

## **CURRICULUM VITAE**

**Amadou K. Camara PhD**

**Professor  
Department of Anesthesiology  
Division of Research**

**PLACE OF BIRTH:  
Basse Santa-Su, The Gambia, West Africa**

**CITIZENSHIP:  
5/18/2011 United States of America  
1988-2011 United States Permanent Resident**

### **OFFICE ADDRESS:**

Medical Education Building  
8701 Watertown Plank Rd  
Milwaukee, WI 53226  
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### **EDUCATION:**

09/1978 - 06/1982 B.A., Lawrence University, Appleton, WI, WI (Adviser Dr. Bradford Rence; Biology)  
09/1984 - 06/1987 M.Sc., University of Wisconsin-Milwaukee, Milwaukee, WI, (Adviser: Dr. Jonathan Copeland; Zoology)  
09/1990 - 05/1995 Ph.D., Medical College of Wisconsin, Milwaukee, WI, (Adviser: Dr. Jeffrey L. Osborn; Physiology)

### **POSTGRADUATE TRAINING AND FELLOWSHIP APPOINTMENTS:**

08/1982 - 06/1983 Teaching Assistant, Department of Biological Science Marquette University, Marquette University, Milwaukee, WI  
08/1984 - 05/1987 Teaching Assistant, Department of Biological Sciences, University of Wisconsin-Milwaukee, Milwaukee, WI  
06/1987 - 05/1988 Research Assistant, Department of Pharmacology and Toxicology, Pain Research, Medical College of Wisconsin, (Supervisors: Dr. Liang F. Tseng and Dr. James Fujimoto), Milwaukee, WI  
05/1988 - 05/1989 Research Technologist, Department of Pediatric Cardiology, Cardiac Arrhythmia, Medical College of Wisconsin, (Supervisors: Dr. Dov Nudel, Dr. Marisa Jarenwattananon and Dr. Elliot Weinhouse), Milwaukee, WI  
06/1989 - 08/1990 Research Technician, Department of Physiology, Renal Physiology, Medical College of Wisconsin, (Supervisor: Dr. Jeffrey L. Osborn), Milwaukee, WI  
02/1993 - 02/1995 Teaching Assistant, Department of Physiology, Medical College of Wisconsin, (Supervisor Dr. Richard Roman), Milwaukee, WI  
06/1995 - 10/1999 Postdoctoral Fellow, Department of Anesthesiology, Cardiac Electrophysiology, Medical College of Wisconsin, (Mentor: Dr. Zeljko J. Bosnjak), Milwaukee, WI

### **FACULTY APPOINTMENTS:**

06/1985 - 08/1996 Associate Instructor, Department of Allied Health and Sciences, University of Wisconsin-Milwaukee, Summer Teaching, Milwaukee, WI  
11/1999 - 07/2003 Instructor, Department of Anesthesiology, Medical College of Wisconsin, Milwaukee, WI  
06/2000 - 07/2005 Instructor, Department of Allied Health and Professions, (Summer Instructor), University

of Wisconsin-Milwaukee, Milwaukee, WI  
07/2003 - 07/2007 Assistant Professor, Department of Anesthesiology, Research, Medical College of Wisconsin, Milwaukee, WI  
07/2007 - 06/2013 Associate Professor, Department of Anesthesiology, Research, Medical College of Wisconsin, Milwaukee, WI  
07/2013 - Present Professor, Department of Anesthesiology, Research, Medical College of Wisconsin, Milwaukee, WI  
07/2017 - Present Adjunct Professor, Institute of Clinical Medicine Suzhou Science & Technology Town Hospital, Suzhou, China  
02/2018 - Present Professor, Department of Physiology, Medical College of Wisconsin, Milwaukee, WI  
07/2018 - Present Awarded Tenure at the full Professor level, Department of Anesthesiology, Research, Medical College of Wisconsin, Milwaukee, WI

#### **AWARDS AND HONORS:**

04/1993 - Present NIH-NIDDK Travel Fellowship Award to attend the FASEB Meeting  
05/1993 - 05/1995 NIH Minority Pre-Doctoral Graduate Research Assistant Supplement  
04/1994 - Present The Procter and Gamble Professional Opportunity Award for Meritorious Research in "The Water and Electrolyte Homeostasis Section" of The American Physiological Society. Presentation: "Selective postna  
04/1995 - Present NIH-NIDDK Travel Fellowship Award to attend the annual FASEB meeting  
05/1995 - 05/1999 NIH-sponsored Minority Postdoctoral Fellowship Grant  
04/1996 - Present NIH-NIDDK Travel Fellowship Award to attend the annual FASEB meeting

#### **MEMBERSHIPS IN HONORARY AND PROFESSIONAL SOCIETIES:**

05/1993 - Present American Physiological Society (primary affiliate Cardiovascular Section and secondary affiliate Central Nervous System Section)  
04/1995 - 2004 Society for Neuroscience  
08/1996 - Present Biophysical Society  
10/1997 - 2005 International Anesthesia Research Society  
09/1998 - Present American Heart Association

#### **EDITORSHIPS/EDITORIAL BOARDS/JOURNAL REVIEWS:**

##### **Editorship**

2011 - Present Reviewing Editor for Antioxidants & Redox Signaling  
2012 - Present Associate Editor for Frontiers in Mitochondrial Research, a subsection of Frontiers in Physiology  
2013 Reviewing Editor for a book chapter in "Systems Biology of Free Radicals and Anti-Oxidants" Edited by Dr. Ismail Laher, published by Springer-Verlag (Germany), copy right 2014  
2014 Reviewing Editor for a book proposal entitled "Mitochondrial Receptors: An Emerging Field" Edited by Dr. WF Maragos, published by Wiley Publishers, 111 River St. Hoboken, NJ 07030, USA  
2014 Guest Associate Editor for the Research Topic "Mitochondria: Hubs of cellular signaling, energetics and redox balance" for Frontiers in Physiology, Mitochondrial Research, 2014.  
2015 - Present Associate Editor Cardiovascular Genetics and Systems Medicine  
2017 - Present Guest Associate Editor for the Research Topic "Genetic Modification of Cardiac Tissue" Frontiers for Cardiovascular Medicine, section Cardiovascular Genetics and Systems Medicine, 2017.  
2018 - Present Member of the Editorial Board (Academic Editor) of "Oxidative Medicine and Cellular Longevity"  
2019 - 2020 Guest Topic Editor Research Topic "Mitochondrial Exchangers and Transporters in Cell Survival and Death" Frontiers in Physiology-Mitochondrial Research, 2019.  
2019 - Present Associate Editor for American Journal of Physiology Heart and Circulatory Physiology.  
2019 - 2020 Guest Topic Editor for the Special Issue "Mitochondria in Health and Disease for the journal Cells, 2019.  
2020 - 2021 Guest Topic Editor Research Topic "Special Issue "Remodeling of Mitochondria in Cancer and Other Diseases" International Journal of Molecular Sciences, 2020-2021.

##### **Ad-Hoc Reviewer**

1997 - Present International Journal of Molecular Sciences  
1997 - Present Frontiers in Pharmacology

1997 - Present European Journal of Pharmacology  
 1997 - Present Brain Research  
 1997 - Present Frontiers in Cardiovascular Medicine  
 1997 - Present Cells  
 1997 - Present Cellular Physiology and Biochemistry  
 1997 - Present Oxidative Medicine and Cellular Longevity  
 1997 - Present Basic Research in Cardiology (BRC)  
 1997 - Present Journal Cellular Molecular Medicine (JCMM)  
 1997 - Present Mitochondrion  
 1997 - Present American Journal of Physiology Heart and Circulatory Physiology  
 1997 - Present American Journal of Physiology Regulatory, Integrative and Comparative Physiology  
 1997 - Present American Journal of Physiology Cell Physiology  
 1997 - Present Anesthesiology  
 1997 - Present Journal of Pharmacology Biochemistry and Behavior  
 1997 - Present Current Alzheimer Research  
 1997 - Present Antioxidants & Redox Signaling  
 1997 - Present Pharmacological Research  
 1997 - Present Neurochemistry International  
 1997 - Present Heart International  
 1997 - Present PLoS ONE  
 1997 - Present Journal of General Physiology  
 1997 - Present Frontiers in Physiology-Mitochondrial Research  
 1997 - Present Pharmacology and Therapeutics (An International Review Journal)  
 1997 - Present Journal Molecular and Cellular Cardiology (JMCC)  
 1997 - Present Biochemi Biophysica Acta-Bioenergetics  
 1997 - Present Cardiovascular Research  
 1997 - Present Nature Reviews Cardiology  
 1997 - Present Hypertension  
 1997 - Present Faculty1000 Research  
 1997 - Present Aging

#### **NATIONAL ELECTED/APPOINTED LEADERSHIP AND COMMITTEE POSITIONS:**

04/1 - 04/06/16 APS National Mentor Program. I mentored Dr. Tanecia Mitchell (APS)  
 05/6 - 05/7 Department of Anesthesiology Visiting Professor Committee, Medical College of Wisconsin  
 08/6 - Present Evaluating Judge for SPUR and MSRTP/DSHREP Student Summer Research oral presentations, Medical College of Wisconsin  
 04/9 - 2015 Liaison between Medical College of Wisconsin Department of Physiology  
 07/9 - Present Member of the Anesthesiology Department Diversity Committee, Medical College of Wisconsin  
 11/9 - 2015 Member of the Department of Anesthesiology Visiting Professor Committee, Medical College of Wisconsin  
 03/10 - 2015 Member of the Biotechnology and Bioengineering Center T32 Internal  
 07/10 - Present Medical College of Wisconsin Admissions Committee (serves 5-7 hours of  
 09/10 - Present Evaluating judge for abstracts and poster presentations by medical student, graduate students, post-doctoral fellows, and junior faculty at the Medical College of Wisconsin Research Days  
 06/13 - 05/16 American Physiological Society (APS) Cardiovascular Section Fellowship  
 07/14 - Present American Physiological Society APS Porter Physiology Development and  
 05/16 - Present American Physiological Society Cardiovascular Section Awards Committee  
 09/16 - Present Member of the Anesthesiology Internal Committee for faculty evaluation and promotion, Medical College of Wisconsin  
 11/16 - Present Member of the MCW Advisory Board, Master of Science in Anesthesia in the department's Anesthesiology Assistant (AA) Program, Department of  
 07/17 - Present One of three moderators on a panel for the Cardiovascular Center (CVC)  
 04/21 - 04/28/18 APS National Mentor Program. I mentored Mr. Armand Meza Mitchell (APS)  
 04/22 - 04/27/17 APS National Mentor Program. I mentored Oluwaseun Ogunbona, MD, a  
 02/2005 - Present Medical student admission interview for the MSTP program  
 06/2006 - Present Ad hoc member of the NIH Myocardial Ischemia and Metabolism (MIM) Study Section

06/2007 - 07/2011 Member of the NIH Myocardial Ischemia and Metabolism (MIM) Study Section

2010 - Present Ad hoc grant reviewer for the Austrian Science Fund (AWF)

09/2011 - Present NIH Special Emphasis Panel ZRG1 CVRS-F90, review of R15 grant applications for Cardiovascular and Respiratory Sciences

03/2012 - Present NIH Special Emphasis Panel ZRG1 CVRS-E (03) M for Myocardial Ischemia and Metabolism Study Section

09/2012 - 2018 Member of the American Heart Association's Cell Transport 2 Peer Review Study Group

2012 - Present Ad hoc grant reviewer for the Czech Science Foundation

11/2014 - 01/2018 Ad hoc grant reviewer for the American Physiological Society-Porter Fellowship Program

11/2014 - 01/2018 Reviewer for American Physiological Society-sponsored travel awards to attend regional, national and international physiology conferences

2014 - Present Ad hoc grant reviewer for the Medical Research Grant Committee of Dubai, UAE

2015 - Present Ad hoc grant reviewer for the National Science Centre of Poland

2015 - Present Ad hoc grant reviewer for the National Science Centre of Poland

2016 - Present Ad hoc grant reviewer for the National Institute of Academic Anesthesia (NIAA e-grants) England, sponsored by the British Journal of Anesthesia (BJA) and The Royal College of Anesthetists (RCA)

10/18/2017 - 18 External grant reviewer for the Pauley Heart Center at Virginia

02/2018 - Present Interviewed Anesthesiology prospective residents

03/2018 - Present Ad hoc grant reviewer for the William Myron Keck foundation, Los Angeles, California, an American Charitable foundation that seeks out scientific research that opens new directions and could lead to breakthrough discoveries or the development of new technologies, the grant program seeks to support high-impact and high-risk projects that are scientifically outstanding.

06/2018 - Present Appointed by the Dean of the School of Medicine, the Medical College of Wisconsin, to serve on the Chair of Family and Community Medicine Search Committee

08/2018 - Present Appointed as a Standing Member of the Medical Students Summer Research Program (MSSRP) Advisory Committee, Medical College of Wisconsin, Milwaukee

11/2018 - Present Temporal member on NIH Mentored Transition to Independence (MTI) K99/R00 and K22 grant applications (NHLBI-MTI)

2019 - Present Ad hoc grant reviewer for the Medical Research Council (MRC) equivalent to NIH, United Kingdom

underrepresented minority participation in physiology and other scientific disciplines.

Member. Currently involve in evaluating nominees for an outstanding Physiologist who has made a significant contribution to physiology.

member) of the University of Alabama, Birmingham, during the Experimental Biology (APS member) attendee, during the 2016 Experimental Biology Grant Reviews: meeting Conference in San Diego, California.

PhD candidate in the Cellular and Molecular Physiology (CMP) Program Johns Hopkins University School of Medicine during the 2017 Experimental Biology, in meeting Chicago, IL.

University of Wisconsin, Madison, during the Experimental Biology (APS member) attendee, during the 2018 Experimental Biology Conference in San Diego, California.

Commonwealth university.

Medical College of Wisconsin Committees and University of Wisconsin-Milwaukee, Marquette University and the Milwaukee Area Technical College to recruit qualified and highly motivated minority/underrepresented students to the Department of Physiology graduate school program

Advisory Committee

volunteering service weekly for screening applications and reviewing files for interviews). I was one of two committee members (approximately 25 members) recognized with a plaque for excellence and de

Department of Anesthesiology

Anesthesiology

Study/Work in Progress discussion and provide feedback on a potential grant for submission; the research

included some aspects on the role of mitochondria.  
 INTERNATIONAL ELECTED/APPOINTED LEADERSHIP AND COMMITTEE  
 POSITIONS:  
 and Spring to formulate strategies and policies on how to increase  
 Minority Affairs Committee Member. Attend APS policy meetings in the Fall  
 of APS.  
 Committee Member. Duties included evaluation of APS members for Fellow  
 National Committees and Services  
 COMMITTEES/SERVICE  
 member), a graduate student in the Department of Neuroscience, of the

## **EXTRAMURAL STUDENTS, FACULTY, RESIDENTS, AND CLINICAL/RESEARCH FELLOWS MENTORED:**

### **Undergraduate Students**

06/01/2005 - 08/01/2005 Mentor to Christopher Johnson of the University of Wisconsin at  
 05/30/2006 - 08/01/2006 Mentor to Christopher Johnson of the University of Wisconsin  
 06/01/2008 - 08/05/2008 Co-Mentor to Emmanuel Ofungwu in his project examining the  
 Cardiovasc Pharmacol 52:236-244, 2008 - Present (PMID: 18806604).  
 06/01/2010 - 08/04/2010 Mentor to Linda Thomas an undergraduate student from  
 06/01/2017 - 08/04/2017 Co-Mentor: Andrew Sobczak is a senior undergraduate at Drake University  
 Project title: "Consequence of VDAC Modulation on Cardiac Mitochondrial Respiration". This project  
 aims to examine novel aspects of VDAC modulations of mitochondrial bioenergetics and Ca<sup>2+</sup>  
 handling by its activators and blockers.  
 Stevens Point was a candidate for the Multicultural Summer Research Training Program (MSRTP).  
 His project title was: "Post-conditioning in cardioprotection: The role of mitochondrial big calcium  
 sensitive potassium channels." I spent most of my time teaching and training Chris about his  
 project. In this effort, I also helped in the design of his protocols and data interpretations.  
 Stevens Point in his second MSRTP participation in our laboratory. He continued to work on the  
 project he started in 2005. In addition to providing him with some help on his research project, I  
 also, tutored him on the significance of mitochondria and the regulation of matrix Ca<sup>2+</sup> dynamics  
 and how these processes pertain to cardiac ischemia and reperfusion injury.  
 05/30/2006-08/01/2006 Mentor to Marisha Spence, a senior at the University of Wisconsin  
 Milwaukee. I supervised during her participation in the 2006 Multicultural Summer  
 Research Training Program (MSRTP). Her summer project title: Sodium-Hydrogen exchange  
 inhibitor and protection of mitochondrial bioenergetics against warm ischemia and reperfusion.  
 This work contributed to another project we were conducting and became part of a publication in J  
 feasibility of hypothermic post-conditioning, specifically the role mitochondria play during  
 hypothermic cardioprotection. I assisted Emmanuel in the entirety of his project in our lab.  
 Emmanuel recently graduated from Ross Medical School in Chicago.  
 the University of St Thomas, St Paul, MN. Her project was to determine the efficacy of the ROS  
 Scavenger Resveratrol and the mild mitochondrial complex I blocker ranolazine in protecting the  
 heart against ischemia and reperfusion injury in the Langendorff model. Poster title: Resveratrol  
 and mild hypothermia provides similar protection against post ischemia reperfusion injury in the  
 isolated guinea pig heart. Linda Thomas is pursuing a graduate study in Biochemistry.  
 6/01/2013-08/01/2013 Mentor to Dehja Brown, Howard University. Project title: Modulation  
 of Mitochondrial Functions and Ca<sup>2+</sup> Homeostasis by Isoflurane under Physiological and  
 Pathophysiological Conditions. Dehja graduated from Howard University and is currently pursuing  
 a career in nurse practitioner College of Wisconsin Diversity Summer Health-related Research  
 Education Program.  
 6/01/2016-8/04/2016 Mentor to Ebony Carson (UW-Madison). Project title: Modulation of the putative  
 mitochondrial ryanodine-like channels alters mitochondrial bioenergetics and matrix Ca<sup>2+</sup> handling.  
 This project focuses on mitochondrial Ca<sup>2+</sup> uptake and regulation, and the modulatory effect of the  
 putative mitochondrial ryanodine like receptors (mRyR) on these processes. Ebony currently works at  
 the MCW Cancer Center.  
 6/01/2017-8/04/2017 Mentor to Bernice Badu is now an MCW M1. Project title: Characterizing and  
 comparing mitochondrial calcium dynamics in H9C2 cell lines and human (diabetic and nondiabetic)  
 iPSC-derived cardiomyocytes and the modulating role of glycemic condition and volatile anesthetics.

This project focused on mitochondrial Ca<sup>2+</sup> uptake and regulation under hyperglycemic and normal glucose conditions, and the modulatory effect of isoflurane. This research endeavor was sponsored by MCW.

Summer Program for Undergraduate Research (SPUR) Undergraduate Students

### **Graduate Students**

#### **MS Committees**

- 1 - Present Introduction to Physiology: General Models in Physiology
- 3 - Present Anatomy and Physiology of the Central Nervous System
- 4 - Present Physiology of the Autonomic Nervous System
- 5 - Present Cardiovascular: Overview of Circulation and Hemodynamics
- 6 - Present Nervous Regulation of the Circulation and Rapid Control of Arterial Pressure; Cardiac Output Regulation: The Heart

- 11 - Present Renal: Tubular Transport II; Urinary Concentration and Dilution

responsible for teaching a significant portion of the Fall Physiology course. I lecture 11 courses @ 2 hours/lecture).

Lectures:

- 2. Transmembrane H<sub>2</sub>O Flux, Synaptic Transmission

- 9. Renal: Kidney Physiology, Composition of Body Fluids, Glomerular Filtration Rate (GFR) I, Renal Blood Flow I

- 10. Renal: GFR II, Renal Blood Flow II, and Renal Tubular Transport I

EDUCATION SERVICE AT OTHER INSTITUTIONS:

University of Wisconsin-Milwaukee

#### **MA Committees**

- 2 - Present Role of Mitochondria in Cancer

2010 - Present Course Director M3-Electives in Anesthesiology Research Department. Course improves Angiogenesis in Persistent Pulmonary Hypertension of the Newborn. Adviser

Dr. Girija G Konduri (Chief and Professor Department of Neonatology, Medical College of mitochondria guided me throughout this process; his discussion, ideas, and feedback have been absolutely invaluable."

TEACHING AT THE MEDICAL COLLEGE OF WISCONSIN:

Graduate and Medical Education

Ion Channel Course. I lecture two courses and lead one group discussion with the graduate students.

Each lecture and group discussion is 2 hours long.

Lectures:

- 1. Ion channels, exchangers, transporters and pumps-cell membrane and mitochondrial membranes

Title: "Mitochondrial Signaling in Cardioprotection" Course number ANES-D3349. Course

objectives: Students learn the fundamental tools on how to conduct basic research in cardiovascular anesthesia. Focus in my lab will be how to design and execute experimental protocols relating to mitochondrial studies in the whole organ, isolated cells and isolated mitochondria in the context of anesthetic effect.

Professor Department of Engineering, UW-Milwaukee. Part of her dissertation has led to a joint publication see Bibliography reference #81).

processing for quantitative analysis of metabolic states in different disease models. Her project:

of her project has been reviewed and accepted for publication (see Bibliography reference #83).

Biomedical Engineering program

Brown Deer High School

See description below, after Bibliography.

#### **PhD Committees**

Department of Engineering, dissertation committee. Dissertation title: Quantitative optical studies

Engineering, Biophotonics Lab, UW-Milwaukee. The objective of her research is to develop and

title: Thermodynamically-Constrained Computational Modeling of Lung Tissue Bioenergetics and the Effect of Hyperoxia-Induced Acute Lung Injury. "Adviser Dr. Said Audi (Professor of

## BIBLIOGRAPHY

### Refereed Journal Publications/Original Papers

1. Tseng L-F, Tang R, Stackman R, Camara A, and Fujimoto JM. Brainstem sites differentially sensitive to  $\mu$ -endorphin and morphine for analgesia and release of met-enkephalin in anesthetized rats. *J Pharmacol Exp Ther* 253: 930-937, 1990 (PMID: 2141638).
2. Nudel DB, Camara A, and Levine M. Comparative effects of bicarbonate, Tris (hydroxymethyl)aminoethane and dichloroacetate in newborn swine with normoxic lactic acidosis. *Dev Pharmacol and Ther* 20: 20-25, 1993 (PMID: 7924761).
3. Osborn JL, and Camara AKS. Renal neurogenic mediation of ICV AII hypertension in rats raised on high sodium chloride diet. *Hypertension* 30(1): 331-336, 1997 (PMID: 9314413).
4. Camara AKS, and Osborn JL. AT1 receptors mediate chronic central nervous system AII hypertension in rats fed high sodium chloride diet from weaning. *J Auton Nerv Syst* 72: 16-23, 1998 (PMID: 9760076).
5. Camara AKS, and Osborn JL.  $\alpha$ -Adrenergic receptors mediate chronic central AII hypertension in rats raised on high sodium chloride diet from weaning. *J Auton Nerv Syst* 76(1): 28-34, 1999 (PMID: 10323304).
6. Camara AKS, and Osborn JL. Central AT1 and AT2 receptors mediate chronic intracerebroventricular angiotensin II-induced drinking in rats fed high sodium chloride diet from weaning. *Acta Physiol Scand* 171 (2): 195-201, 2001 (PMID: 11350280).
7. Camara AKS, Begic Z, Kwok W-M, and Bosnjak ZJ. Differential modulation of the cardiac L- and T-type calcium channels by isoflurane. *Anesthesiology* 95: 515-524, 2001 (PMID: 11506128).
8. Camara AKS, Turner LA, and Bosnjak ZJ. Interactions of halothane with isoproterenol and epinephrine on canine epicardial conduction velocity at normal and elevated potassium levels. *Acta Anesthesiol Scand* 45(7): 885-892, 2001 (PMID: 11472292).
9. An JZ, Varadarajan SG, Camara A, Chen Q, Novalija E, Gross GJ, and Stowe DF. Blocking  $\text{Na}^+/\text{H}^+$  exchange reduces  $[\text{Na}^+]_i$  and  $[\text{Ca}^{2+}]_i$  load after ischemia and improves function in intact hearts. *Am J Physiol Heart Circ Physiol* 281: H2398-H2409, 2001 (PMID: 11709405).
10. Stowe DF, Heisner JS, An JZ, Camara AKS, Varadarajan SG, Novalija E, Chen Q, and Schelling P. Inhibition of  $\text{Na}^+/\text{H}^+$  exchange-1 isoform protects hearts reperfused after six-hour cardioplegic cold storage. *J Heart Lung Transplant* 21(3): 374-382, 2002 (PMID: 11897527).
11. Chen Q, Camara AKS, An JZ, Riess ML, Novalija E, and Stowe DF. Cardiac preconditioning with 4 hr, 17°C ischemia reduces  $[\text{Ca}^{2+}]_i$  load and damage in part via KATP channel opening. *Am J Physiol Heart Circ Physiol* 282(6): H1961-H1969, 2002 (PMID: 12003799).
12. Riess ML, Camara AKS, Chen Q, Novalija E, Rhodes SS, and Stowe DF. Altered NADH and improved function by anesthetic and ischemic preconditioning in guinea pig intact hearts. *Am J Physiol Heart Circ Physiol* 283: H53-H60, 2002 (PMID: 12063274).
13. Novalija E, Varadarajan SG, Camara, AKS, An JZ, Chen Q, Riess, ML, Hogg N, and Stowe DF. Anesthetic preconditioning: triggering role of reactive oxygen and nitrogen species in isolated hearts. *Am J Physiol Heart Circ Physiol* 283: H44-H52, 2002 (PMID: 12063273).
14. Chen Q, Camara AKS, An JZ, Novalija E, Riess ML, and Stowe DF. Sevoflurane preconditioning prior to moderate hypothermic ischemia protects against cytosolic  $[\text{Ca}^{2+}]$  loading and myocardial damage in part via mitochondrial KATP channels. *Anesthesiology* 97(4): 912-920, 2002 (PMID: 12357159).
15. Riess ML, Camara AKS, Novalija E, Chen Q, Rhodes SS, and Stowe DF. Anesthetic preconditioning attenuates mitochondrial  $[\text{Ca}^{2+}]$  accumulation during ischemia by triggering mitochondrial KATP channel opening in guinea pig intact hearts. *Anesth Analg* 95(6): 1540-1546, 2002 (PMID: 12456413).
16. Camara AKS, An JZ, Chen Q, Novalija E, Varadarajan SG, Schelling P, and Stowe DF.  $\text{Na}^+/\text{H}^+$  exchange inhibition with cardioplegia reduces cytosolic  $[\text{Ca}^{2+}]$  and damage after cold ischemia. *J Cardiovasc Pharmacol* 41(5): 686-698, 2003 (PMID: 12717098).
17. Kevin LG, Camara AKS, Riess ML, Novalija E, and Stowe DF. Ischemic preconditioning alters real-time measures of  $\text{O}_2$  radicals in intact hearts with ischemia and reperfusion. *Am J Physiol Heart Circ Physiol* 284: H566-H574, 2003 (PMID: 12414448).
18. Kevin LG, Novalija E, Riess ML, Camara AKS, Rhodes, SS, and Stowe, DF. Sevoflurane exposure generates superoxide but leads to decreased superoxide during ischemia and reperfusion in isolated hearts. *Anesth Analg* 96(4): 949-955, 2003 (PMID: 12651639).
19. Riess ML, Novalija E, Camara AKS, Eells JT, Chen Q, and Stowe DF. Preconditioning with sevoflurane reduces changes in nicotinamide adenine dinucleotide during ischemia-reperfusion in hearts: reversal by 5-hydroxydecanoic acid. *Anesthesiology* 98(2): 387-395, 2003 (PMID: 12552198).
20. Rhodes SS, Ropella KM, Camara AKS, Kevin LG, Riess ML, and Stowe DF. Cross-bridge kinetics modeled from myoplasmic  $[\text{Ca}^{2+}]$  and LVP pressure at 17°C, and after 37°C and 17°C ischemia. *Am J Physiol*

- Heart Circ Physiol 284: H1217-H1229, 2003 (PMID: 12531735).
21. An JZ, Camara AKS, Chen Q, and Stowe DF. Effect of low  $[CaCl_2]$  and high  $[MgCl_2]$  cardioplegia and moderate hypothermic ischemia on myoplasmic  $[Ca^{2+}]$  and cardiac function in intact hearts. *Eur J Cardiothorac Surg* 24(6): 974-985, 2003 (PMID: 14643817).
  22. Novalija E, Kevin LG, Camara AKS, Bosnjak, ZB, Kampine, JP, and Stowe DF. Reactive oxygen species precede the epsilon isoform of protein kinase C in the anesthetic preconditioning cascade. *Anesthesiology* 99: 421-428, 2003 (PMID: 12883415).
  23. Rhodes SS, Ropella KM, Camara AKS, Chen Q, Riess ML, and Stowe DF. How inotropic drugs alter dynamic and static indices of cyclic myoplasmic  $[Ca^{2+}]$  to contractility relationships in intact hearts. *J Cardiovasc Pharmacol* 42(4): 539-553, 2003 (PMID: 14508241).
  24. Kevin LG, Katz, P, Camara AKS, Novalija, E., Riess, ML., and Stowe DF. Anesthetic preconditioning: effects on latency to ischemic injury in isolated hearts. *Anesthesiology* 99: 385-391, 2003 (PMID: 12883411).
  25. Novalija E, Hogg N, Kevin LG, Camara AKS, and Stowe DF. Ischemic preconditioning: triggering role of nitric oxide-derived oxidants in isolated hearts. *J Cardiovasc Pharmacol* 42(5): 593-600, 2003 (PMID: 14576506).
  26. Chen Q, Camara AKS, Rhodes SS, Riess ML, Novalija E, and Stowe DF. Cardiotonic drugs differentially alter cytosolic  $[Ca^{2+}]$  to LVP relationship before and after ischemia in intact guinea pig hearts. *Cardiovasc Res* 59: 912-925, 2003 (PMID: 14553831).
  27. Camara AKS, Kevin LG, Riess ML, Novalija E, and Stowe DF. Hypothermia augments reactive oxygen species detected in the guinea pig isolated perfused heart. *Am J Physiol Heart Circ Physiol* 286: H1289-H1299, 2004 (PMID: 14644763).
  28. Riess ML, Camara AKS, Kevin LG, and Stowe DF. Hypothermia preserves mitochondrial NADH and prevents  $Ca^{2+}$  overload and excess ROS formation during ischemia in intact hearts. *Cardiovasc Res* 61: 580-590, 2004 (PMID: 14962488).
  29. Riess ML, Kevin LG, Camara AKS, Heisner JS, and Stowe DF. Dual exposure to sevoflurane improves anesthetic preconditioning in intact hearts. *Anesthesiology* 100: 569-574, 2004 (PMID: 15108970).
  30. Riess ML, Eells JT, Kevin LG, Camara AKS, Henry MM, and Stowe DF. Attenuation of mitochondrial respiration by sevoflurane in isolated cardiac mitochondria is mediated in part by reactive oxygen species. *Anesthesiology* 100: 498-505, 2004 (PMID: 15108961).
  31. Camara AKS, Chen Q, An JZ, Novalija E, Rhodes SS, Riess ML, and Stowe DF. Comparison of hyperkalemic cardioplegia with varied  $Ca^{2+}$  and  $Mg^{2+}$  concentrations on  $[Ca^{2+}]_i$  transients and function after global ischemia in isolated hearts. *J Cardiovasc Surg* 45(1): 1-13, 2004 (PMID: 15041929).
  32. Kevin LG, Katz P, Camara AKS, Novalija E, Riess ML, and Stowe, DF. Anesthetic preconditioning versus anesthetic treatment: effects on ischemic injury in isolated hearts. *Anesthesiology* 100: 1327-1328, 2004 DOI: 10.1097/00000542-200405000-00052)-Author response (PMID: 15114246).
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105. BOOK CHAPTERS/REVIEWS/EDITORIALS
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107. \*1. Chen Q, Camara AKS, Stowe DF, Hoppel CL, and Lesnefsky EJ. Modulation of electron transport protects cardiac mitochondria and decreases myocardial injury during ischemia and reperfusion [review article]. *Am J Physiol Cell Physiol* 292: C137-C147, 2007 (PMID: 16971498). This article has been cited over 266 times.
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  114. Note: This article was published in July 2011, and according to the journal, in one year the article received approximately 4000 total views, "...making it among the highest-performing articles in Frontiers." An e-mail sent to me reads, "As there is so much interest in your work and your field, Frontiers would like to invite to you to serve as Host Editor of a Frontiers Research Topic..." The article has also been recognized since its publication in the top 20 articles of interest (Domain of related articles 20001744) published on similar mitochondrial related topics.
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  121. Note: Dr. Miguel Aon (Johns Hopkins) and I were the editors for a "Special Call" for papers titled: "Mitochondria: Hubs of cellular signaling, energetics and redox balance". The call for paper exceeded expectations in terms of the total number of articles targeted and the actual number submitted for consideration. At the end, a total of 20 articles were submitted and all were accepted, except two. The contributors included numerous prominent investigators in the field of mitochondrial biology. The success of this editorial endeavor has led to the publication of an E-Book that shows 20 chapters, including 2 editorial comments (see below, #14). Cited 10 times.
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  127. Note: Drs. Sabzali Javadov (Department of Physiology, School of Medicine, University of Puerto Rico, San Juan, PR 00936-5067, USA), Andrey V. Kozlov (Ludwig Boltzmann Institute for Experimental and Clinical Traumatology, 1200 Vienna, Austria) and I were the guest editors for a "Special Call" for papers titled: "Mitochondria in Health and Diseases". The call for paper exceeded expectations in terms of the total number of articles targeted and the actual number submitted for consideration. At the end, a total of nearly 30 articles were submitted and 24 from a wide range of topics were accepted with the remaining rejected. The Editorial is a compendium of overviews of each article in designated categories of "Mitochondria in health" and "Mitochondria in Disease".
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186. PROGRAMMATIC DEVELOPMENT OF RESEARCH
187. Research collaborations at the Medical College of Wisconsin:
188. My research to date focuses on: 1) the role of mitochondrial ROS production and the Na<sup>+</sup>/H<sup>+</sup> exchanger in cold ischemia and reperfusion injury and the potential relevance of ROS scavengers in cardiac preservation; 2) the regulation of mitochondrial ion transport (hydrogen, potassium and calcium fluxes), mitochondrial pH, membrane potential and the effects of derangement in these processes in the potential the activation mitochondrial damage and cell injury; 3) the molecular mechanisms, for example, posttranslational modification of key mitochondrial outer and inner membrane proteins critical to oxidative stress-mediated mitochondrial dysfunction and cell death.
189. I have in the years broaden my research by collaborating with faculties at the Medical College of Wisconsin, University of Wisconsin-Milwaukee and Marquette University. I also have collaboration with a former mentee who is now an Assistant Professor at Michigan State University. With my strong background in mitochondrial biology, I have been able to collaborate with faculties and postdoctoral fellows who have expressed interest in incorporating mitochondria in their research. In this endeavor, I have helped faculties and postdoctoral fellows with preliminary data for grants and data for publications. Some of the preliminary data provided crucial results to test hypotheses or verify feasibility of research plans; these efforts have led to funded grants and numerous collaborative publications. The collaborations have also given me the opportunity to mentor graduate students at Marquette University and UW-Milwaukee, and to serve on dissertation committees. My level of involvement with students at MCW and beyond the campus, underscores my fervent philosophy of collaboration as the cornerstone for success in academic research. I intend to continue to use my expertise to foster further collaboration with new PIs, and to assist wherever possible, to contribute to the development of novel ideas towards grants.
190. R01 Grant 04-01-17: My research on mitochondria has entered a new phase with focus on molecular mechanisms to elucidate the etiology of mitochondrial dysfunction following oxidative/nitrosative stress. In this effort, I teamed up with Dr. Wai-Meng Kwok, Professor of Anesthesiology and Pharmacology and Toxicology and Dr. Emad Tajkhorshid Professor of Pharmacology, Biophysics and Computational Biology at The College of Medicine, University of Illinois Urbana-Champaign, on a 3-PI (Multiple PI mechanism) proposal to investigate the mechanisms underlying transformation of the mitochondrial voltage dependent anion channel (VDAC) between protective and lethal states during

oxidative/nitrosative stress. Specifically, we postulate that phosphorylation of certain amino acid residues regulate the gating properties of the channel, its conformational structure and overall impact on mitochondrial bioenergetics and cell survival/death following oxidative stress. The proposal uses state-of-the-art techniques including gene editing (CRISPR-Cas9 to conduct knock-ins of VDAC), proteomics and molecular dynamic simulations to determine how mitochondria can transform from being protective to becoming lethal to the cell. These novel approaches will provide, hitherto, not reported mechanisms to show the role of VDAC in cell protection or death and their potential therapeutic utility against oxidative stress.

191. AHW Grant 07-01-17: The Advance Healthier Wisconsin (AHW) grant is part of the financial package that was given to our new Chair, Dr. Cynthia Lien, to expand our basic science research into the area of mild Traumatic Brain Injury (mTBI), with emphasis on mitochondria. I was selected to lead this initiative (PI), because of my expertise and strong track record in mitochondrial biology. In this effort, I work with three other faculty members, all of whom are essential to the success of this initiative. These faculty members are Dr. Wai-Meng Kwok, an expert in ion channel electrophysiology, Dr. Christopher Pawela, Assistant Professor of Anesthesiology, an expert in brain imaging, and Dr. Bin Pan, an Assistant Professor of Anesthesiology, an expert in neuro-electrophysiology at the tissue level. Our team of investigators, with complementary skills, is poised to lead this research to a new frontier in better understanding the manifestation of mTBI and its impact on the health of individuals afflicted with the disease. The project title is: "Identifying molecular mechanisms underlying TBI-a path to novel therapeutic opportunities". The progression of molecular changes following mTBI leads to multiple physiological changes including mitochondrial dysfunction and neuronal degeneration. Despite the tremendous effort invested on TBI research, the ability to mitigate chronic neurological deficits in TBI patients remains limited. The objective of this proposal is to unravel the underlying molecular mechanisms that are the underpinnings of mTBI. To accomplish this task, we will use an integrative multiscale (top-down) hierarchical approach, which involves brain imaging, electrophysiology at the tissue and mitochondria level, and mitochondrial bioenergetics and other functions. We will also use the latest proteomic approaches that may shed some new insights into how trauma impacts mitochondrial function based on its effect on specific mitochondrial proteins critical in bioenergetics. My overarching goal for this initiative, as a PI, is to create an environment that would spur further collaboration amongst faculties in our department, and to work together to submit multiple R01 proposals, based on complementary skills.
192. PPG 03/01/15-02/28/20 Dr. Zeljko Bosnjak, Program Project Grant; Projector Director. I play a crucial role in the current PPG. My role is to coordinate the experiments in Project III. The project has both experimental (Dr. Camara) part and computational modeling (Dr. Ranjan Dash) component. I have worked very closely with Dr. Ranjan Dash, Associate Professor Marquette University-MCW BME program; we both contribute equally towards the project. My lab provided important preliminary data for Project III that was needed for computational modeling and for the success of the project. There are two postdoctoral fellows, one experimentalist and the other a computational biologist who responsible for the bulk of work proposed in the PPG. The experimental part of the project relies heavily on role of mitochondria in cardiac function during exposure to volatile anesthetics, and the potential impact of type II diabetes in impeding volatile anesthetic-mediated protection against ischemia and reperfusion injury. A substantial progress in this project has been the work I supervise in the experimental component of the PPG.
193. Other collaborations
194. Marquette University & Medical College of Wisconsin Department of Biomedical Engineering: I continue to pursue my interest in understanding the biophysical changes that contribute to mitochondrial dysfunction in ischemia and reperfusion injury. In the past five years, I have collaborated with Dr. Ranjan Dash (computational biologist), to study mitochondrial function in normal and in diseased heart. Our goal is to understand the biophysical and biochemical factors involved in mitochondrial handling of pH, cations, and reactive oxygen (ROS) in cardiomyocytes using experimental and computational modeling approaches to provide a unique perspective in this dynamic process. Our studies have also focused on understanding how these biophysical and biochemical factors individually and collectively influence and modulate mitochondrial function. This research objective was the basis of our recently completed multiple (2-PI) R01 proposal (NIH-NHLBI HL095122; 2010-2015). We are currently working on a new proposal, an extension of this proposal based on our continued iterative experimental-computational strategy, to understand how mitochondria Ca<sup>2+</sup> buffering is central in the cross-talk between mitochondrial Ca<sup>2+</sup> and ROS under normal and oxidative stress conditions.



195. Department of Division of Pulmonary and Critical Care Medicine Medical College of Wisconsin: I have worked with Dr. Elizabeth Jacobs on several of her grants, which are designed to establish the role of mitochondrial dysfunction in ischemia and reperfusion injuries and diagnose these injuries using novel minimally invasive techniques based upon deranged mitochondrial function. With novel means to detect apoptosis and redox injury in vivo, the proposed studies examined correlations between altered mitochondrial bioenergetics, severity of changes to lung structure or function and the potential of imaging methods to track these injuries. I have assisted in data interpretation and My collaboration contributed to the recently expired funded grants: a VA Merit grant (IBX001681A) and NIH R01 (R01 HL116530). My collaboration with Dr. Jacobs continues on her VA Merit grant which has just been resubmitted for review. This grant is entitled "Role of mitochondrial dysfunction in hyperoxia-induced pulmonary vascular endothelial injury". If funded, my major scientific role in this project will be to provide oversight in the acquisition and interpretation of data regarding mitochondrial function. I also have experience with optical imaging to determine the redox state of tissues, a crucial approach in this study. As noted above, Dr. Jacobs and I have worked on separate projects. One of our articles has recently been published in the journal *Shock*, entitled: "Protection by Inhaled Hydrogen Therapy in a Rat Model of Acute Lung Injury can be Tracked in vivo Using Molecular Imaging" (PMID: 28915216).
196. Department of Medicine and Physiology: I collaborate with Dr. Andre Sorokin, Professor of Medicine and Physiology, on the role of mitochondrial p66shc transgenic rats in ischemia and reperfusion injury. The transgenic rats showing KO of p66shc or telomerase are generated using ZFN, TALEN and CRISPR-Cas9 site directed nuclease technologies under by Dr. Aron Geurts Director of MCW Rat Transgenic Facility. We have shown that use of the p66shc KO rats recapitulates the cardioprotection we observed when p66shc translocation to mitochondria was inhibited (PLoS One 9 (12):e113534, 2014 PMID: 25436907). Use of these transgenic animal models in addition to use of targeted pharmacological agents could provide us the opportunity to explore novel mechanisms for understanding mitochondrial-mediated cell death or apoptosis. We have acquired enough data from recent experiments using the transgenic rats in ischemia and reperfusion studies to write a manuscript or be used as preliminary data for a potential grant.
197. I have worked with Dr. Andreas Beyer, Assistant Professor of Medicine and Physiology, on numerous projects, and I also helped train his postdoctoral fellow, Dr. Karima Ait-Aissa, on her work the contributing role of mitochondria in the etiology of human coronary artery disease. Some of the studies conducted in my lab were and/or will be presented at national meetings (e.g. "Increased mitochondrial DNA damage results in loss of complex IV catalytic subunit expression with elevated levels of mitochondrial fission/fusion markers in Coronary artery disease"). Dr. Ait-Aissa also recently submitted a Scientist Development Grant to the AHA. Her grant had a decent score, but was not enough for funding. I have also worked closely with Dr. Beyer on his mitochondria telomerase knock out rats and their susceptibility to ischemia and reperfusion injury. Our collaboration on these projects has led to several pending publications (e.g. Mitochondrial Oxidative Phosphorylation defect in the Heart of Subjects with Coronary Artery Disease submitted to J. American Heart Association, 2018) and preliminary data for potential collaborative grant proposals.
198. Department of Surgery: I collaborate with Dr. Johnny Hong, the Chief Division of Transplant Surgery, Froedtert Hospital and Medical College of Wisconsin, and his team of surgeons looking at mitochondria function following liver ischemia and ischemia and reperfusion. Specifically, Dr. Hong's team is interested in optimizing preservation solutions for organ storage before transplant, with minimal impact on mitochondrial functional integrity. Their objectives include the potential beneficial effects of the "ideal preservation solution" on protecting mitochondrial function that would in turn provide better preservation of livers for transplant. This work is akin to several of my earlier studies where I showed that hypothermia even though protects against cardiac ischemia and reperfusion injury, it also leads to deleterious reactive oxygen species production from mitochondria (see Bibliography #27 and #41). Therefore, creating the ideal preservation solutions with minimal impact on mitochondria function is desirable. My role in Dr. Hong's project is to advise our research team on the design of protocols for mitochondrial studies, and to aid in interpretation of the results. An abstract on our novel findings is submitted to the Experimental Biology conference, entitled Mitochondrial Function in Swine Liver Procured after Cardiac Death, scheduled to take place in April. Some preliminary data from the mitochondrial studies will be used in conjunction with other data for submission of an AHW grant proposal.
199. Blood Research Institute/Comprehensive Center for Bleeding Disorders: I collaborate with Dr. Shawn Jobe. Both Dr. Jobe and I are currently interested in how cyclophilin D (CypD) and the mitochondrial

calcium uniporter function to regulate mitochondrial calcium entry in the setting of necrosis and apoptosis. My lab has extensive experience in the detailed analysis of cytosolic and mitochondrial calcium fluxes in cardiomyocytes and we have recently utilized CypD null mice provided by Dr. Jobe's lab to address a novel question regarding better understanding of mitochondrial  $\text{Ca}^{2+}$  handling in normal and pathophysiological conditions. I am a co-investigator on Dr. Jobe's recent R01 submission. I continue to provide him assistance in investigating the role of mitochondrial calcium dynamics (influx and efflux) in the regulation of platelet activation. The title of his R01 grant proposal is: "Procoagulant platelet mechanisms and function".

200. Research collaborations at the University of Wisconsin-Milwaukee:

201. University of Wisconsin-Milwaukee Department of Engineering: I have recently embarked on research collaboration with Dr. Masha Ranji, Founder and Director of the UW-Milwaukee Biophotonics Lab, and Associate Professor of Engineering at UW-Milwaukee, Department of Engineering. Dr. Ranji is an expert in optical imaging and image processing of tissue metabolism, especially in the 3-D model. We have used this novel approach to show for the first time a 3-D view of mitochondrial bioenergetics, ROS production and cellular and mitochondrial  $\text{Ca}^{2+}$  homeostasis in the ex vivo perfused heart. This approach shows for the first time a 3-D heterogeneous distribution of mitochondrial redox state in the heart during ischemia and reperfusion injury. This work has been published in recently in IEEE J Transl Eng Health Med entitled "Optical Cryo-imaging Reveals a Heterogeneous Distribution of Mitochondrial Redox State in ex vivo Guinea Pig Hearts and its Alteration during Ischemia and Reperfusion" (PMID: 27574574), and it was recognized for its novelty and was the Editor's pick for that publication issue. In a recent ongoing project in collaboration with Dr. Meetha Medhora Professor in the Department of Pulmonary Medicine at the Medical College of Wisconsin, we have used similar cryoimaging to assess the impact of whole thorax low dose irradiation versus whole body irradiation on cardiac function and mitochondrial redox state in rats before and after cardiac ischemia and reperfusion injury. This work has been published in J. Biomed Opt entitled: Optical metabolic imaging of irradiated rat heart exposed to ischemia-reperfusion injury (PMID: 29352564). Dr. Ranji and I continue to work together on other projects, including the lungs and kidney. We have recently submitted a multiple PI Letter of intent (Grant title: Investigating metabolism and vascular dysfunction in cardiovascular ischemia reperfusion injury) to an American Heart Association RFA on a Multidisciplinary research broadly related to cardiovascular function, cardiovascular disease, and stroke. I have also served, and continue to serve, as a mentor and an adviser to her postdoctoral and pre-doctoral students (see list of students mentored above). An R15 grant was recently submitted based on our collaborative effort. The grant is titled: "Predicting cardiovascular ischemic injury propagation border zone using optical imaging and computational modeling".

202. Department of Biological Science Marquette University: I am working with Dr. Robert Fitts an Emeritus Professor of Biology on understanding how moderate level of exercise impacts the heart and protects against ischemic stress. Specifically, this project seeks to elucidate the role of calcium homeostasis during exercise, from the organismic level to the mitochondria associated membrane region of the cell in the protection against ischemia and reperfusion-mediated injury. We have submitted a multiple PI grant titled "Exercise-Training Induced Protective Mechanisms in the Stressed Heart" in this collaborative partner.