

Sarah Kuzmiak-Glancy, Ph.D.

Assistant Professor

Department of Kinesiology, University of Maryland
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Education

National Institutes of Health, Bethesda, MD

National Heart, Lung, and Blood Institute

Laboratory of Cardiac Energetics

- Postdoctoral Fellow with Robert S. Balaban, Ph.D.; July 2016 – January 2017

The George Washington University, Washington, DC

Department of Biomedical Engineering

- Postdoctoral Fellow with Matthew W. Kay, PE, D.Sc.; July 2012 – June 2016

Arizona State University, Tempe, AZ

- Graduate research with Wayne T. Willis, Ph.D.; August 2008 - May 2012
- Ph.D., Biology, May 2012

Rutgers University, New Brunswick, NJ

- Undergraduate study with Shawn M. Arent, Ph.D.
- B.S., Exercise Physiology, *Magna Cum Laude*, May 2008

Publications

Giles, A.V., J. Sun, A.N. Femnou, **S. Kuzmiak-Glancy**, J.L. Taylor, R. Covian, E. Murphy, R.S. Balaban. (2018) "Paradoxical arteriole constriction compromises cytosolic and mitochondrial oxygen delivery in the isolated saline-perfused heart." Am J Physiol Heart Circ Physiol **315**: H1791-H1804

Kuzmiak-Glancy, S., R. Covian, A.N. Femnou, B. Glancy, R. Jaimes III, A. Wengrowski, K. Garrott, S.A. French, R.S. Balaban, M.W. Kay. (2018). "Cardiac performance is limited by oxygen delivery to the mitochondria in the crystalloid-perfused heart." Am J Physiol Heart Circ Physiol **314**: H704-H715.

Femnou, A.N., **S. Kuzmiak-Glancy**, R. Covian, A.V. Giles, M.W. Kay, R.S. Balaban. (2017). "Intracardiac light catheter for rapid scanning transmural absorbance spectroscopy of perfused myocardium: measurement of myoglobin oxygenation and mitochondrial redox state." Am J Physiol Heart Circ Physiol **313**: H1199-H1208.

Moreno, A., **S. Kuzmiak-Glancy**, R. Jaimes III, M.W. Kay. (2017). Enzyme-dependent recovery of NADH after phobleaching to assess dehydrogenase activity of isolated perfused hearts." Scientific Reports 7: 45744.

Garrott, K., **S. Kuzmiak-Glancy**, A. Wengrowski, H. Zhang, J. Rogers, M.W. Kay. (2017). "K_{ATP} channel inhibition blunts electromechanical decline during hypoxia in left ventricular working rabbit hearts." J Physiol 595(12): 3799-3813.

Garrott, K., J. Dyavanapalli, E. Cauley, M.K. Dwyer, **S. Kuzmiak-Glancy**, X. Wang, D. Mendelowitz, M.W. Kay. (2017) "Chronic activation of hypothalamic oxytocin neurons improves cardiac function during left ventricular hypertrophy-induced heart failure." Cardiovascular Research cvx084. doi: 10.1093/cvr/cvx084

- Willis, W.T., M.R. Jackman, J.I. Messer, **S. Kuzmiak-Glancy**, B. Glancy. (2016) "A simple hydraulic analog model of oxidative phosphorylation." Med Sci Sports Exerc 48: 990-1000.
- Kang, C., J.A. Brennan, **S. Kuzmiak-Glancy**, K.E. Garrott, M.W. Kay, I.R. Efimov. (2016) "Technical advances in studying cardiac electrophysiology – Role of rabbit models." Prog Biophys Mol Biol 121(2): 97-109.
- Kuzmiak-Glancy, S.**, R Jaimes III, A.M. Wengrowski, M.W. Kay. (2015) "Oxygen demand of perfused heart preparations: How electromechanical function and inadequate oxygenation affect physiology and optical measurements." Exp Physiol **100**: 603–616. (Cover.)
- Jaimes III, R.J., **S. Kuzmiak-Glancy**, D.M. Brooks, L.M. Swift, N.G. Posnack, M.W. Kay. (2015) "Functional response of the isolated, perfused heart to pyruvate dehydrogenase activation by dichloroacetate and pyruvate." Pflugers Archiv Eur J of Physiol pg 1-12. DOI 10.1007/s00424-015-1717-1
- Azam, M.A., C. Wagg, S. Massé, T. Farid, P. Lai, M. Kusha, J. Asta, R. Jaimes III, **S. Kuzmiak-Glancy**, M.W. Kay, G. Lopaschuk, K. Nanthakumar. (2015) "Feeding the Fibrillating Heart: Dichloroacetate Improves Cardiac Contractile Dysfunction Following Ventricular Fibrillation." Am J Physiol Heart Circ Physiol **309**: H1543-H1553.
- Cauley, E., X. Wang, J. Dyavanapalli, K. Sun, K. Garrott, **S. Kuzmiak-Glancy**, M.W. Kay, D. Mendelowitz. (2015) "Neurotransmission to parasympathetic cardiac vagal neurons in the brainstem is altered with left ventricular hypertrophy." Am J Physiol Heart Circ Physiol **309**: H1281-H1287
- Kay, M.W., **S. Kuzmiak-Glancy**, J. Rogers. (2015) "Racing to the flatline: heart rate and β -adrenergic stimulation quicken the pace." Am J Physiol Heart Circ Physiol **308**: H977-H979.
- Kuzmiak-Glancy, S.**, W.T. Willis. (2014) "Skeletal muscle fuel selection occurs at the mitochondrial level." J Exp Biol **217**: 1993-2003.
- Wengrowski, A.M., **S. Kuzmiak-Glancy**, R. Jaimes III, M.W. Kay. (2014) "NADH changes during hypoxia, ischemia, and increased work differ between isolated heart preparations." Am J Physiol Heart Circ Physiol **306**: H529-H537.
- Kuzmiak, S.**, B. Glancy, K.L. Sweazea, W.T. Willis. (2012) "Mitochondrial function in sparrow pectoralis muscle." J Exp Biol **215**: 2039-2050.

Invited & Oral Presentations

- 2019 Deconstructing Mitochondrial Energetics in Healthy and Failing Hearts; 2019 MARC ACSM Annual Meeting, Harrisburg, PA
- 2019 Control of *in vivo* and *ex vivo* Cardiac Metabolism; Children's National Medical Center, Washington, DC
- 2018 Matching Myocardial Energy Supply to Demand: From the Organelle to the Organ; Uniformed Services University, Bethesda, MD
- 2017 Matching Myocardial Energy Supply to Demand: From the Organelle to the Organ; Children's National Medical Center, Washington, DC
- 2015 The Chemiosmotic Proton Circuit; Mitochondrial Physiology School, Greenville, NC
- 2015 Mitochondrial Energy Production in Heart Failure; May 2015 Meeting of the American Heart Association Women's Board of the Greater Washington Region

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- 2014 Relieving the Oxygen Limitation in Krebs-Henseleit Perfused Hearts: Perfluorocarbon Perfusion Improves Outcomes at the Functional, Cellular, and Mitochondrial Levels; The Greater Washington DC Chapter of the APS (dmvCAPS) Annual Meeting
- 2012 Mitochondrial Physiology in Avian and Mammalian Skeletal Muscle; The George Washington University Cardiac Research Seminar
- 2011 Electron Conductance in Rat and Sparrow Skeletal Muscle Mitochondrial Electron Transport Chain; Arizona Physiological Society Conference
- 2011 Modulation of Fuel Selection at the Mitochondrial Matrix; 30th Annual Southwest Regional Chapter of the American College of Sports Medicine Conference
- 2010 Pyruvate Sparing by Fatty Acid and Glutamate in Sparrow Skeletal Muscle Mitochondria; Arizona Physiological Society Conference
- 2010 Fuel Utilization and Oxidant Production in Mitochondria from Avian and Mammalian Skeletal Muscle; Arizona State University Kinesiology Department Seminar

Poster Presentations

- 2019 Li, H., J. Durbin, A. Chowdhury, & **S. Kuzmiak-Glancy**. Calcium Activation of Mitochondrial Respiration is Maintained in Heart Failure Despite Altered Mitochondrial Membrane Potential. 2019 NHLBI Mitochondrial Biology Symposium.
- 2019 Tejada, S., H. Li, & **S. Kuzmiak-Glancy**. Reactive Oxygen Species Production is Increased in the Presence of Calcium Despite Activation of the Electron Transport Chain in Heart Mitochondria. 2019 NHLBI Mitochondrial Biology Symposium.
- 2019 Liu, Y. & **S.Kuzmiak-Glancy**. Cardiac Responses to β -adrenergic Stimulation and Induced Vasodilation are Similar in Young Male and Female Rats. 6th Annual Meeting of the Greater Washington DC Area Physiological Society.
- 2019 Li, H., J. Durbin, A. Chowdhury, & **S. Kuzmiak-Glancy**. Calcium Activation of Mitochondrial Respiration is Maintained in Heart Failure Despite Altered Mitochondrial Membrane Potential. 6th Annual Meeting of the Greater Washington DC Area Physiological Society.
- 2019 Liu, Y. & **S.Kuzmiak-Glancy**. Cardiac Responses to β -adrenergic Stimulation and Induced Vasodilation are Similar in Young Male and Female Rats. 2019 MARC ACSM Annual Meeting.
- 2019 Li, H., J. Durbin, A. Chowdhury, & **S. Kuzmiak-Glancy**. Calcium Activation of Mitochondrial Respiration is Maintained in Heart Failure Despite Altered Mitochondrial Membrane Potential. 2019 MARC ACSM Annual Meeting.
- 2018 Li, H., **S. Kuzmiak-Glancy**. Calcium activation of mitochondrial oxidative phosphorylation is maintained in the presence of heart failure levels of extramitochondrial sodium
- 2018 Rekhman, D., D. D. Shill, J.W. Durbin, J.M. Hagberg, **S. Kuzmiak-Glancy**. Perivascular adipose tissue growth and the impact of adrenergic stimulation in rats with and without heart failure.
- 2018 Giles, A.V., J. Sun, A.N. Femnou, **S. Kuzmiak-Glancy**, J.L. Taylor, R. Covian, E. Murphy, R.S. Balaban. Paradoxical arteriole constriction limits cytosolic and mitochondrial oxygen delivery and mitochondrial metabolism in the isolated saline-perfused heart.
- 2017 **Kuzmiak-Glancy**, S., B. Glancy, M.W. Kay. Cardiac ischemia impairs every step of the oxidative phosphorylation pathway. 2017 Physiological Bioenergetics: From Bench to Bedside Conference.
- 2016 Dwyer, M.K., **S. Kuzmiak-Glancy**, K. Garrott, M.W. Kay. Sodium-calcium exchanger inhibition results in ventricular fibrillation in hearts with pressure overload induced hypertrophy. Annual Meeting of the Biomedical Engineering Society.

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- 2016 Garrott, K., E. Cauley, **S. Kuzmiak-Glancy**, X. Wang, D. Mendelowitz, M.W. Kay. Improved cardiac function by chronic activation of hypothalamic oxytocin neurons in a rat model of heart failure. Annual Meeting of the Biomedical Engineering Society.
- 2016 **Kuzmiak-Glancy, S.**, B. Glancy, M.W. Kay. Cardiac ischemia results in decreased intermediate mitochondrial respiration rates and impairs every step of the oxidative phosphorylation pathway. 2016 APS Intersociety Meeting: The Integrative Biology of Exercise.
- 2016 Garrott, K., **S. Kuzmiak-Glancy**, H. Zhang, J. Rogers, M.W. Kay. Glibenclamide prevents APD shortening during deoxygenation in left ventricular working hearts. 37th Annual Scientific Sessions of the Heart Rhythm Society.
- 2016 Garrott, K., E. Cauley, **S. Kuzmiak-Glancy**, D. Mendelowitz, M.W. Kay. Diminished heart rate response to beta-adrenergic stimulation is restored by chronic activation of hypothalamic oxytocin neurons in a rat model of heart failure. 37th Annual Scientific Sessions of the Heart Rhythm Society.
- 2015 **Kuzmiak-Glancy, S.**, B. Glancy, M.W. Kay. Mitochondrial respiration and calcium activation are maintained in the presence of heart failure levels of extramitochondrial sodium. 2015 Physiological Bioenergetics: From Bench to Bedside Conference.
- 2015 Moreno, A., R. Jaimes III, **S. Kuzmiak-Glancy**, M.W. Kay. Enzyme-Dependent Fluorescence Recovery after Photobleaching (ED-FRAP) in a Whole Heart. Annual Meeting of the Biomedical Engineering Society.
- 2015 **Kuzmiak-Glancy, S.**, M.W. Kay. Mitochondrial respiration response to calcium is maintained in the presence of heart failure levels of extramitochondrial sodium. Keystone Symposia: Mitochondria, Metabolism, and Heart Failure.
- 2014 **Kuzmiak-Glancy, S.**, R. Covian, B. Glancy, A.M. Wengrowski, R. Jaimes III, S. French, R.S. Balaban, M.W. Kay. Relieving the oxygen limitation in Krebs-Henseleit perfused hearts: Perfluorocarbon perfusion improves outcomes at the functional, cellular, and mitochondrial levels. 2014 Gordon Research Conference on Cardiac Regulatory Mechanisms.
- 2014 Jaimes III, R., **S. Kuzmiak-Glancy**, R. Covian, A.M. Wengrowski, B. Glancy, R.S. Balaban, M.W. Kay. Visible light absorbance spectroscopy of excised perfused hearts reveals increased myocardial and mitochondrial oxygenation with perfluorocarbon perfusate. 2014 Annual Meeting of the Biomedical Engineering Society.
- 2014 **Kuzmiak-Glancy, S.**, M.W. Kay. Cardiac ischemia impairs submaximal mitochondrial respiration without dramatic impairments of electron transport chain conductance. *Med Sci Sports Exerc* Volume 46 Issue 5: 745-745.
- 2014 Jaimes III, R., **S. Kuzmiak-Glancy**, N. Gillum-Posnack, M.W. Kay. Functional effects of pyruvate dehydrogenase activation by dichloroacetate and pyruvate in the normoxic heart. 2014 Annual dmvcAPS Meeting.
- 2013 **Kuzmiak, S.**, R. Jaimes III, L. Swift, M.W. Kay. Sustained perfusion boundaries are necessary for arrhythmias during ischemia/reperfusion in contracting hearts. 34th Annual Scientific Sessions of the Heart Rhythm Society.
- 2013 Jaimes III, R., **S. Kuzmiak**, N. Serafino, M.A. Azam, K. Nanthakumar, M.W. Kay. Dichloroacetate increases mitochondrial NADH concentration in excised contracting hearts when O₂ and ATP are non-limiting. 34th Annual Scientific Sessions of the Heart Rhythm Society.
- 2013 Wengrowski, A.M., R. Jaimes III, **S. Kuzmiak**, M.W. Kay. Effect of myocardial workload and oxygen supply on the dynamics of NADH fluorescence. 34th Annual Scientific Sessions of the Heart Rhythm Society.
- 2013 Azam, M.A., R. Jaimes III, **S. Kuzmiak**, S. Massé, C.S. Wagg, M. Kusha, P.F.H. Lai, J. Asta, M.W. Kay, G.D. Lopaschuk, K. Nanthakumar. Mapping modulation of mitochondrial redox state following ventricular fibrillation resuscitation using optical tools. 34th Annual Scientific Sessions of the Heart Rhythm Society.
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- 2013 **Kuzmiak, S.**, L. Swift, M.W. Kay. Regional hypo-reperfusion causes local elevations of NADH and arrhythmias in contracting hearts. Keystone Symposia: Mitochondria, Metabolism, and Myocardial Function.
- 2012 **Kuzmiak, S.**, D. Gardner, P. Pangle, H McInnis, W.T. Willis. Avian and mammalian skeletal muscle mitochondrial enzyme and electron transport chain activities. FASEB J 26:1b705.
- 2012 Gardner, D., **S. Kuzmiak**, W.T. Willis. NAD-linked isocitrate dehydrogenase activity is phosphate dependent in sparrow mitochondria. FASEB J 44:1b356.
- 2011 **Kuzmiak, S.**, W.T. Willis. Pyruvate sparing in avian and mammalian muscle mitochondria. FASEB J 25:859.12.
- 2011 Lefort, N., C. Sharoff, **S. Kuzmiak**, Z. Yi, P. Langlais, J. Cordova, C. Mielke, S. Ozkan, H. Chakker, W.T. Willis, L. Mandarino. Dysregulation of acetylation of mitochondrial proteins after exercise in insulin resistance. 71st Scientific Sessions of the American Diabetes Association.
- 2010 **Kuzmiak, S.**, E. Schmidt, K. Sweazea, W.T. Willis. Pyruvate sparing by fatty acid and glutamate in sparrow skeletal muscle mitochondria. Med Sci Sports Exerc Volume 42 Issue 10:110-111.
- 2010 **Kuzmiak, S.**, B. Glancy, K. Sweazea, W.T. Willis. Mitochondrial function in sparrow pectoralis muscle. FASEB J 24:1055.15.

Honors & Awards

- 2020 Maryland Research Excellence Celebration Honoree
- 2015 Mamie Doud Eisenhower Memorial Award; American Heart Association Women's Board of the Greater Washington Region
- 2011 The Norman James Research Award; 30th Annual Southwest Regional Chapter of the American College of Sports Medicine Conference
- 2010-2011 Douglas L. Conley Memorial Scholarship; Arizona State University
- 2010 Graduate Student Oral Presentation Award, 3rd Place; Arizona Physiological Society
- 2008 The Phi Beta Kappa Society; Rutgers University

Funding

Extramural

Source: American Heart Association
Scientific Development Grant

16SDG30770015

Kuzmiak-Glancy (PI)

07/01/16-06/30/2019

Matching myocardial energy supply to increases in demand: altered calcium activation in heart failure.

The goal of this project is to measure how intracellular calcium is altered in failing hearts and how altered calcium concentrations and kinetics affect the ability of the heart to produce energy and force.

Role: PI

Source: National Heart, Lung, & Blood Institute; National Institutes of Health
R21

R21HL132618

Kay (PI)

04/01/16-03/30/2018

Oxygen-rich perfusate that is compatible with optical assessments of myocardial physiology

The goal of the project is to use a custom-made perfluorocarbon emulsion to provide capillary oxygen reserve in perfused heart studies to examine myocardial metabolism, in-situ mitochondrial function, and electrophysiology without physiological artifacts associated with inadequate oxygenation.

Role: Investigator

Source: American Heart Association
Postdoctoral Fellowship Grant

14POST20490181

Kuzmiak-Glancy (PI)

07/01/14-06/30/2016

Changes in mitochondrial respiration and ROS production during heart failure: mitochondrial or cytosolic dysfunction?

The goal of this project is to determine the effect of cytosolic sodium and calcium overload, which occur during heart failure, on mitochondrial respiration and mitochondrial reactive oxygen species production.

Role: PI

Source: American Heart Association
Innovative Research Grant

14IRG18430027

Salvin (PI)

01/01/14-12/31/2015

Real-Time Assessment of Myocardial Function Using NADH Fluorescence

The goal of this project is to use NADH fluorescence to assess myocardial function in critically ill newborns who are recovering from extensive surgical correction of congenital heart defects.

Role: Investigator

Teaching

University of Maryland

2019-present KNES360: Exercise Physiology

- Redeveloping core course with colleagues to optimize student experience
- Updated laboratory materials to reflect new techniques
- 4 credits, 120 students

2018-present KNES691: Muscular Aspects of Exercise Physiology

- Developed graduate curriculum focused on current research on skeletal muscle structure and function
- 3 credits, 5 students

2018-present KNES497: Kinesiology Senior Seminar: Exercise Adaptations in Health and Disease

- Guide undergraduate seniors in writing a 30-reference capstone thesis
- 3 credits, 5 students

2017-present KNES464: Exercise Metabolism: Role in Health and Disease

- Developed curriculum focused on fuel utilization during exercise, mitochondrial function, and metabolic principles behind exercise regimes
- 3 credits, 30 students

The George Washington University

2012-2015 Principles and Practices of Biomedical Engineering Guest Lecturer

- Three 1 hour lectures per semester

Arizona State University

Graduate Teaching Associate

Department of Kinesiology

Fall 2008 - Summer 2011

Biology Department

Fall 2012 - Spring 2012

Student Training***University of Maryland****Graduate Students*

2017-present Harry Li, PhD Student

2018-present Yuan Liu, PhD Student

Undergraduate Honors Students

2017-present Jackson Durbin

Undergraduate Student Research Interns

2019-present Abdil Chowdy

2019-present Hodalis Gaytan,

2018-2019 Sigmund Tejada, BS

2017-present Jackson Durbin

2017-2018 Daniel Dagdag, BS

George Washington University*Provided laboratory research mentorship to graduate students in Matthew Kay's Lab*

Kara Garrott: Fall 2013 - Spring 2017

Angel Moreno: Fall 2013 – Spring 2017

Rafael Jaimes III: Fall 2012 – Summer 2015

Anastasia M. Wengrowski: Fall 2012 - Spring 2015

Service

2019-present Chapter Advisory Committee, The Greater Washington DC Area Physiological Society (dmvCAPS)

2018-2019 President, dmvCAPS

2016-2017 Treasurer, dmvCAPS

2014-Present Conference Organizing Committee, dmvCAPS

2011-2012 Arizona Physiological Society Executive Council Member

Reviewer for the Following Journals:

Medicine & Science in Sports & Exercise

Journal of Experimental Physiology

Current Opinion in Physiology

Journal of Visualized Experiments

Hypertension

Professional Affiliations

Member 2010 – Present

The American Physiological Society (APS)

Member 2010 – Present

The American College of Sports Medicine (ACSM)

Member 2013 – Present
Member 2014 – Present
Member 2010 – 2013

American Heart Association (AHA)
Greater Washington DC Area Physiological Society (dmvCAPS)
The Arizona Physiological Society (AzPS)