

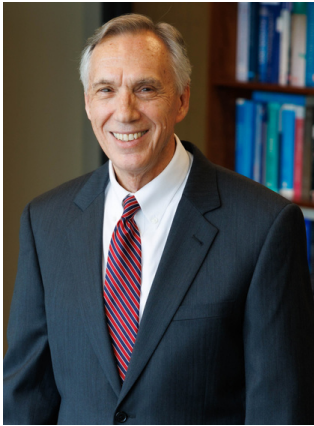


Physiology News

The UMMC Department of Physiology and Biophysics Newsletter

Issue 5/August 2022

Chair's Welcome



Welcome to the Department of Physiology and Biophysics at the University of Mississippi Medical Center (UMMC). Each year brings new challenges, exciting opportunities, and changes in the department. New faculty members, postdoctoral fellows, students, and staff continue to bring fresh ideas and energy to the department. This newsletter provides a brief update of a few recent activities of department members.

Despite more than two years of direct and indirect adverse effects of COVID, we have been fortunate that most of our research, education, and service activities have continued, almost uninterrupted and our overall mission of excellence in education, research, service, and leadership has not changed. I am happy to report that multiple metrics suggest that we remain as one of the top physiology departments in the country. It is a great privilege to work with talented and dedicated colleagues who make us proud to be part of the Department of Physiology and Biophysics at UMMC.

If you are a former faculty member, postdoctoral fellow, student, or staff member we hope that you will stay connected with us and provide updates of your current activities and news that we can feature in our future newsletters. We greatly enjoy hearing from you and are always delighted to have you visit the department when you have a chance to be in Mississippi.

We hope that you enjoy reading this newsletter and look forward to hearing from you. With best wishes,

A handwritten signature in blue ink that reads "John".

John E. Hall, Ph.D.
Arthur C. Guyton Professor and Chair,
Director, Mississippi Center for Obesity Research





**In Memoriam:
Dr. Thomas G.
Coleman**

Dr. Thomas G. Coleman passed away on February 27, 2021. He was 80.

Dr. Coleman, a native of Rochester, New York, earned his electrical engineering degree at the University of Rochester in 1962 and his M.S. in electrical engineering at Mississippi State University in 1964. The Ph.D. in biomedical engineering he achieved in 1967 was the first joint degree awarded by the engineering school at MSU and the graduate school at UMMC. He had postdoctoral training at the London Hospital Medical College in London, England.

Dr. John E. Hall, Arthur C. Guyton Professor and Chair, said everyone in the department is indebted to Dr. Coleman for his many contributions to science and medicine.



"Tom was at the center of the fundamental cardiovascular research and mathematical modeling that brought world acclaim to the department and to UMMC," Hall said. "Tom was a brilliant scientist. Many people do not realize that the famous 'Guyton' mathematical model of the cardiovascular system was really the 'Guyton-Coleman' model, resulting from the synergistic work of Arthur Guyton and Tom Coleman. Without the work of Tom, the model would never have been developed to become the world's largest and most important mathematical model of the cardiovascular system, consisting of about 400 variables when it was published in 1972. Over the years, Tom and his colleagues continued to expand his model of human physiology to include over 10,000 variables.

Dr. Coleman retired from UMMC in 2013 but continued his contributions to the Medical Center as professor emeritus of physiology and biophysics until shortly before his death. His human physiology models live on in educational and commercial applications.

More information about Dr. Coleman's life and career in research can be found in an article in the [Hypertension Journal](#).

The Department of Physiology & Biophysics has ranked in the top 10 (ranging from 4th to 10th) physiology departments in the country for total research funding from the National Institutes of Health (NIH) for the past several years. These high rankings for NIH funding have occurred with considerably fewer faculty members in our department, compared to others ranked in the top 10.

New Extramural Research Funding

- Dr. Yingjie Chen, NIH-R01 grant, "Mechanism of PD1 on cardiac inflammation resolution during heart failure development"
- Dr. John Clemmer, NIH-R00, "Improving hypertension treatment in African Americans"
- Dr. John Hall, NIH-P20-COBRE, "Cardiorenal and Metabolic Diseases Research Center-supplement"
- Dr. Xuan Li, AHA Postdoctoral Fellowship, "Role of sestrin2 in cardiac protection during role of sestrin2 in endoplasmic reticulum homeostasis and cardiac protection during ischemia/reperfusion injury"
- Dr. Alan Mouton, AHA Career Development Award, "Role of macrophage metabolism in myocardial ischemic injury"
- Dr. Ana Omoto, AHA Postdoctoral Fellowship, "Cardiac protection by CNS actions of leptin administration after ischemia/reperfusion"
- Dr. Erin Taylor, NIH-R00 grant, "Immune system dysfunction and gut dysbiosis in the pathogenesis of vascular dysfunction in auto immunity"

Ongoing Extramural Research Funding

- Dr. Barbara Alexander, NIH-R01, "Hypertension in adult IUGR offspring: beneficial effects of perinatal intervention"
- Dr. Alejandro Chade, NIH-R01, "Microcirculation in renovascular hypertension"
- Dr. Yingjie Chen, NIH-R01 grant, "Mechanisms of treg and IL-35 regulating LV failure-induced lung remodeling and right heart hypertrophy"
- Dr. Jussara do Carmo, NIH-R01 grant, "Long-term consequences of parental obesity on developmental programming of cardiorenal disease in offspring"
- Dr. Heather Drummond, NIH-R01, "Placental ischemia, hypertension and vascular function"
- Dr. Eric George, NIH-R01, "A novel therapy for preeclampsia"
- Dr. Joey Granger, renewal of NIH-U54, "Mississippi Center for Clinical and Translational Research"
- Dr. Joey Granger, renewal of NIH-T32, "Hypertension and Cardiorenal Disease Research Training Program"
- Dr. John Hall, NIH-P20-COBRE, "Cardiorenal and Metabolic Diseases Research Center"
- Dr. Josh Speed, NIH-R01 grant, "Endothelin-1 in obesity and insulin resistance"
- Dr. Josh Speed, NIH-R25 grant, "Mississippi Diversity in Hypertension and Cardiorenal Research Program"
- Dr. David Stec, NIH-R01, "Integrative role of bilirubin in obesity"
- Dr. David Stec, NIH-R01, subcontract with University of Kentucky, "Novel liver signaling pathways controlling adiposity"
- Dr. Zhen Wang, NIH-R00, "Mechanisms of synergistic interactions of hypertension and diabetes in promotion kidney injury"

American Physiological Society's Claude Bernard Distinguished Lectureship Award



Dr. Robert Hester

Professor of Physiology and Biophysics

Dr. Robert Hester, Billy S. Guyton Distinguished Professor and professor of physiology and biophysics, is the 2022 recipient of the American Physiological Society's Claude Bernard Distinguished Lectureship Award.

First presented in 2018, the award is given to an established investigator with a history of excellence in education who is making outstanding contributions to teaching and learning.

Hester, a member of the UMMC faculty since 1985, is the primary architect of HumMod, a computer and mathematics-based tool for modeling human physiology. In addition to its expansive research utility, Hester uses the simulation to teach students how to apply physiologic principles and enhance their understanding of acute and chronic conditions throughout the body. Hester also developed a related education package, "Just Physiology," based on HumMod.

The accomplishments make Hester an "innovator of educational materials for teaching and learning physiology," said Dr. John Hall, Arthur C. Guyton Professor and Chair of Physiology and Biophysics, in a letter nominating Hester for the honor. Hester was also nominated by Dr. Dee Silverthorn, professor emerita of medical education at the University of Texas-Austin. She illustrated Hester's reputation for teaching excellence outside of Mississippi.

At UMMC, Hester is director of the medical physiology course's respiratory physiology section and student laboratories. In addition to other courses he has taught through the years, Hester has mentored dozens of medical and graduate students, postdoctoral fellows and faculty at UMMC.

Hester has furthered the APS's educational mission as a member of its Education Committee, co-chair of the refresher course for teaching muscle physiology, faculty for several professional skills courses and reviewer for the journal, *Advances in Physiology Education*.

As recipient of The Claude Bernard Distinguished Lectureship, Dr. Hester received a \$1,000 prize and presented the lecture at the Experimental Biology Meeting held April 2-5, 2022, in Philadelphia, Pennsylvania.

American Heart Association Excellence Award for Hypertension Research



Dr. Joey Granger

Professor of Physiology and Medicine

Dr. Joey Granger, UMMC associate vice chancellor for research and dean of the School of Graduate Studies in the Health Sciences, has received the 2022 Excellence Award for Hypertension Research from the [American Heart Association's Council on Hypertension](#).

He will be recognized at the annual Council on Hypertension in San Diego on September 9.

The award recognizes researchers who have had a major impact in the field of hypertension and whose work has contributed to improved treatment and greater understanding of high blood pressure. Nominees are assessed by a committee on their impact in the field of hypertension throughout their careers, as well as any single discovery.

Granger's "translational research throughout his extremely productive career has made a significant impact on the hypertension field," Dr. Barbara Alexander, UMMC professor of physiology and biophysics, said in her letter of nomination. "Besides his personal research accomplishments, Dr. Granger is a dedicated mentor to students and fellow faculty members."

Granger is the Medical Center's Billy S. Guyton Distinguished Professor of Physiology and Medicine and former chair of the AHA's Council on Hypertension. He also serves as director of the Cardiovascular-Renal Research Center and of the National Institute of General Medical Sciences-funded Mississippi Center for Clinical and Translational Research.

He came to the Medical Center in 1990 as a professor of physiology and was named director of the Cardiovascular-Renal Research Center in 2008. He has served as dean since 2007. Granger was named associate vice chancellor for research earlier this year.

During his nearly 40-year career, Granger has studied numerous elements of the molecular mechanisms of pathogenesis of hypertension, and in particular, preeclampsia in pregnancy. Using a model developed in his lab, Granger and his laboratory discovered and quantified unique molecular pathways that link placental ischemia and cardiovascular dysfunction in preeclampsia and identified compelling drug targets for future preeclampsia treatments.

He is the author or co-author of more than 300 manuscripts that have been cited more than 24,000 times.

Granger and his colleagues, Dr. Heather Drummond and Dr. Michael Ryan, have also made significant contributions to the understanding of cerebrovascular dysfunction during preeclampsia which can lead to acute and long-term cerebral complications in the mother. His laboratory has been continuously funded by the National Institutes of Health since 1985.

"Dr. Granger is a leading international expert on the endothelial and neurohormonal factors in mediating hypertension. He has amassed an amazing body of evidence that has informed our knowledge and understanding of the most common chronic disease in the world," said Dr. Alan Jones, associate vice chancellor for clinical affairs.

"This award is the ultimate recognition in the field of hypertension research, which established Joey as a key foundational contributor to the field."

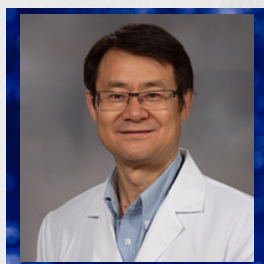
Excellence in Research Awardees

The University of Mississippi Medical Center recognized the following faculty in the Department of Physiology and Biophysics during the 2021 Excellence in Research Awards.

The awards are based on the cumulative amount of outside grants and awards each investigator has received for their own original research.

Gold Medallion

\$1,000,000-\$4,999,999



Dr. Yingjie Chen

professor of physiology
and biophysics

Gold Medallion

\$1,000,000-\$4,999,999



Dr. Josh Speed

assistant professor of
physiology and
biophysics

Silver Medallion

\$500,000-\$999,999



Dr. Erin Taylor

instructor in physiology
and biophysics



Physiology Faculty

Welcome New Postdoctoral Fellow and Graduate Students



Dr. Olufunto Badmus

Dr. Badmus, postdoctoral fellow, came to University of Mississippi Medical Center from Nigeria to work with Dr. David Stec in September 2021. She obtained her PhD in 2019 from the University of Ilorin with research focus on cardio-metabolic responses to glucocorticoid use during pregnancy. Dr. Badmus' long-term goal is to obtain a faculty position with a research focus on the mechanisms responsible for the development of cardiovascular disease in non-alcoholic fatty liver disease (NAFLD).

NAFLD is a global health problem. High prevalence of cardiovascular events are observed in NAFLD patients. Patients with NAFLD die more from complications of cardiovascular disease than liver-related complications itself. Hence, there is an urgent need to understand the mechanism by which NAFLD contributes to cardiovascular disease.

"During the last 11 months as a postdoc, I have acquired new skills. These include implantation of carotid artery catheters, measurements of cardiac and vascular parameters using the VEVO 3100 ultrasound echocardiography machine, as well as learned state-of-the art physiological, biochemical and molecular approaches that will help me study the role of NAFLD in the development of cardiovascular disease. The Department of Physiology & Biophysics at the University of Mississippi Medical Center is well known for its research on obesity, cardiorenal and metabolic diseases. My coming here has given me the opportunity to learn and strengthen my research capability to align with my career goals," said Dr. Badmus.



"Long-term, I see myself becoming a clinician-scientist with an equal emphasis on clinical duties and research. I plan on doing bench research on neuromuscular disorders that I will be able to correlate with my clinical expertise. At a later point in my career, I plan to become a consultant for a pharmaceutical company that also will make use of my clinical and physiological knowledge."

Breland Crudup, graduate student



"Though there are numerous aspirations that lie beyond obtaining my degree, my common goal is to acquire the necessary skills, throughout graduate and postdoctoral training, to become a successful and influential researcher, instructor, and medical science liaison. Hailing from a small town absent of programs to prepare its youth for opportunities that lie ahead in STEM, my ultimate goal is to change that by implementing community organizations that expose students to different subjects and basic, yet fundamental laboratory experience that may increase their likelihood of pursuing a career in said field. My passion for science, learning, and teaching has led me to obtaining this degree and it is with that, I will be able to work with the next generation of aspiring scientists. "

Jordan Hart, graduate student



"My interests in computational modeling and its application with biological systems has led me to pursue a PhD in physiology and biophysics. My future goals after obtaining a PhD include medical device research and development in the private sector. My long-term interests may include education and research, as well, at an academic institution."

Jordan Mallette, graduate student

Staff Spotlight



Stephanie resides in Braxton with her husband, Don, and son, Paxton.

Stephanie Lucas, Director of Research Operations, has worked for over 18 years in the Department of Physiology & Biophysics. She provides oversight for all department administration.

Stephanie can often be found taking a mid-morning break to get in steps on the walkway between the schools of Medicine and Dentistry. Stephanie is a fixture on the walkway. Her fast pace inspires others who walk through the day. "I do eight full rounds, from wall to wall, so that's a little over two miles," Lucas said.



"I do it to stay fit and to reprogram. It takes me 35 to 40 minutes, and it makes the day go by better."

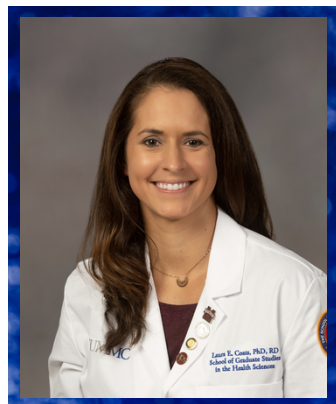
Her hobbies include singing, watching her son play sports and "junkin" at yard and estate sales.

Stephanie's colleagues describe her as a good listener and a campus leader who engages with everyone within and without the department. She has high energy and prides her self in having a high level of professionalism and competency.



Physiology Administrative Staff

Alumni Spotlights



Dr. Laura Coats

2016-2020 alumna

"I am an assistant professor in the Department of Obstetrics and Gynecology at UMMC. In this role, I am a research scientist, educator, and director of research for the OB-GYN department. This job allows me to help clinical faculty, residents, and students develop, implement, monitor, evaluate, and publicize basic, clinical, and translational research projects.

My personal research interests involve how maternal nutrition and lifestyle influence placental and fetal development and the long-term health of the baby. In my free time I enjoy exercising, watching sports, being in nature, and playing with my dogs.

"Dr. Coats excelled during her time as a graduate student in our PhD program." said Dr. Barbara Alexander, professor and mentor. She received the 2021 Regions Outstanding Graduate Research Award from the UMMC School of Graduate Studies in the Health Sciences in 2021."

"The recipient of numerous abstract-based research and poster presentation awards, she also served as the Vice-President of the Graduate Student Body and was an author on 5 publications from her graduate work."



Dr. Barbara Alexander and Dr. Laura Coats



Tryp and Dr. Coats



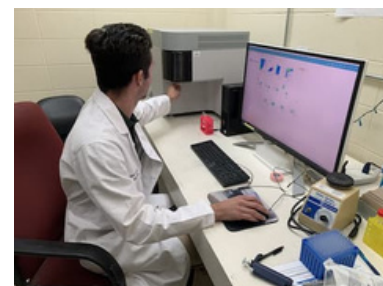
Dr. Kyle Moore

2017-2021 alumnus

"I started a postdoctoral fellowship at the University of Alabama at Birmingham in August of 2021. I am currently studying chronic kidney disease and the contributions of a specific T-cell subpopulation in the progression of kidney disease and kidney fibrosis. I recently received the Karen L. Campbell Travel Award to the upcoming American Society of Nephrology Kidney Week conference where I will be mentoring the Kidney STARS program and presenting my own research.

"UMMC provided me with a strong foundation in renal physiology which I have since built upon to develop a multidisciplinary research niche in the fields of immunology and renal physiology. I recently applied for the NIH F32 Postdoctoral Fellowship and plan on continuing to pursue a career in academic science."

"Kyle was an amazing graduate student," said Dr. Eric George, associate professor and Dr. Moore's mentor. "He was hard working, smart, and an excellent experimentalist. He was very productive in my lab, and he's clearly carrying that forward in his current fellowship. I'm very excited to see where his future will take him."



Dr. Moore in his lab at UAB



Pictured above L to R: Dr. Adrian Eddy (Physiology student alumnus (2015-2019)), Dr. Eric George and Dr. Kyle Moore

Faculty Promotions



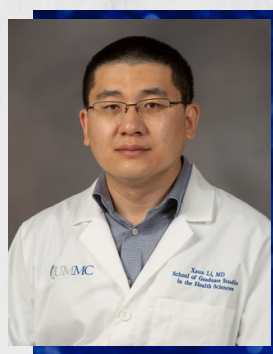
Dr. John Clemmer
promoted from
instructor to assistant
professor



Dr. Erin Taylor
promoted from
instructor to assistant
professor

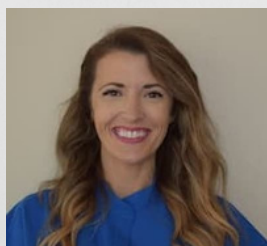


Dr. Ana Omoto
promoted from
postdoctoral fellow to
instructor



Dr. Xuan Li
promoted from
postdoctoral fellow to
instructor

New Research Assistants



Kylie Larson
researcher IV



Deven Mendoza
researcher IV



Jayla-Danielle Reese
researcher III



Lucy Taylor
researcher III

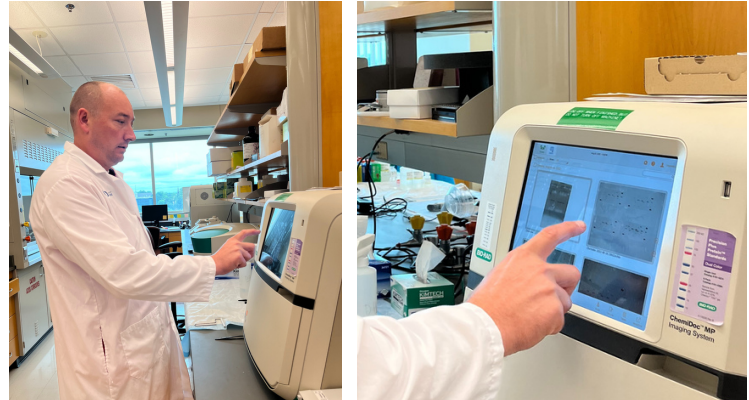


Alex Willis
researcher II

Research Highlights



Dr. Josh Speed,
assistant professor



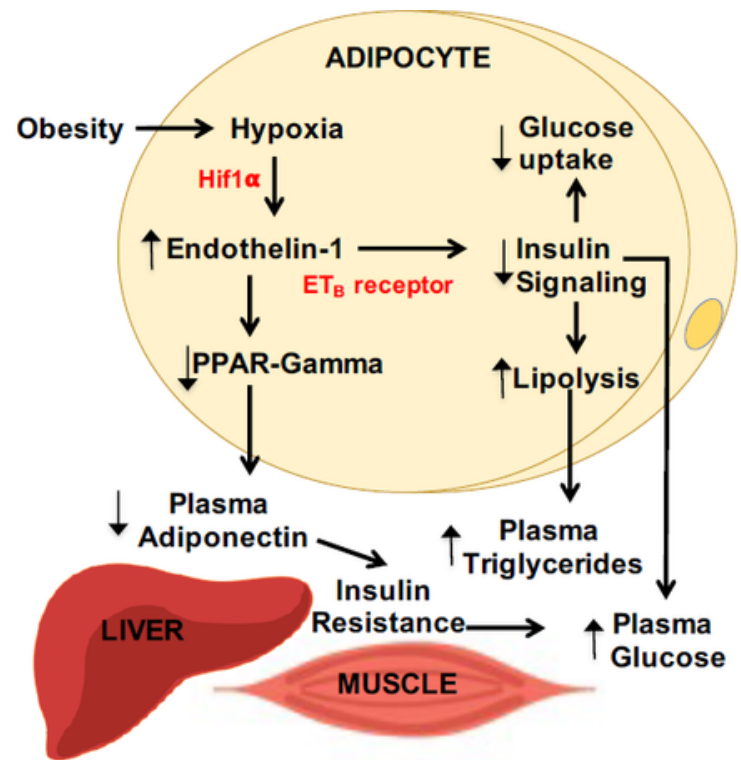
Insulin resistance is a major health problem in the U.S. It precedes type II diabetes and is often present in patients suffering from obesity. Endothelin-1 (ET-1) is a protein produced by blood vessels that is increased in patients with obesity and contributes to the development of insulin resistance. Dr. Speed's laboratory has shown that blockade of ET-1 receptors improves insulin sensitivity in a rodent model of diet induced obesity.

One mechanism by which ET-1 causes insulin resistance is by activating receptors on fat cells that inhibit the production of the insulin sensitizing protein adiponectin. In addition, ET-1 impairs the ability of fat cells to increase glucose uptake and inhibit the breakdown of fat in response to insulin.

ET-1 is also thought to cause insulin resistance through activation of pro-inflammatory pathways in fat tissue. Gaining an understanding of the mechanisms by which ET-1 contributes to the pathophysiology of obesity is the overall goal of Dr. Speed's laboratory in hopes of finding potential therapeutics to improve cardiovascular health in patients with obesity.

Publications associated with this research:

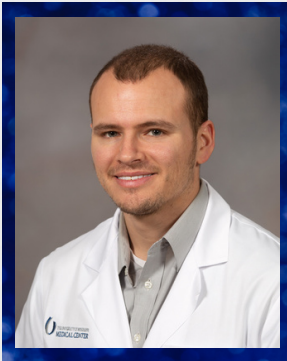
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For more information on Dr. Speed's research, please click on the link:

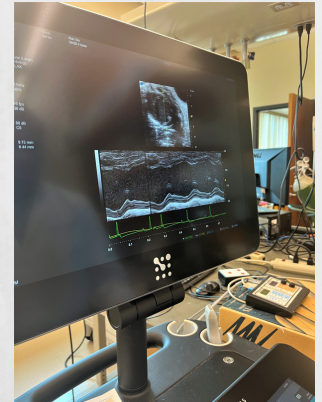
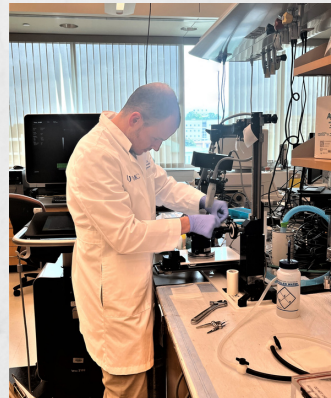
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Research Highlights



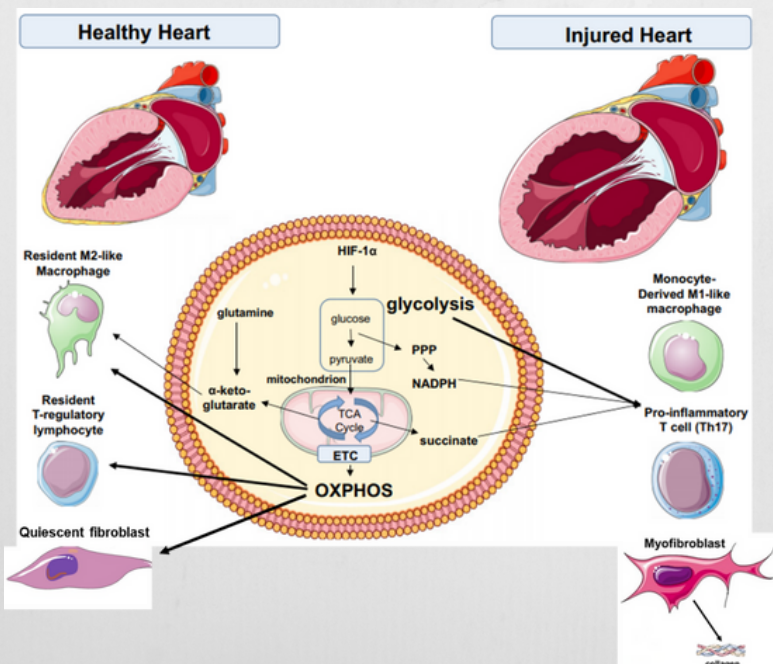
**Dr. Alan Mouton,
Instructor**

Almost 1 million Americans suffer a heart attack, or myocardial infarction (MI) each year. MI leads to an area of the heart muscle becoming irreversibly damaged, which is replaced by non-functional scar tissue. Inflammation plays a key role in remodeling of the heart after MI. While inflammation is required for an appropriate healing response, too much inflammation can impair healing and promote development of congestive heart failure, which has a high mortality rate. Dr. Mouton's research focuses on the mechanisms by which immune cells called macrophages, and resident cells called fibroblasts contribute to the remodeling heart after MI. Macrophages are critical in phagocytosing necrotic tissue from the heart, and initiating a healing response. Quiescent fibroblasts become activated myofibroblasts, which secrete extracellular matrix proteins such as collagen that form the scar tissue.



Mouton's current area of research in this field involves understanding how metabolic pathways contribute to the activation and different phenotypes of these cells during the remodeling process. His lab has shown that macrophages undergo an early switch to glycolysis to support inflammation, then switch back to mitochondrial glucose oxidation to support healing and scar formation.

Dr. Mouton's lab is also investigating the role of glucose metabolism in fibroblasts, which sustain glycolysis throughout the healing phase. Glutamine metabolism is another key feature of macrophage metabolism that is currently under investigation. By better understanding these pathways, the Mouton lab hopes to gain insight into how different metabolic states, such as obesity/diabetes, as well as nutrition influence phenotypic switching of these cells and affect remodeling of the injured heart.



Publications associated with this research:
<https://pubmed.ncbi.nlm.nih.gov/34023353/>
<https://pubmed.ncbi.nlm.nih.gov/33666098/>

For more information on Dr. Mouton's research, please click on the link:
<https://www.umc.edu/som/Departments%20and%20Offices/SOM%20Departments/Physiology/About-Us/Faculty-and-Staff/Mouton-Overview.html>

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