



DEPARTMENT OF PHYSIOLOGY

DEPARTMENT OF PHYSIOLOGY FACULTY

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Thomas A. Gerwin Chair of Excellence
in Physiology

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Julio Cordero-Morales, PhD

Associate Professor

Ioannis Dragatsis, PhD

Professor

Zheng Fan, PhD

Professor

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Senior Executive Associate Dean,
College of Medicine

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Maury W. Bronstein Professor

Salvatore Mancarella, PhD

Associate Professor

Helena Parfenova, PhD

Professor

Kaushik Parthasarathi, PhD

Associate Professor

Gadiparthi N. Rao, PhD

George and Elizabeth Malloy Professor

Donald B. Thomason, PhD

Professor
Dean, College of Graduate Health Sciences

Gabor J. Tigyi, MD, PhD

Van Vleet Professor

Valeria Vásquez, PhD

Associate Professor

PHYSIOLOGY FACULTY

RECEIVE PROMOTIONS

The Department of Physiology is excited to announce that three of its faculty members have received promotions. Dr. Adebowale Adebisi has been promoted from Associate Professor to Professor; Dr. Valeria Vásquez has been promoted from Assistant Professor to Associate Professor; and Dr. Salvatore Mancarella has been promoted from Assistant Professor to Associate Professor. We are extremely proud of these faculty member's continued accomplishments and are thrilled to celebrate with them on this wonderful achievement in their careers.



Dr. Adebisi



Dr. Vásquez



Dr. Mancarella



VÁSQUEZ AND CORDERO LABS

PUBLISH ARTICLE IN NATURE COMMUNICATIONS

Dr. Valeria Vásquez and Dr. Julio Cordero-Morales, both Associate Professors in the Department of Physiology, recently had an article published in the prestigious high-impact journal *Nature Communications*. The article, entitled "A dietary fatty acid counteracts neuronal mechanical sensitization," was published on June 19, 2020. In the article, Vásquez, Cordero, and their teams report on how margaric acid (MA), a natural product, inhibits PIEZO2 function and counteracts neuronal mechanical sensitization, thus revealing a key region for channel inhibition.

Nature Communications is part of the *Nature* family of journals, which were first published in 1869 and quickly became the leading international weekly journal of science. The Communications journals, a group of high-quality, selective, open access multidisciplinary journals, published their first articles in 2018. Nature Research serves the research community by publishing its most significant discoveries – findings that advance knowledge and address some of the greatest challenges that we face as a society today.

The full cite for the article is Romero LO, Caires R, Nickolls AR, Chesler AT, Cordero-Morales, JF, Vásquez V. A dietary fatty acid counteracts neuronal mechanical sensitization. *Nat Commun* 11, 2997 (2020). doi.org/10.1038/s41467-020-16816-2. The article can also be accessed at nature.com/articles/s41467-020-16816-2.

To learn more about Dr. Vásquez and her research, please contact her at vvasquez@uthsc.edu. To find out more about Dr. Cordero-Morales's research, please contact him at jcordero@uthsc.edu. For more information about *Nature Communications*, please visit nature.com/ncomms/.

DR. GÁBOR TIGYI AND TIGYI GROUP

PUBLISHES ARTICLES IN LEADING JOURNALS



Dr. Gábor Tigyi

Dr. Gábor Tigyi, Harriet Van Vleet Endowment Professor of Physiology, and the Tigyi Group has had two articles published recently. These articles appear in leading journals including *Cancers* and the *Journal of the American Chemical Society*.

The Tigyi Group's article in *Cancers* is entitled "Regulation of tumor immunity by lysophosphatidic acid," and focuses on the immunomodulatory actions of LPA in baseline immunity to provide a broad understanding of the subject with a special emphasis on LPA and cancer immunity, highlighting the latest progress in this area of research. The full cite for this article is Lee SC, Dacheux MA, Norman DD, Balázs L, Torres RM, Augelli-Szafran CE, Tigyi GJ. Regulation of Tumor Immunity by Lysophosphatidic Acid. *Cancers* 2020, 12, 1202; doi.org/10.3390/cancers12051202.

Dr. Tigyi's second article, "Optical control of lysophosphatidic acid signaling," appeared in the June 17 issue of the *Journal of the American Chemical Society*, and reports on a photoswitchable analogue of LPA, termed AzoLPA, which contains an azobenzene photoswitch embedded in the acyl chain. AzoLPA enables optical control of LPA

receptor activation, shown through its ability to rapidly control LPA-evoked increases in intracellular Ca²⁺ levels. The full cite for the article is Morstein J, Dacheux MA, Norman DD, Shemet A, Donthamsetti PC, Citir M, Frank JA, Schultz C, Isacoff EY, Parrill AL, Tigyi GJ, Trauner D. Optical Control of Lysophosphatidic Acid Signaling. *J. Am. Chem. Soc.* 2020, 142, 24, 10612-10616; doi.org/10.1021/jacs.0c02154.

To learn more about Dr. Tigyi's research endeavors, please contact him at gtigyi@uthsc.edu.



cancers



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DR. JONATHAN JAGGAR AND JAGGAR LAB

PUBLISH ARTICLE IN ELIFE

Dr. Jonathan Jaggar, Maury Bronstein Endowed Professor of Physiology, and his lab members recently published a paper in *eLife*. The article is entitled "Intravascular flow stimulates PKD2 (polycystin-2) channels in endothelial cells to reduce blood pressure," and was published in the May 4, 2020 issue of the journal. Jaggar and his team observe in their work that flow stimulates PKD2 channels in endothelial cells, leading to SK/IK channel and eNOS activation, hyperpolarization, vasodilation, and a reduction in systemic blood pressure. Ultimately, they find that PKD2 channels are a major component of functional flow sensing in the vasculature, thus representing a step forward in understanding the physiological significance of the PKD2 protein and its dysfunction in patients with Autosomal Dominant Polycystic Kidney Disease (ADPKD), the most prevalent monogenic human disease worldwide, as well as other cardiovascular diseases.

eLife is a nonprofit organization created by funders and led by researchers. Their mission is to accelerate discovery by operating a platform for research communication that encourages and recognizes the most responsible behaviors. *eLife* works across three major areas: publishing, technology, and research culture. Its publishing arm aims to

publish work of the highest standards and importance in all areas of biology and medicine, while exploring creative new ways to improve how research is assessed and published.

The full cite for Dr. Jaggar's article is MacKay CE, Leo MD, Fernández-Peña C, Hasan R, Yin W, Mata-Daboin A, Bulley S, Gammons J, Mancarella S, Jaggar JH. Intravascular flow stimulates PKD2 (polycystin-2) channels in endothelial cells to reduce blood pressure. *eLife* 2020;9: e56655. doi.org/10.7554/eLife.56655.

For more insights about Dr. Jaggar, his lab, and his research, please contact him at jjaggar@uthsc.edu. For more information about *eLife* and the aims and scopes of its various areas of focus, please visit elifesciences.org/about/aims-scope.



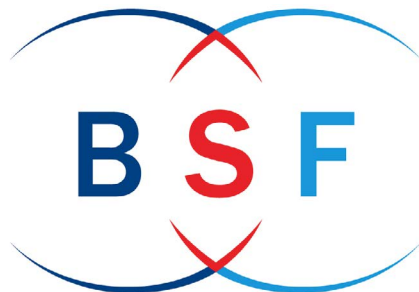
eLife

DR. VALERIA VÁSQUEZ RECEIVES RESEARCH GRANT FROM UNITED STATES - ISRAEL BINATIONAL SCIENCE FOUNDATION

Dr. Valeria Vásquez was recently notified that her research proposal entitled “Studying prolonged nociceptors sensitization by TRPV1 combining a spider toxin and *C. elegans*” was approved for support by the United States-Israel Binational Science Foundation (BSF). This grant is supported for four years. Dr. Vasquez will be collaborating with Dr. Avi Priel, professor in the School of Pharmacy Center for Research on Pain at the Hebrew University of Jerusalem in Israel.

Dr. Vásquez’s and Dr. Priel’s grant focuses on studying how persistent activation of the pain response is initiated. They will use a unique natural pharmacological tool they recently identified and a genetically-engineered animal model to study the molecular, cellular and behavioral changes underlying the development of chronic pain. This study will enhance understandings of how chronic pain is induced and will facilitate the development of specific analgesics to treat this debilitating condition.

The U.S.-Israel Binational Science Foundation (BSF) promotes scientific relations between the U.S. and Israel by supporting collaborative research projects in a wide range of basic and applied scientific fields, for peaceful and non-profit purposes.



Founded in 1972 by an agreement between the United States and Israel, the BSF is an independent body, directed by a board of governors consisting of five American and five Israeli members. Its base of operation is in Israel.

Funding for the research derives from the annual interest on an endowment contributed in equal parts by the two countries. Grants are made on a competitive, peer reviewed basis, juried by leading scientists from the U.S., Israel and around the world. Eligible projects must demonstrate outstanding scientific merit and clear collaboration between Israeli and American researchers from institutions throughout the two countries.

To learn more about Dr. Vásquez’s research, please reach out to her at vvasquez@uthsc.edu. For more about the work done by the US-Israel Binational Science Foundation, please visit bsf.org.il/.

DR. GÁBOR TIGYI HONORED AS RESEARCH PROFESSOR BY SEMMELWEIS UNIVERSITY ACADEMIC SENATE

Dr. Gábor Tigyi was recently bestowed the title “Research Professor” by the Academic Senate of Semmelweis University in Budapest, Hungary. Dr. Tigyi’s appointment was announced on July 2 as part of the 250th Celebrations of the University and recognized Dr. Tigyi’s 15 years of productive collaboration with investigators at Semmelweis University.

Semmelweis University is named after Ignaz Semmelweis, who was a pioneer in the discovery of antiseptic procedures. Described as the “savior of mothers,” Semmelweis discovered that the incidence of puerperal fever (also known as “childbed fever”) could be cut drastically by the use of hand disinfection in obstetrics clinics.

Dr. Tigyi, who is currently Harriet Van Vleet Endowment Professor in Physiology, as well as Associate Vice Chancellor for Research, Global Cooperation, and Industry Relations previously received an honorary Doctorate from Semmelweis University in 2016. Dr. Tigyi has been engaged in a very successful collaboration with the Institute of Clinical Experimental Research at Semmelweis University for almost ten years.

For more about Dr. Tigyi and his research collaborations, please contact him at gtigyi@uthsc.edu. To learn more about Semmelweis University, please visit semmelweis.hu/english/.



NIH GRANTS AWARDED

TO PHYSIOLOGY DEPARTMENT FACULTY

The Department of Physiology is pleased to announce that four of its faculty members have been awarded funding from the NIH. This funding is indicative of the high quality research and cutting-edge innovative work being done by our department and of the NIH's commitment to furthering and recognizing the efforts of our investigators.



Dr. Adebawale Adebisi, Professor of Physiology, was awarded funding for two NIH R01 grants. The first grant is for \$1.8 million over four years from the NHLBI for a project entitled "Control of microvascular function by ion channels." The central objective of this project is to study how ion channels in nerve endings that impinge on blood vessels regulate blood flow and their roles in vascular and kidney dysfunctions caused by oxidative stress. Dr. Adebisi stated, "We anticipate that this project will unravel new insights into the mechanisms that control vascular reactivity and their roles in cardiovascular and kidney disorders, thereby providing potential therapeutic targets for the prevention or treatment of these life-threatening diseases."

Dr. Adebisi's second grant is for \$2.7 million over five years from the NIDDK and is for a project entitled "Vascular ion channels and microcirculation in neonatal urinary tract obstruction." This project aims to investigate vascular mechanisms that underlie impairment of kidney blood flow caused by urinary tract obstruction in newborns. The proposed studies in this project will accrue mechanistic findings that will not only improve our understanding of kidney injury but may lead to the future development of diagnostic markers or therapeutic targets for obstructive kidney insufficiency in newborns.

In addition, Dr. Julio Cordero-Morales, Associate Professor

of Physiology, was awarded funding for an NIH R21 grant. Dr. Cordero received his funding from the NINDS in their Exploratory Neuroscience Research Grant category for his project entitled "Spectroscopic analyses of TRPV1 during gating." His research focuses on generating new strategies to alleviate pain hypersensitivity in a variety of conditions such as arthritis, aging, tissue injury, and cancer. The transient receptor potential (TRP) channels are promising targets in the treatment of a variety of pain syndromes, since they are known to play critical roles in the detection of harmful stimuli in the nervous system. Dr. Cordero's proposed study will provide a structural dynamic framework of TRP channels as a basis for understanding their role in neuronal activation and guiding the development of novel analgesics through structure-based drug design.

The department's third investigator to receive funding is Dr. Salvatore Mancarella, Associate Professor of Physiology, who was awarded funding for an NIH R01 grant. Dr. Mancarella's R01 will be used to support his work on "Defining the roles of Orai3 channel in cardiomyocytes and cardiomyopathy," which is the first study examining the role of Orai3, a recently-discovered calcium channel, in idiopathic dilated cardiomyopathy (DCM), a disease of the myocardium leading to heart failure and death. Dr. Mancarella states that the results from his project could be the basis for new therapeutic approaches against heart failure induced by DCM.

Finally, Dr. Zhongjie Sun, Professor and Chair of the Department of Physiology, was awarded funding for an NIH R01 grant. The objective of Dr. Sun's project, "Investigation into Arterial Stiffness," is to investigate the epigenetic mechanism of aging-associated arterial stiffness and hypertension in order to craft effective interventions for aging-associated arterial stiffness due to unknown etiologies.

Congratulations to these investigators on receiving such wonderful recognition from the NIH!

ADEBIYI LAB

RECEIVES 2020 OUTSTANDING ANNUAL LABORATORY INSPECTION AWARD

Dr. Adebawale Adebisi and his lab were recently awarded the 2020 Outstanding Annual Laboratory Inspection Award from the UTHSC Office of Research Safety Affairs. This determination was based on Dr. Adebisi's lab safety inspection, the nature of hazards managed in his labs, and the number of labs or personnel under Dr. Adebisi's oversight. This recognition demonstrates Dr. Adebisi's commitment to providing a safe and productive environment for students, employees, and visitors to work and study.

For more information about Dr. Adebisi's work, please contact him at aadebiyi@uthsc.edu. To learn more about the UTHSC Office of Research Safety Affairs, please visit uthsc.edu/research/safety/index.php.



DRS. CORDERO AND VÁSQUEZ

AWARDED FUNDING FROM UTHSC NEUROSCIENCE INSTITUTE

Dr. Julio Cordero-Morales and Dr. Valeria Vásquez recently received notification that their project entitled “Increased levels of Eicosapentaenoic Acid Promote Vasodilation and Decrease Tactile Allodynia” received high rankings from the seven reviewers of the Neuroscience Executive Committee and, as a result, will be funded for \$30,000.

The Neuroscience Institute at UTHSC is supported by the Neuroscience Center of Excellence, one of several Centers of Excellence established by the Tennessee Higher Education Commission in 1985. Their mission is to develop and support multidisciplinary research and training in neuroscience. The Neuroscience Institute features basic science and clinical members spanning 10 departments, and fosters neuroscience research through support of neuroscience track graduate students and postdocs, the Neuroscience Imaging Center and Behavioral Core, a robust seminar series, and start-up packages for new faculty.

To learn more about the work being done by Dr. Cordero and Dr. Vasquez, make sure to visit their lab webpage at corderovasquezlab.com/. For more information about the UTHSC Neuroscience Institute, please visit uthsc.edu/neuroscience-institute/.

DR. JEREMIAH AFOLABI

SELECTED FOR THE AMERICAN SOCIETY OF NEPHROLOGY KIDNEY TREKS PROGRAM

Jeremiah Afolabi, DVM, MVSc, Physiology graduate student currently working in the lab of Dr. Adebawale Adebisi, was selected to participate in the



American Society of Nephrology TREKS (Tutored Research and Education for Kidney Scholars) Program. This program consists of a weeklong course held at the Mount Desert Island Biological Laboratory in Bar Harbor, Maine. Dr. Afolabi will also receive travel support, room, board, and tuition as part of the program.

The Kidney TREKS program is an initiative established by the American Society of Nephrology to foster interest in careers in nephrology and research through a week-long intensive research course retreat and long-term mentorship program. The course in which Dr. Afolabi will be participating is organized around several research modules that examine all aspects of kidney function. Modules include water homeostasis, salt homeostasis and secretion, acid/base homeostasis, glomerular function, and personalized medicine and genetics. In each module, classical experiments using model systems (toad, zebrafish, roundworm, shark, *Xenopus* oocyte) are combined with modern molecular techniques.

To find out more about Dr. Afolabi and his work with the Adebisi lab, please contact him at jafolabi@uthsc.edu. For more information about the American Society of Nephrology and its TREKS program, please visit asn-online.org/education/training/students/treks/.

DR. ADEBOWALE ADEBIYI

AWARDED 2020 JOHN F. PERKINS, JR. RESEARCH CAREER ENHANCEMENT AWARD FROM APA

Dr. Adebawale Adebisi has been awarded the 2020 John F. Perkins Research Career Enhancement Award (RCEA) from the American Physiological Society. The RCEA supports the awardee to develop new skills in areas of emerging interest. The award will support Dr. Adebisi’s research on the canonical Notch signaling pathway in podocytes.

For more insight into this project or any of Dr. Adebisi’s other research, please contact him at aadebisi@uthsc.edu. To learn more about the John F. Perkins, Jr. RCEA and other awards bestowed by the American Physiological Society, please visit physiology.org/meetings-awards/awards/researchers/rcea?SSO=Y.



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