodium-Calcium Exchange Interacts with Caveolin-3. *Biophys. J.* 82: 564a.
Wong, T.C., Kamath, S., Quinn, T.P., Peletskaya, E.N., Bossuyt, J. and C.C. Hale, 2002, The solution structure of the cardiac exchange inhibitory peptide (XIP) by NMR spectroscopy. *Biophysical J.* 82: 653a.

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Heesch

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Huxley

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Hwang

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Jones

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Kornegay

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Laughlin

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Milanick

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Price

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Hill, B.J.F., Price, E. and Sturek, M. "Increased Calcium Buffering in Coronary Smooth Muscle Cells from Diabetic Dyslipidemic Pigs." *Diabetes* Submitted (2001).

Rovetto

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Rubin

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Schadt

Schadt, J.C. and Hasser, E.M. The defense reaction alters the response to blood loss in the conscious rabbit. *Am.J.Physiol.* 280 (Regulatory Integrative Comp. Physiol.)R985-R993, 2001.

Smith

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Terjung

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Tsika

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Zou

- Xiaoqin Zou, and Tzyh-Chang Hwang. ATP-Hydrolysis-Coupled Gating of CFTR: Structure and Function. *Biochemistry.* 40:5579-86, 2001.
- Hao-Yang Liu, and Xiaoqin Zou. Pair-wise GB/SA Scoring Function for Structure-based Drug Design. To be submitted to *Journal of Physical Chemistry.*
- Xiaoqin Zou, Min Li, and Tzyh-Chang Hwang. A Dimeric Structural Model of the Nucleotide Binding Domains of the CFTR Based on the Crystal Structures of MalK and HisP. To be submitted to *Biochemistry.*

Books and Book Chapters

Rubin

Rubin, LJ, Parker, JL and Adams, HR: Bacterial Lipopolysaccharide (Endotoxin) and Myocardial Dysfunction, in Cardiovascular Toxicology, 3rd edition. Ed: Daniel Acosta, Jr. 2001.

Costello, M, Rubin, LJ and Otto, C The role of tumor necrosis factor - alpha and the sphingosine pathway in sepsis-induced myocardial failure. Book Chapter In preparation.

Terjung

Terjung, R.L., R. Zarzeczny, and H.T. Yang. Muscle blood flow and mitochondrial function: Influence of Aging. In: *Biochemistry of Exercise XI*. W. Evans (Ed.), Human Kinetics Pub., Champaign, Il, 2002, *In Press*.

Patents

Hale

Large Scale Expression and Purification of Recombinant Proteins, U.S. Patent Application Serial Number 09/901,419 filed July 9, 2001

Awards, Honors and Offices

Blaine

Leadership in Cardiovascular Research, American Heart Association
Award for Excellence in Medical Education, University of Missouri-Columbia

Booth

Associate Editor, *Journal of Applied Physiology*
Editorial Board, *American Journal of Physiology: Cell Physiology*
Board Member of Research Group on the Biochemistry of Exercise

Cunningham

Award for Excellence in Medical Education, University of Missouri-Columbia, 2001.
Editorial Board for *American Journal of Physiology: Heart and Circulatory Physiology*
Editorial Board for *American Journal of Physiology: Regulatory, Integrative and Comparative Physiology*

Hamilton

Stevens Professor, University of Florida
Editorial Board, *Journal of Applied Physiology*

Hasser

American Physiological Society Travel Award
Associate Editor, *Am. J. Physiol. Heart Circ. Physiol.*

Hay

Editorial Board, *Am. Journal of Physiology, Heart*

Heesch

Editorial Board, *American Journal of Physiology: Heart and Circulatory Physiology*
Consulting Editor, *American Journal of Physiology: Heart and Circulatory Physiology*

Huxley

Hugh Stephenson Award – Research, American Heart Association-Heartland Affiliate

Hwang

Service Award, American Medical Student Association, University of Missouri
Order of Socrates, MU Medical School

Laughlin

Editorial Board, *Journal of Applied Physiology*
Associate Editor *Medicine & Science in Sports & Exercise*

Milanick

Editorial Board: *Journal of Membrane Biology*

Rubin

Editorial Board, Shock
Honorary Member, Phi Zeta Veterinary Honor Society

Schadt

Faculty Performance Shares, Recognition for teaching contributions, University of Missouri
Editorial Board, American Journal of Physiology: Heart and Circulatory Physiology
Editorial Board, Journal of Applied Physiology

Smith

Robert Gans Professorship, Massachusetts General Hospital
Journal of Infectious Disease

Terjung

Chair, Organizing Committee, American Physiological Society Conference: The Integrative Biology of Exercise IV
Advisory Committee, August Krogh Institute, University of Copenhagen
IUPS Commission on Work and Exercise Physiology
Editorial Board, Journal of Applied Physiology
Editorial Board, Medicine and Science In Sports and Exercise

Tsika

Editorial Board, Journal of Applied Physiology

Zou

FASEB MARC Program Travel Award

Peer Review

Booth

Research Task Force, American College of Sports Medicine
Health & Science Policy Committee, American College of Sports Medicine
Planning Committee of Normative Measures of Musculoskeletal Fitness, NIH Workshop
Member International Union of Physiological Sciences commission on Work and
Exercise Physiology

Bowles

Reviewer, Cardiovascular Research
Reviewer, American Journal of Veterinary Research
Reviewer, Circulation Research
Reviewer, Journal of Applied Physiology
Reviewer, American Journal of Physiology: Heart and Circ. Physiology
Reviewer, Medicine & Science in Sports & Exercise
Member, American Heart Association CV Regulation II Peer Review Study Group

Clarke

Reviewer, American Journal of Physiology: Gastrointestinal and Liver Physiology
Reviewer, Journal of General Physiology
Reviewer, American Journal of Respiratory Cell and Molecular Biology
Grant Reviewer, Cystic Fibrosis Foundation
Grant Reviewer, National Institutes of Health Medical Biochemistry Study Section, Ad
Hoc

Cunningham

Member of American Physiological Society Standing Committee for Education.
Reviewer, Hypertension
Reviewer, Brain Research
Reviewer, Brain Research Bulletin
Reviewer, Circulation Research.

Dixon

Metabolism Study Section, Nutrition and Metabolic Sciences Integrated Review Group
Reviewer, Journal of Lipid Research
Reviewer, Journal of Biological Chemistry
Reviewer, Biochimica et Biophysica Acta
Reviewer, Atherosclerosis

Gillis

Reviewer, Nature
Reviewer, Science
Reviewer, Neuron
Reviewer, EMBO Journal
Reviewer, Biophysical Journal

Reviewer, Journal of Theoretical Biology
Reviewer, Journal of Neuroscience
Grant Reviewer, NIH, Ad Hoc
Grant Reviewer, NSF, Ad Hoc
Grant Reviewer, UM Research Board

Hale

Reviewer, American Heart Association – Great American Consortium
Reviewer, Biochimica et Biophysica Acta

Hamilton

Reviewer, Physiological Genomics
Reviewer, Journal of Applied Physiology
Reviewer, Medicine & Science in Sports & Exercise
Reviewer, Journal of Molecular and Cellular Cardiology,
Grant Reviewer, University of Missouri Research Board

Hasser

Reviewer, American Journal of Physiology (Heart Circ. Physiol.)
Reviewer, American Journal of Physiology (Reg. Integ. Physiol.)
Reviewer, Brain Research
Reviewer, Canadian Journal of Physiology and Pharmacology
Reviewer, Hypertension
Reviewer, Journal of Applied Physiology
Reviewer, Journal of Physiology
Reviewer, Journal of the Autonomic Nervous System
Reviewer, Medicine and Science in Sports and Exercise
Grant Review Board, American Heart Association, Heartland Section
NIH Program Project Grant Special Review Committee

Hay

Chair, Study-Section, CV-Reg. 1, AHA National Center
Reviewer, American Journal of Physiology, Heart and Circulation
Reviewer, American Journal of Physiology, Regulatory, Integrative
Reviewer, Hypertension
Reviewer, Journal of Neurophysiology
Reviewer, Journal of Physiology, London
Reviewer, Brain Research
Reviewer, Journal of Autonomic Nervous System
Reviewer, Journal of Applied Physiology
Member, Ad-Hoc NIH Study Section, ECS
Grant Review, Midwest Regional, American Heart Association

Heesch

Reviewer, Journal of Applied Physiology
Reviewer, American Journal of Physiology
Reviewer, Journal of Applied Physiology

Huxley

Reviewer, American Journal of Physiology: Heart & Circulation; Cell; Regulatory, Integrative & Comparative; Endocrine & Metabolism
Reviewer, Circulation Research
Reviewer, Biorheology
Reviewer, Biophys. Biochem. Acta
Reviewer, Journal of Applied Physiology
Reviewer, Journal of Physiology (London)
Reviewer, Annals of Biomedical Engineering
Reviewer, Hypertension
Reviewer, Journal of the American Society of Nephrology
Reviewer, Proceedings of the National Academy of Sciences (US)
NIH DDK Special Study Section

Hwang

Reviewer, American Journal of Physiology (cell physiology)
Reviewer, American Journal of Physiology (heart and circulation)
Reviewer, Journal of General Physiology
Reviewer, Neuron
Reviewer, Journal of Membrane Biology
Reviewer, Journal of Biological Chemistry
Reviewer, Journal of Pharmacology and Experimental Therapeutics
Reviewer, Journal of Molecular and Cellular Cardiology
Reviewer, Canadian Journal of Physiology and Pharmacology
Reviewer, Biophysical Journal
Reviewer, Journal of Physiology
Grant Review, Cystic Fibrosis Trust
Grant Review, Cystic Fibrosis Foundation
Grant Review, Cystic Fibrosis Research Inc.
Grant Review, MU Research Board
Grant Review, Veteran Affairs
Grant Review, NIH (CVA, special reviewer), NIH (GMB, ad hoc member).

Kornegay

Ad Hoc Reviewer, Journal of the American Veterinary Medical Association
Ad Hoc Reviewer, Journal of the American Animal Hospital Association
Ad Hoc Reviewer, Journal of Neurological Sciences,
Ad Hoc Reviewer, Neuromuscular Diseases
Ad Hoc Reviewer, Journal of Veterinary Internal Medicine

Laughlin

Reviewer, Avia. Space Environ. Med
Reviewer, J. Applied Physiol
Reviewer, Med. Sci. Sports Exercise
Reviewer, Am. J. Physiol.
Reviewer, Hypertension
Reviewer, Blood Vessels
Reviewer, Microvascular Research
Reviewer, Circulation
Reviewer, Circulation Research
Reviewer, Microcirculation
Grant Review, National Institutes of Health, NRSA Review Panel

Milanick

Reviewer, American Journal of Physiology: Cell Physiology
Reviewer, Biochimica Biophysica Acta: Biomembranes
Reviewer, Biophysics Journal
Reviewer, Journal of Biological Chemistry
Reviewer, Journal of General Physiology
Reviewer, Journal of Membrane Biology
Reviewer, Journal of Theoretical Biology
Reviewer, Science

Price

Reviewer, Molecular Pharmacology
Reviewer, Biochimica et Biophysica Acta
Reviewer, Biochemistry
Reviewer, Journal of Applied Physiology
Grant Review, American Heart Association Midwest Affiliate Consortium

Rovetto

Reviewer, American Journal of Physiology
Reviewer, AHJ
Reviewer, Circulation
Reviewer, Circulation Research
Reviewer, Journal Mol. Cell. Cardiol.
Reviewer, Cardiovascular Research
Reviewer, Circulation Research

Rubin

Reviewer, American Journal of Physiology, Heart and Circulatory Physiology
Reviewer, Cell and Integrative Physiology
Reviewer, Journal Molecular and Cellular Cardiology
Reviewer, Shock

Schadt

Reviewer, American Journal of Physiology: Heart and Circulatory Physiology
Reviewer, Journal of Applied Physiology
Reviewer, American Journal of Physiology: Regulatory, Integrative and Comparative Physiology
Reviewer, American Journal of Physiology: Physiological Genomics
Reviewer, Medicine and Science in Sports and Exercise
Grant Reviewer, American Heart Association, National (Cardiovascular Regulation II Study Group)
Grant Reviewer, American Osteopathic Association
Grant Reviewer, U.S. Army (Coordinated through AIBS)

Smith

Ad Hoc Reviewer, Medical Research Council of Canada
Ad Hoc Reviewer, National Sciences Foundation
Ad Hoc Reviewer, Cystic Fibrosis Foundation of Canada
Ad Hoc Reviewer, Thrasher Foundation
NIH Peer Review Oversight Group (PROG)
NIH working group on Regulatory Burden and Conflict of Interest

Tsika

Reviewer, Journal of Biological Chemistry
Reviewer, Molecular and Cellular Cardiology
Reviewer, European Journal of Biochemistry
Reviewer, Developmental Genetics
Reviewer, American Journal of Physiology (Reg., Integ., Comp.)
Reviewer, American Journal of Physiology (Cell Physiology)
Reviewer, American Journal of Physiology (Heart and Circulatory Physiology)

Presentations and Lectures

Bowles

7th World Congress for Microcirculation, Sydney, Australia; August, 2001
Medical College of Georgia, Vascular Biology Center, January, 2002.
University of Missouri, Dept. of Physiology; November, 2001.

Clarke

Intestinal bicarbonate secretion in the cystic fibrosis mouse. 1st Annual HCO₃ Cystic Fibrosis Conference, San Diego, CA. March 4 - 5, 2001.
Acid-Base transporters in the CFTR-null intestine. Department of Physiology. University of Southern Alabama, Mobile, AL. April 18, 2002.

Cunningham

2001 Invited Speaker for American Society of Physiology Refresher Course on Integrating Endocrinology into Modern Medical School Curricula.
2001 Symposium Speaker for American Physiological Society, Experimental Biology Meeting 2001, Vasopressin: An Integrative Look at Regulation and Function.
Cardiovascular Regulation of Supraoptic Vasopressin Neurons. World Congress on Neurohypophysial Hormones, September 2001, Bordeaux, France

Dixon

The Plasma Lipoprotein Profile is an Important Factor in Development of Atherosclerosis in Diabetic Hyperlipidemic Swine. University of Missouri, Cardiovascular Day VIII, February 12, 2001
Enhanced Atherosclerosis in Diabetic Hyperlipidemic Swine: Role of Lipoproteins. Case Western Reserve University, Department of Nutrition, Cleveland, Ohio, February 26, 2001
Development of Coronary Artery Atherosclerosis in Diabetic Dyslipidemic Swine: Role of Intermediate Density Lipoproteins. Department of Endocrinology, Washington University School of Medicine, St. Louis, MO, May 31, 2001
Rapid Development of Coronary Artery Atherosclerosis in Diabetic Hyperlipidemic Swine: Role of Intermediate Density Lipoproteins. Department of Medicine, College of Physicians and Surgeons, Columbia University, New York, NY, June 18, 2001
Coronary Artery Atherosclerosis in Diabetic Dyslipidemic Swine: A Model for Coronary Disease in Diabetic Humans. Department of Anatomy and Cell Biology, SUNY Downstate Medical Center, Brooklyn, NY, June 20, 2001
ApoB Transport in the Secretory Pathway-Studies with Confocal Microscopy. 10th Southeast Lipid Research Conference, Callaway Gardens, GA. October 4-7, 2001
Hepatic Free Cholesterol is Highly Correlated with Coronary Atheroma in Diabetic Dyslipidemic Pigs. University of Missouri, Cardiovascular Day IX, February 4, 2002

Gillis

“A method for measuring membrane capacitance during cell depolarization”, Max Planck Institute for Biophysical Chemistry, Dept. of Membrane Biophysics, Goettingen, Germany, 07/2001

“The relationship between cAMP, Ca²⁺, and transport of CFTR to the plasma membrane”, Oregon Health Sciences University, Vollum Institute, Portland, OR, 02/2002

“Amperometric detection of quantal catecholamine release on micromachined silicon chips”, Drug Discovery for Ion Channels Satellite Symposium, Biophysical Society Annual Meeting, San Francisco, CA, 02/2002

“The relationship between cAMP, Ca²⁺, and transport of CFTR to the plasma membrane”, Case Western Reserve University, Dept. of Physiology, Cleveland, OH, 03/2002

Hale

"Cardiac Sodium-Calcium Exchange: Structural and Functional Studies Using a Novel Expression System". Department of Pharmacology, School of Medicine, University of Brussels (VUB), Brussels, Belgium, April 2001.

“The Cardiac Sodium-Calcium Exchanger Associates with Caveolin-3” APS Conference, Banff, Alberta, Canada, 2001

"Cardiac Sodium-Calcium Exchange: Large-Scale Expression and Possible Role in Transmembrane Signaling". Department of Physiology and Biophysics, Finch University of Health Sciences, The Chicago Medical School, Chicago, IL, January 2002.

Hamilton

Cardiovascular Day, University of Missouri-Columbia, February 2001

University of Texas Medical School, Houston, TX, March 2001

Experimental Biology 2001, Orlando, Fl, April 2001

American College of Sports Medicine, Baltimore, MD, May 2001

University of Florida, Gainesville, FL, December 2001

National Space Biomedical Research Institute, Montgomery, TX, January 2002

Hasser

Hot Topics in Neurohumoral Control of Homeostatic Function; Altered neurohumoral control in Cardiovascular Deconditioning, 2001

International Union of Physiological Societies; Effects of Deconditioning on Vasopressin Secretion, 2001

Hay

“Gender differences in baroreflex heart rate responses in conscious mice”; Experimental Biology, Orlando Fla., 2001.

“Baroreflex heart rate responses in estrogen receptor-alpha knockout mice”; Experimental Biology, Orlando Fla, 2001.

Heesch

Univ. of Missouri, First Annual Missouri Symposium on Women's Health Research.

“Cardiovascular Regulation and Pregnancy” May 2001

Univ. of Missouri – KC, School of Pharmacy/ Kansas City, MO. “CNS Effects of Ovarian Hormones on Cardiovascular Regulation” March 2002

Experimental Biology '02/ Symposium Organizer/ Amer. Physiol. Soc./ Refresher Course in Neuroscience April 2002

Huxley

World Congress of Microcirculation meeting in Sydney Australia. 2001

Eli Lilly and Company, Cardiovascular Toxicology Division, “Physiological Adaptation of Microvascular Permeability” 2002

Department of Pharmacology and Physiology, University of Rochester School of Medicine “And We Thought We Knew How Microvascular Exchange Occurs” 2002

University of Rochester School of Medicine: Rochester, NY: Department of Pharmacology & Physiology "Despite what the Textbooks say Microvascular Barrier Properties Adapt to Changes in their Environment" 2002

University of Rochester Matrix Journal Club “Adaptation of the Microvascular Glycocalyx: a Mechanism Participating in the Regulation of the Microvascular Barrier to Water and Solute” 2002

Hwang

Department of Physics, Wuhan University, China

Department of Physiology and Biophysics, University of Colorado

Osaka Medical College

Department of Physiology, Kyoto University

Williamsburg Meeting

Department of Physiology and Biophysics, Cornell Medical College

Kornegay

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