



**State of the Science Symposia Series:**  
**Metabolic Pathways and Therapeutics to**  
**Promote Resilience, Rehabilitation**  
**and Delayed Aging**

Friday, Oct 25th, 2019  
0800 – 1600

Uniform Services University for the Health Sciences  
Sanford Auditorium  
Bethesda, Maryland

*Presented by*

**The Center for Rehabilitation Science Research, Department of Physical Medicine and Rehabilitation at the Uniformed Services University for the Health Sciences**

**Department of Rehabilitation, Walter Reed National Military Medical Center**

**The University of Pittsburgh, School of Health and Rehabilitation Sciences  
Department of Rehabilitation Science and Technology  
Human Engineering Research Laboratories**

**The Department of Veterans Affairs**

**University of Pittsburgh School of Medicine Center for Continuing Education in the Health Sciences**

**State-of-the-Science Symposium:**

Metabolic Pathways and Therapeutics to Promote Resilience,  
Rehabilitation and Delayed Aging

Friday, Oct 25, 2019

USUHS, Sanford Auditorium, Bethesda, MD 20817

**State of the Science Symposium: Metabolic Pathways and Therapeutics to Promote Resilience, Rehabilitation and Delayed Aging**

Uniformed Services University of the Health Sciences, Oct 25, 2019

PRESENTED BY THE CENTER FOR REHABILITATION SCIENCE RESEARCH, THE DEPARTMENT OF PHYSICAL MEDICINE AND REHABILITATION AT THE UNIFORMED SERVICES UNIVERSITY FOR THE HEALTH SCIENCES; THE DEPARTMENT OF REHABILITATION, WALTER REED NATIONAL MILITARY MEDICAL CENTER; THE HUMAN ENGINEERING RESEARCH LABORATORIES (A VA RR&D CENTER OF EXCELLENCE); AND THE UNIVERSITY OF PITTSBURGH SCHOOL OF HEALTH AND REHABILITATION SCIENCES, DEPARTMENT OF REHABILITATION SCIENCE AND TECHNOLOGY.

**Course Directors:**

**Rory A. Cooper, PhD:** *Director/CEO, Human Engineering Research Laboratories, VA Pittsburgh Healthcare System Associate Dean for Inclusion, School of Health and Rehabilitation Sciences, University of Pittsburgh*

**Colonel (ret.) Paul F. Pasquina, MD,** *Professor & Chair, Department of PM&R and Director, Center for Rehabilitation Sciences Research, USUHS; Chief, Department of Rehabilitation, Walter Reed National Military Medical Center*

**Dr. William Kennedy Smith, MD,** *Assistant Professor, Department of PM&R, Uniformed Services University of Health Sciences Adjunct Assistant Professor, University of South Carolina School of Pharmacy*

**Overview and Objectives**

The overall objective of this course is to provide participants with an overview of current techniques utilized and programs implemented in the area of research and treatment related to metabolic pathways. The course will attain this objective by showcasing research talks regarding the metabolic pathways and therapeutics to increase resilience, rehabilitation and the ageing process.

**Who Should Attend**

The content of the sessions will benefit civilians, veterans, and military service members, their families, care-givers, community-based organizations, government agency personnel, students, residents, and healthcare providers.

We gratefully acknowledge the support of The Paralyzed Veterans of America for this symposium.



**Paralyzed Veterans  
of America**

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Uniformed Services University of the Health Sciences, Oct 25, 2019

- 0800 – 0830**    **Check-In | Continental Breakfast**
- 0830 – 0840**    **Opening Remarks - Welcome**  
COL (ret) Paul Pasquina, MD  
*Department Chief and Chair, PM&R*  
Walter Reed National Military Medical Center/Uniformed Services University of the Health Sciences (USUHS)
- 0840 - 0900**    **The Importance of Nutrition and Metabolic Research to Military Readiness and Resilience**  
Patricia Deuster, PhD, MPH, FACSM  
*Professor and Director Consortium for Health and Military Performance*  
Uniformed Services University of the Health Sciences (USUHS)
- 0900 – 0925**    **Overview of Calorie Restriction and Aging as a Field of Research**  
Yih-Woei Fridell, PhD  
*Program Officer Division of Aging Biology*  
National Institute on Aging, NIH
- 0925 – 0950**    **Time-Restricted Feeding**  
Rafael de Cabo, PhD  
National Institute on Aging
- 0950 – 1015**    **Low Calorie Diet for Chemotherapy Augmentation**  
Sebastian Brandhorst, PhD  
University of Southern California
- 1015 – 1040**    **Metformin**  
Jamie Nicole Justice, PhD  
Wake Forest School of Medicine
- 1040 - 1100**    **BREAK**
- 1100 – 1125**    **Glycolytic Inhibition**  
Donald Ingram, PhD  
Pennington Biomedical Research Center
- 1125 - 1150**    **Acarbose**  
Daniel Larry Smith, PhD  
University of Alabama at Birmingham
- 1150 – 1215**    **Sirtuin Activators and NAD Precursors**  
Joseph Baur, PhD  
University of Pennsylvania
- 1215 - 1300**    **LUNCH**
- 1300 – 1325**    **Nicotinamide Mononucleotide and eNAMPT**  
Shin-ichiro Imai, MD, PhD  
Washington University School of Medicine
- 1325 – 1350**    **Rapamycin**  
Arlan Richardson, PhD  
University of Oklahoma Health Science Center

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Uniformed Services University of the Health Sciences, Oct 25, 2019

**1350 – 1415 Ketone Bodies**  
John Newman, MD, PhD  
University of California San Francisco (UCSF)

**1415 – 1430 BREAK**

**1430 – 1455 Senolytic**  
Yi Zhu, PhD  
Mayo Clinic Rochester

**1455 – 1520 PARP Activators**  
Sajish Mathew PhD  
University of South Carolina College of Pharmacy

**1520 – 1545 Mitochondrial Derived Peptides**  
Su-Jeong Kim  
University of Southern California

**1545-1600 Closing Remarks/Adjournment**  
William K. Smith, MD  
*Conference Co-Chair, Assistant Professor*  
Department of PM&R, USUHS

COL(ret), Paul Pasquina, MD  
*Professor and Chair, Department of PM&R*  
WRNMMC & USUHS

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**COURSE DIRECTORS:**



**RORY A. COOPER, PHD**

*Director/CEO, Human Engineering Research Laboratories, VA Pittsburgh Healthcare System  
Associate Dean for Inclusion, School of Health and Rehabilitation Sciences, University of  
Pittsburgh*

*FISA Foundation/Paralyzed Veterans of America Distinguished Professor, Department of  
Rehabilitation Science and Technology, University of Pittsburgh*

*Professor, Departments of Bioengineering, Physical Medicine and Rehabilitation, and  
Orthopaedic Surgery, University of Pittsburgh*

**Contact Information:**

Human Engineering Research Laboratories  
VA Pittsburgh Healthcare System  
Bakery Square – 6425 Penn Avenue, Suite 400  
Pittsburgh, PA 15206  
[rcooper@pitt.edu](mailto:rcooper@pitt.edu)

**Rory A. Cooper, PhD** earned B.S. and M.Eng degrees in electrical engineering from California Polytechnic State University, San Luis Obispo in 1985 and 1986, respectively. He earned a Ph.D. degree in electrical & computer engineering with a concentration in bioengineering from University of California at Santa Barbara in 1989. He is *Associate Dean for Inclusion* in the School of Health and Rehabilitation Sciences, *FISA & Paralyzed Veterans of America (PVA) Professor* and *Distinguished Professor* of the Department of Rehabilitation Science & Technology, and professor of Bioengineering, Physical Medicine & Rehabilitation, and Orthopaedic Surgery at the *University of Pittsburgh (Pitt)*. Cooper is *Founding Director* and *VA Senior Research Career Scientist* of the *Human Engineering Research Laboratories*, a VA Rehabilitation R&D Center of Excellence in partnership with Pitt. Cooper is an adjunct professor in the Robotics Institute of *Carnegie Mellon University* and the Department of Physical Medicine & Rehabilitation of the *Uniformed Services University of Health Sciences*, and he was awarded Honorary Professor at *Hong Kong Polytechnic University* and *Xi'an Jiatong University* where he was awarded an *Honorary Doctorate*. Cooper has authored or co-authored over 350 *peer-reviewed journal publications*. He has over 25 patents awarded or pending. Cooper is the author of two books: “*Rehabilitation Engineering Applied to Mobility and Manipulation*” and “*Wheelchair Selection and Configuration*,” and co-editor of “*An Introduction to Rehabilitation Engineering*,” “*Warrior Transition Leader: Medical Rehabilitation Handbook*,” “*Promoting Successful Integration*,” and the award winning book “*Care of the Combat Amputee*.”

Dr. Cooper is a former President of RESNA, and a member of the IEEE-EMBS Medical Device Standards Committee. In 1988, he was a bronze medalist in the *Paralympic Games*, Seoul Republic of Korea. He was on the steering committee for the 1996 *Paralympic Scientific Congress* held in Atlanta, GA, and the Sports Scientist for the 2008 U.S. *Paralympic Team* in Beijing, China. In 2013, Cooper was awarded the *International Paralympic Scientific Achievement Award*. He has been a member of the U.S. Centers for Medicare and Medicaid Services – Medicare Advisory Committee, U.S. Secretary of Veterans Affairs Prosthetics & Special Disability Programs Advisory Committee, Chair of the National Advisory Board on Medical Rehabilitation Research, National Institute of Child Health & Human Development, U.S. Department of Defense Health Board Subcommittee on Amputation and Orthopedics, Board of Directors of Easter Seals, National Academy of Medicine Committee on Assistive Products and Devices, and National Academy of Sciences Keck Foundation Initiative on Human Health Span Steering Committee.

Dr. Cooper is a *U.S. Army veteran* with a spinal cord injury (SCI) and a Director of the Paralyzed Veterans of America Research Foundation. He is a *Civilian Aide to the Secretary of the Army*. He currently serves as a member of the *Honorary Board of Advisors Student Veterans of America*, Chair Honorary Board of Advisors Disabled Veterans National Foundation, *NSF Advisory Committee for Education and Human Resources*, *Command Council, Staff Sergeant Donnie D. Dixon Center for Military and Veterans Community Services*, and member of the *World Health Organization GATE Committee*. In 2009, Cooper was featured on a *Cheerios* cereal box for his achievements, and in August 2010, he with one of his robots was the

**State of the Science Symposium: Metabolic Pathways and Therapeutics to Promote Resilience, Rehabilitation and Delayed Aging**

Uniformed Services University of the Health Sciences, Oct 25, 2019

centerfold in *Popular Science* for his work in robotics to aid PwD and older adults. In 2014, *PN Magazine* included Cooper as one of the people who have transformed the lives of people with SCI; while *USO On Point* featured Cooper as one of the veterans who have most influenced the lives of veterans through technology. In 2015, *TIME* magazine produced a video on Cooper's work for their on-line magazine (<http://time.com/3975280/robotics-disabled/>). Drs. Cooper and his work have received coverage by *NY Times*, *Washington Post*, *TIME*, *CNN*, *Forbes*, *ESPN*, *NBC*, *BMJ*, *Reuters*, *NPR*, and other national and international media outlets. Cooper also shared his story and provided insights to best-selling author, Mary Ann McFadden, during the writing of her novel "*The Book Lover*." Dr. Cooper was selected by the Gen. James Amos, Commandant of the United States Marine Corps as the *Guest of Honor* for the "*Evening Parade*" hosted on 3 August 2012 by Michael P. Barrett, the 17<sup>th</sup> Sergeant Major of the Marine Corp. On 28 June 2016, Dr. Cooper was the *Guest of Honor* for the "*Sunset Parade*" hosted by Ronald E. Green, 18<sup>th</sup> Sergeant Major of the Marine Corps. He was recognized in the *Congressional Record of the United States Congress on Monday, July 27, 2009* and with a *Proclamation of Rory A. Cooper, PhD Day by the City of Pittsburgh on June 17, 2014* for his contributions to engineering and science on behalf of PwD and personal example. Further, Dr. Cooper's students have been the recipients of over 50 national and international awards. Dr. Cooper's highest awards include the *Samuel E. Heyman Service to America Service Medal*, *Secretary of Defense Meritorious Civilian Service Medal*, *National Guard Bureau "Minute Man Award"*; *AAAS Mentor Award*, *Joseph F. Engelberger Award*, *AIMBE Advocacy Award*, *Herny Viscardi Achievement Award*, *U.S. Army Distinguished Civilian Service Medal*, *U.S. Department of Veterans Affairs Diversity & Inclusion Excellence Award*, *Olin E. Teague Award*, *Pennsylvania Military & Veteran Hall of Fame*, *Order of Military Medical Merit*, *Order of Mercury*, *Order of Saint Maurice*, *Chapel of Four Chaplains Legion of Honor*, *DaVinci Lifetime Achievement Award*, and a member of the inaugural class of the *Spinal Cord Injury Hall of Fame*.



**COL (Ret.) PAUL F. PASQUINA, MD**

Professor & Chair, Department of PM&R

Director, Center for Rehabilitation Sciences Research, USUHS

Chief, Department of Rehabilitation, Walter Reed National Military Medical Center

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**Paul F. Pasquina, MD** is the Department Chief and Chair of the Physical Medicine & Rehabilitation and Director of the Center for Rehabilitation Sciences Research at Uniformed Services University of the Health Sciences, Walter Reed National Military Medical Center. Dr. Pasquina retired from the United States Army Medical Corps in 2012 as Chief of the Department of Orthopaedics and Rehabilitation at Walter Reed National Military Medical Center and the Director of the Center for Rehabilitation Sciences Research (CRSR) at the Uniformed Services University of the Health Sciences (USUHS). He is a graduate of the United States Military Academy at West Point and USUHS. In addition to being board certified in Physical Medicine & Rehabilitation (PM&R), he is also board certified in Electrodiagnostic Medicine and Pain Medicine. He completed a fellowship in sports medicine and remains interested in all aspects of musculoskeletal medicine especially as it applies to individuals with disabilities.

He is the specialty consultant to the Army Surgeon General for Physical Medicine & Rehabilitation and a Secretarial appointee on the Department of Veterans Affairs (VA) Advisory Committee for Prosthetics and Special Disabilities Programs. Dr. Pasquina has authored multiple book chapters, journal articles and policy papers. He has served as the PM&R Residency Program Director and Medical Advisor to the North Atlantic Regional Medical Command for quality healthcare. He has received multiple military awards, as well as awards for teaching and mentorship, including the U.S. Army's "A" Proficiency Designation for academic excellence, the Order of Military Medical Merit, and Honorary Fellow of the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA).



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Uniformed Services University of the Health Sciences, Oct 25, 2019



**Dr. William Kennedy Smith, MD**

Assistant Professor, Department of PM&R, Uniformed Services University of Health Sciences  
Adjunct Assistant Professor, University of South Carolina School of Pharmacy  
[smith.usuhs@gmail.com](mailto:smith.usuhs@gmail.com)

Dr. William Kennedy Smith is a physician, teacher, researcher, entrepreneur, social and community activist, husband and father.

As a physician, he is board certified in the field of physical medicine and rehabilitation and trained in lower extremity prosthetics. As a teacher and researcher, he holds the rank of Assistant Professor at the Uniformed Services University of Health Sciences and Adjunct Assistant Professor at the University of South Carolina College of Pharmacy. He also serves on the faculty of Northwestern University, where he taught courses on disability and international law. He was Principal Investigator of the National Institute for Disability and Rehabilitation Research (NIDRR) Rehabilitation Engineering Research Center on Improved Technology Access for Landmine Survivors, designated a “National Center of Excellence in Rehabilitation Engineering”. He has also served as Principle Investigator on several multi-year distance learning grants from the United States Department of defense. He conceptualized and led the design and delivery of the world’s first distance learning course in prosthetics, which was certified by the International Society of Prosthetics and Orthotics and successfully delivered in 7 war-affected countries. In 2007, Dr. Smith led efforts, under the World Bank’s Emergency Disability Project, to deliver training to over 100 Iraqi Health Professionals working with the War Wounded for the Iraqi Ministry of Health.

As an entrepreneur, Dr. Smith was awarded U.S. patent US8900141B2 for the development of an expert system for clinical documentation and decision support utilized by the Departments of Defense and Veterans Affairs to help manage patients with traumatic Brain Injury. He founded MedRed LLC, named by FEDHEALTHIT as a leading small business with domain expertise in clinical care delivery and health information systems. Under Dr. Smith’s leadership, MedRed beat out a number of larger and better-known technology companies, including Hewlett Packard, Google and IBM, to finish first in the inaugural Department of Veterans Affairs Industry Innovation Competition and later finished first in the Department of Veteran Affairs Medical Appointment Scheduling Contest. MedRed is a member of the Leidos Partnership for Defense Health team awarded the \$4.3-9 billion Defense Healthcare Management System Modernization (DHMSM) contract with the U.S. Department of Defense.

In the field of social activism, Dr. Smith founded Physicians Against Land Mines, a co-recipient of the 1997 Nobel Peace Prize. He organized the first meeting and was a founding steering committee member of the International Disability Caucus, which organized civil society groups to participate in negotiations for the United Nations Convention on the Rights of People with Disabilities. This marked the first time Civil Society groups were allowed direct participation in treaty negotiations at the United Nations and the CRPD stands as the most rapidly negotiated treaty with the greatest number of first-day signatories in United Nation’s history. Dr. Smith also served as a founding board member of the National Organization on Fetal Alcohol Syndrome.

As a community activist, Dr. Smith currently Chairs Advisory Neighborhood Commission 2A in Washington DC. He has won three general elections and twice been unanimously selected to chair the Commission. In that role, he leads a variety of community efforts in the areas of education, health care, transportation, historic preservation, public safety and other matters. Dr. Smith and his wife Anne were married in 2011. They have four children, India, Stephen and Mara and Liam.

**Conference Organizing Committee (alphabetical):**

- Charles Bennett, M.D., Ph.D., M.P.P  
Josie M. Fletcher Professor / SC SmartState Center in Medication Safety and Efficacy / Clinical Pharmacy and Outcomes Sciences College of Pharmacy, University of South Carolina
- Donald K. Ingram, PhD  
Professor, Nutritional Neuroscience and Aging Laboratory Director, Animal Metabolism and Behavior Core, Pennington Biomedical Research Center, Louisiana State University, Baton Rouge, LA

**State of the Science Symposium: Metabolic Pathways and Therapeutics to Promote Resilience, Rehabilitation and Delayed Aging**

Uniformed Services University of the Health Sciences, Oct 25, 2019

**GUEST FACULTY AND PRESENTERS**

**Patricia Deuster, Ph.D., MPH, FACSM**, Professor, Director, Consortium for Health and Military Performance, Department of Military and Emergency Medicine, USU



**Topic: The Importance of Nutrition and Metabolic Research to Military Readiness and Resilience**

Dr. Deuster, a Certified Nutrition Specialist, has conducted research in the area of sports and warrior nutrition for over 25 years and has published well over 100 peer-reviewed papers relating to stress, nutrition, and physical performance in the military. She authored of the first U.S. Navy SEAL Nutrition Guide sponsored by U.S. Special Operations Command and was commissioned to update the nutrition guide for the United States Special Operations Commands (USSOCOM).

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**Yih-Woei Fridell, Ph.D**, Program Officer, National Institute on Aging



**Topic: Overview of Calorie Restriction and Aging as a Field of Research**

Yih-Woei Fridell joined the Genetics and Cell Biology Branch, Division of Aging Biology at the National Institute on Aging (NIA), NIH in June 2015 as the Program Officer overseeing an extramural research portfolio encompassing nutrient sensing, caloric restriction, mitochondrial biology, stress signaling, and metabolic regulation. Before joining NIA, Yih-Woei had been an NIA- and NINDS-funded investigator at the University of Connecticut working on mitochondrial uncoupling in aging and neuroprotection. She received her Ph.D. in Molecular Biology from the University of North Carolina at Chapel Hill.

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**Rafael de Cabo Ph.D.**, Senior Investigator, Translational Gerontology Branch, National Institute on Aging



**Topic: Time-restricted Feeding**

After receiving his B.S. and M.S. from the University of Cordoba, Spain, Dr. de Cabo earned his Ph.D. in 2000 from the Department of Foods and Nutrition at Purdue University. Upon completion of his graduate education, he received a postdoctoral position in the Laboratory of Neurosciences at the National Institute on Aging in Baltimore, Maryland. In 2004, he was appointed as a tenure track investigator in the Laboratory of Experimental Gerontology, where he now heads the Aging, Metabolism, and Nutrition Unit (AMNU). The AMNU applies both physiological and tissue-specific molecular approaches to investigate effects of nutritional interventions on basic mechanisms of aging and age-related diseases. Research within his unit strives to identify protective mechanisms invoked by caloric restriction and to evaluate the consequences of dietary interventions on lifespan, pathology, and behavioral function. The AMNU balances the exploration of in vivo rodent, as well as in vitro, paradigms of caloric restriction. Dr. de Cabo is an active member of the Board of the American Aging Association.

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**State of the Science Symposium: Metabolic Pathways and Therapeutics to Promote Resilience, Rehabilitation and Delayed Aging**

Uniformed Services University of the Health Sciences, Oct 25, 2019

**Sebastian Brandhorst, Ph.D.**, Research Assistant Professor of Gerontology, University of Southern California



**Topic: Low Calorie Diet for Chemotherapy Augmentation**

Dr. Brandhorst has scientific training in cell biology, molecular biology, medicine, and biochemistry, all of which are highly relevant to his focus on biogerontology research to identify the mechanisms underlying cellular protection, as well as health- and lifespan-regulation, and their translation into clinical applications. Dr. Brandhorst has performed research related to aging in yeast and *C. elegans* since 2009, after which he began to utilize mouse models to study the role of growth hormone/Insulin-like growth factor 1 (IGF-1) signaling as a major regulatory pathway that modulates lifespan and age-associated diseases/pathologies; particularly cancer. Subsequently, he focused on the role and application of short-term starvation, low calorie and/or low protein diets and fasting-mimicking diets on health and lifespan in pre-clinical to clinical studies.

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**Jamie Nicole Justice, Ph.D.**, Assistant Professor, Gerontology, Wake Forest School of Medicine



**Topic: Metformin**

Dr. Justice's work focuses on targeting biological aging processes to prevent or delay functional decline and age-related chronic diseases collectively, rather than one at a time. Her research training that spans disciplines, species, and intervention strategies. Current research includes: 1) efforts launch the clinical trial, Targeting Aging with METformin (TAME), which is designed to facilitate regulatory approval for the use of a drug for the purpose of slowing aging; 2) development of biomarkers of biological aging; 3) investigating the therapeutic potential of targeting the biologic aging hallmark cellular senescence in humans.

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**Don Ingram, Ph.D.**, Professor, Nutritional Neuroscience and Aging, Pennington Biomedical Research Center



**Topic: Glycolytic Inhibition**

Dr. Ingram has held several positions at PBRC including Adjunct Professor, School of Human Ecology and has served on the Steering Committee, Director, Animal Metabolism and Behavior Core. He was President of the Gerontological Society of America between 2010 and 2011 and is currently Professor in the Geriatrics Section, Department of Internal Medicine, LSUHSC-New Orleans, LA. Dr. Ingram's research has focused on nutritional and pharmacological interventions designed to slow the rate of aging and thus reduce the risk of age-related disease and functional decline. The major area of investigation involves *in vivo* rodent models and *in vitro* cellular models to identify protective mechanisms invoked by calorie restriction.

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**Daniel Larry Smith, Ph.D.**, Assistant Professor, Department of Nutrition Sciences, University of Alabama at Birmingham



**Topic: Acarabose**

Dr. Smith's research focuses on nutrition and metabolism in relationship to aging and disease using a number of model organisms including budding yeast, zebrafish, and rodents. He is currently exploring non-invasive methods to quantify and study brown adipose tissue *in vivo* using magnetic resonance imaging, high-throughput quantitative methods to study the effect of nutrition on cellular lifespan using the yeast model and dietary interventions/ optimization in both zebrafish and mice to increase lifespan and prevent disease.

**State of the Science Symposium: Metabolic Pathways and Therapeutics to Promote Resilience, Rehabilitation and Delayed Aging**

Uniformed Services University of the Health Sciences, Oct 25, 2019

**Joseph Baur, Ph.D.**, Associate Professor of Physiology, University of Pennsylvania

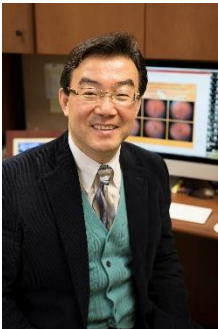


**Topic: Sirtuin Activators and NAD Precursors**

The Baur lab is interested in the basic mechanisms that lead to aging, the most important risk factor for many diseases, including cancer, cardiovascular disease, and neurodegenerative disorders. Although the causes of aging are not known, it can be delayed experimentally in rodents by decreasing energy intake in the absence of malnutrition (caloric restriction, CR). Elucidating the mechanism(s) by which CR extends lifespan is expected to yield insights into the causes of aging and to highlight new therapeutic approaches to the prevention and treatment of age-related diseases.

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**Shin-ichiro Imai, M.D., Ph.D.**, Professor, Dept of Developmental Biology, Dept of Medicine (joint), Washington University School of Medicine, St. Louis, Missouri, USA



**Topic: Nicotinamide Mononucleotide and eNAMPT**

Received his MD and PhD degrees in 1989 and 1995, respectively, from Keio University School of Medicine in Tokyo, Japan, where he studied cellular aging-associated transcriptional regulation in human fibroblasts and proposed his “Heterochromatin Island Hypothesis of Aging.” Dr. Imai’s long-term goal is to achieve “productive aging” by understanding the spatial and temporal dynamics of our physiological system and developing interventions for age-associated complications. His work focuses on three key tissues that have been identified as basic elements in mammalian aging and longevity control: the hypothalamus as the control center, skeletal muscle as an effector and adipose tissue as a modulator.

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**Arlan Richardson, Ph.D.**, Donald W Reynolds Endowed Chair of Aging Research Professor of Biochemistry & Molecular Biology, University of Oklahoma Health Science Center and Research Career Scientist



**Topic: Rapamycin**

Dr. Richardson’s research has focused on various aspects of aging, e.g., (i) the effects of aging and dietary restriction on gene expression in rats and mice, (ii) testing the oxidative stress theory of aging by measuring the effect of alterations in the antioxidant defense system on the lifespan and pathology of transgenic and knockout mice, and (iii) most recently, studying the effect of rapamycin on aging and age-related diseases. His group was the first to show that dietary restriction altered gene expression through changes in specific transcription factors. He is currently studying the mechanism responsible for genotype differences in response to dietary restriction using mouse models. Over the past decade, Dr. Richardson’s group has used over 15 transgenic and knockout mouse models with alterations in the antioxidant defense system to study how increased or decreased oxidative damage affects survival, e.g., transgenic/knockout mice for catalase, Cu/Zn-superoxide dismutase, Mn-superoxide dismutase, thioredoxin, glutathione peroxidase 1 and 4, and methionine sulfoxide dismutase. He is currently using conditional knockout and transgenic mice to Cu/Zn-superoxide dismutase to study the weather oxidative damage/stress induces cellular senescence which leads to accelerated aging and age-related diseases.

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Uniformed Services University of the Health Sciences, Oct 25, 2019

**John Newman, MD Ph.D.**, Assistant Professor, Medicine, University of California San Francisco (UCSF)



**Topic: Ketone Bodies**

Dr. Newman's career goal is to translate our expanding understanding of aging biology to improve the care and help maintain the independence of older adults. His research at the Buck Institute studies the molecular details of how diet and fasting regulate the genes and pathways that in turn control mechanisms of aging, focusing on the ketone body beta-hydroxybutyrate. Dr. Newman is a pioneer in understanding the molecular signaling activities of ketone bodies, such as in regulating epigenetics and inflammation, and was the first to show that a ketogenic diet can extend healthy lifespan and improve memory in aging mice. His work has been published in *Cell Metabolism*, *Science*, *Annual Reviews of Nutrition*, and other journals. He has been invited to speak about ketone bodies and aging biology at national and international meetings including the American Geriatrics Society, Obesity Week, American Aging Association, and the Japanese Society of Anti-Aging Medicine. Dr. Newman is also a geriatrician who cares for hospitalized older adults at UCSF and the San Francisco VA Medical Center, focusing on preserving mobility and preventing delirium. He completed an MD/PhD at the University of Washington, then residency and fellowship training at UCSF. He is an NIA Beeson Scholar.

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**Yi Zhu, Ph.D.**, Research Fellow, Mayo Foundation for Medical Education and Research



**Topic: Senolytics**

Dr. Zhu's recent research focuses on delaying, preventing, or alleviating multiple age-related diseases. Her goal is to develop drugs, which specifically target and eliminate senescent cells, that play a causal role in many age-related chronic diseases. Integration of genomic and proteomic data have permitted the elucidation of a detailed network of pro-survival pathways that constitute a virtual Achilles' heel for senescent cells. "Knocking down" key components of these pathways cause apoptosis in these target cells. After screening hundreds of small molecules that inhibit key elements of the target pathways, Dr. Zhu and her team identified therapeutic compounds that mimic the desired "knock-down" effect and named these compounds "senolytic drugs" - drugs that selectively eliminate senescent cells through apoptosis. Based on this approach, Dr. Zhu and her team have, to date, developed a number of senolytic drugs, currently being translated into clinical therapeutics, that hold a great transformational promise. Senolytic drugs, that have already been identified, have been shown to ameliorate a wide range of age-related cardiac, vascular, metabolic, neurological, radiation-induced, chemotherapy-induced, renal, and pulmonary dysfunction, as well as improve mobility and reduce frailty in both animal models and human trials.

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**Sajish Mathew, Ph.D.**, Assistant Professor, Drug Discovery and Biomedical Science, College of Pharmacy, University of South Carolina



**Topic: PARP Activators**

Dr. Mathew received his Ph.D. at the Institute of Technology, Kanpur in his native India before completing his post-doctoral fellowship at the Scripps Research Institute in La Jolla, California. He has done significant work elucidating important mediators of cellular aging and his current research focus is on understanding and exploring the potential of NAD<sup>+</sup> metabolism and signaling through SIRTuins and PARPs in the regulation of the newly identified biology of tRNA synthetases.

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**State of the Science Symposium: Metabolic Pathways and Therapeutics to Promote Resilience, Rehabilitation and Delayed Aging**

Uniformed Services University of the Health Sciences, Oct 25, 2019

**Su-Jeong Kim, PhD**, Assistant Professor of Gerontology, USC Leonard Davis School of Gerontology



**Topic: Mitochondrial Derived Peptides**

Su-Jeong Kim, PhD, researches the functional roles of mitochondrial DNA variants in age-related diseases or the therapeutic potential of mitochondrial-derived peptides in age-related diseases. She trained in the field of Parkinson's disease (PD) during her Ph.D. and currently focus on the roles of mtDNA SNP and a mitochondrial peptide called SHLP2 in PD. She uses a population-based database, human cell culture, and mice models in her research. She also investigates the key features of mitochondrial physiology, mitochondrial-derived peptides, and mitochondrial long noncoding RNAs and its binding proteins during cellular senescence. She is studying the importance of the mitochondrial alteration during senescence and the senolytics targets.

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**Faculty Disclosure**

All individuals in a position to control the content of this education activity including members of the planning committee, speakers, presenters, authors, and/or content reviewers have disclosed all relevant financial relationships with any entity producing, marketing, re-selling, or distributing health care goods or services, used on, or consumed by, patients.

The following relevant financial relationships were disclosed:

- Sebastian Brandhorst is a Scientific Director for the Create Cures Foundation.
- Donald K. Ingram is a consultant for Isagenix International, Gilbert, AZ and Suntory Wellness, Osaka, Japan and is a stockholder for GeroScience, Inc, Baltimore, MD and Prolongevity Technologies, Baton Rouge, LA.
- Joseph Baur received grant and research support form Metro Biotech, Elysium Health, Calico (Applied) he also serves as a consultant for Mitobridge, and Calico.
- Shin-ichiro Imai receives patent and licensing fees from MetroBiotech, USA, and Teijin Limited, Japan, through the Washington University.
- John Newman is a stockholder for BMB Therapeutics, Ltd.
- Yi Zhu is a stockholder and receives patents fee on senolytic drugs, held by Mayo Clinic, and licensed to Unity Biotechnology. He has received stocks from Unity Biotechnology.

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Uniformed Services University of the Health Sciences, Oct 25, 2019

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