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Hypertension, Cardiorenal, and Metabolic Diseases Research at the University of Mississippi Medical Center

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The University of Mississippi Medical Center (UMMC) ([click here](#)) was established in 1955 as the only academic health science center and the only level 1 trauma center in Mississippi. Located in Jackson, UMMC includes seven health science schools: medicine, nursing, dentistry, health related professions, graduate studies, population health, and pharmacy. The Medical Center's three-part mission is to improve the lives of Mississippians by educating tomorrow's health care professionals, by conducting health sciences research, and by providing cutting-edge patient care.

From its beginning, UMMC has been a leading center for cardiovascular research. The pioneering work of Arthur C. Guyton ([click here](#)) and his colleagues laid the foundation for UMMC as an internationally renowned center of research excellence in cardiovascular and renal physiology as well as in the pathophysiology of hypertension and cardiorenal diseases. Guyton, Thomas Coleman ([Click here](#)), and their collaborators published in 1972 the first large scale systems analysis of cardiovascular function, consisting of ~450 variables; over the ensuing years the model has been continuously expanded, mainly by Coleman, Robert Hester and their collaborators,

and currently includes over 10,000 variables but continues to expand as new data are obtained. The interplay of mathematical systems analysis and experimental studies has been a major theme of the UMMC cardiovascular, renal and hypertension research programs for more than 50 years. This systems analysis approach has led to seminal discoveries related to short-term and long-term blood pressure regulation, as well as the multiple neurohormonal and intrarenal mechanisms that control cardiovascular and kidney function in hypertension and other pathophysiological conditions.

Another major figure in the history of cardiovascular research at UMMC was James D. Hardy ([Click here](#)). Professor Hardy was the first chair of the Department of Surgery at UMMC and a pioneer in cardiopulmonary surgery, leading teams that were responsible for groundbreaking operations such as the first human lung transplant in 1963, the first animal-to-human heart transplant in 1964, and a double-lung transplant that left the heart in place in 1987. Hardy also trained many prominent surgeons and continued productive research and training programs until his retirement in 1987.



University of Mississippi Medical Center

The Department of Physiology and Biophysics

This Department of Physiology and Biophysics ([click here](#)) has a long history of teaching and research excellence. Professor Guyton was the first chair of the department and served in that position for 34 years until his retirement in 1989. John Hall was appointed as the Arthur C. Guyton Professor and Chair, a position he has held for the past 32 years, during which time the department has markedly expanded its research programs and its extramural grant funding. Thus, the department has had only two chairs in its entire history!

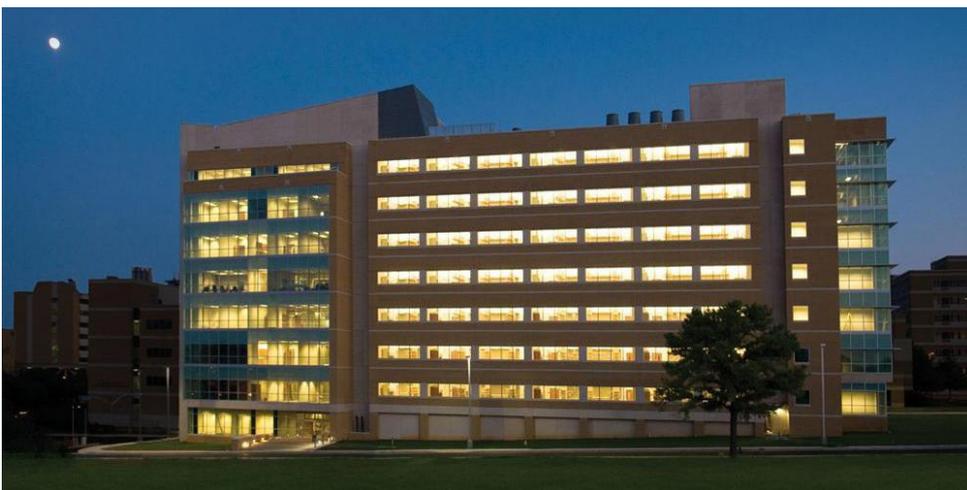
The department is widely recognized for excellence in basic research related to cardiovascular, renal, and endocrine physiology as well as translational research on hypertension, obesity, preeclampsia, fetal programming, kidney diseases, and heart failure. For the past several years, the department has been in the top 10 for total National Institutes of Health (NIH) research funding among all physiology departments in the United States.

The Department of Physiology and Biophysics is the home of five multidisciplinary research centers, including two major NIH-funded centers: the Cardiorenal and Metabolic Diseases Center of Biomedical Research Excellence ([click here](#)) founded in 2013; and the Mississippi Center for Clinical and Translational Research ([click here](#)), founded by James Wilson in 2017 and led by Joey Granger and Michael Hall since 2020. The department has also provided leadership for the Mississippi Center for Obesity Research ([click here](#)) founded by John Hall in 2006; the Cardiovascular-Renal Research Center ([Click here](#)), founded by John Hall

in 1996 and currently directed by Joey Granger; and establishment of the Women's Health Research Center ([click here](#)), founded in 2010 by Jane Reckelhoff, who is currently Chair of the Department of Cell and Molecular Biology at UMMC.

The Department of Physiology and Biophysics training programs for undergraduate and graduate students as well as postdoctoral fellows are highly regarded and currently receive funding from NIH for the Hypertension and Cardiorenal Diseases Research Training Program ([click here](#)) for pre-and post-doctoral fellows. The department's Mississippi Diversity in Hypertension and Cardiorenal Research Program is also funded by NIH and is focused on increasing participation of underrepresented minorities in this field of research.

Faculty and former trainees from the Mississippi cardiovascular research program include 9 presidents of the American Physiological Society, more than 35 chairs of departments and deans, and leaders of other several professional organizations such as the American Heart Association (one national president and four chairs of the Council on Hypertension), the Inter-American Society of Hypertension (two presidents), and the Microcirculatory Society (four presidents). Former trainees and current faculty have served or are currently serving as editors or associate editors of scientific journals in the cardiovascular and renal fields, including Hypertension, American Journal of Physiology, Physiological Genomics, and the Microcirculation Journals, as well as authors and editors of several major textbooks including the Guyton and Hall Textbook of Medical Physiology, Comprehensive Hypertension, and others.



Arthur C. Guyton Research Center where Department of Physiology & Biophysics and its associated Centers are located



James G. Wilson



Joey P. Granger



Jane Reckelhoff

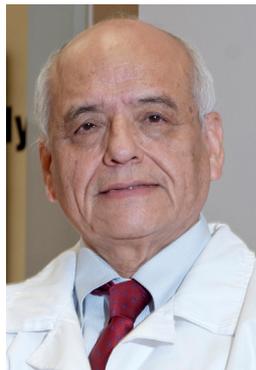
The Jackson Heart Study (JHS)

The JHS ([click here](#)) is the largest single-site, community-based epidemiologic longitudinal investigation of environmental and genetic factors associated with cardiovascular disease (CVD) among African Americans ever undertaken. Design of the JHS began in 1996 with Daniel Jones as its first principal investigator, John Hall as its first Scientific Directions Chair, and with funding from the National Heart, Lung and Blood Institute (NHLBI) and the National Institute on Minority Health

and Health Disparities (NIMHD) in 1999. Herman Taylor (now at the Morehouse School of Medicine) served as the JHS director from 1999 to 2013. Adolfo Correa directed the JHS from 2013 to 2021 and April Carson began leading this important study in 2021. The JHS continues to elucidate CVD risk factors as well as for conducting community education and outreach activities to promote healthy lifestyles and reduce disease risk burden.



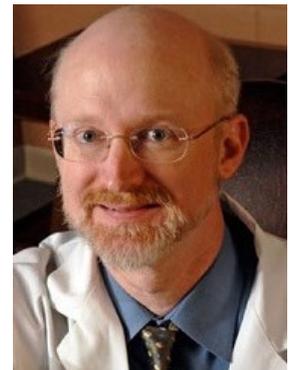
Daniel W. Jones



Adolfo Correa



April Carson



Thomas Mosley

The Memory Impairment and Neurodegenerative Dementia (MIND) Center

The MIND center ([click here](#)), led by Thomas Mosely, is focused on Alzheimer's risk factors and is engaged in several NIH-funded studies including the large multi-site Atherosclerosis Risk in Communities (ARIC) Neurocognitive Study. Their team has shown that brain changes, such as atrophy, vascular disease and silent strokes, are surprisingly common, even in healthy, middle-aged people and are associated with cardiovascular disease (CVD) risk factors, including hypertension.

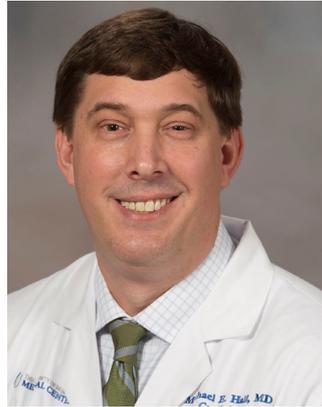
The Department of Medicine

Currently chaired by Javed Butler, the Department of Medicine ([click here](#)) is the largest department at UMMC and is the home for 13 divisions, including Cardiology, Nephrology, Endocrinology, and General Internal Medicine which treat patients for hypertension and related cardiorenal and metabolic diseases. The department has been a major contributor to many important clinical trials and studies related to hypertension and CVD risk management. Herbert Langford, William (Bill) Cushman (now at the University of Tennessee), and Daniel Jones were key investigators in several landmark clinical trials for hypertension treatment, including the Hypertension Detection and Follow Up Program (HDFP), Trial of Antihypertensive Interventions

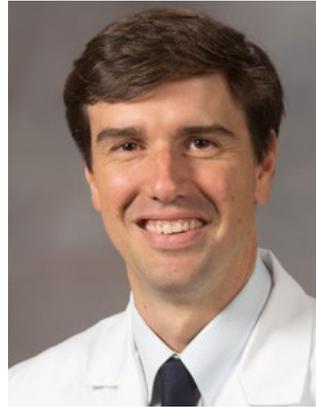




Javed Butler



Michael Hall



Donald (Trey) Clark

and Management (TAIM), Trials of Hypertension Prevention (TOHP), Multiple Risk Factor Intervention Trial (MRFIT), Hypertension Optimal Treatment (HOT) study, Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT), and Systolic Blood Pressure Intervention Trial (SPRINT). Javed Butler serves on steering committees for several important heart failure clinical trials and as co-principal investigator of the recent EMPEROR-Preserved Trial. UMMC has also played an important role in enriching clinical trials for underrepresented minority populations; over 60% of currently enrolled cardiovascular clinical study participants at UMMC are Black. UMMC clinical investigators have also served in leadership roles and writing groups that developed guidelines and scientific statements for cardiovascular societies including the 2017

ACC/AHA Hypertension Guidelines; 2021 Management of Stage 1 Hypertension in Adults With a Low 10-Year Risk for Cardiovascular Disease: Filling a Guidance Gap, led by Daniel Jones; and 2021 Weight-Loss Strategies for Prevention and Treatment of Hypertension, led by Michael Hall.

UMMC has also been a leader in telehealth and in 2017 was recognized as one of only two Health Resources and Services Administration (HRSA) designated Centers of Excellence in Telehealth. With this designation UMMC was tasked to explore innovative ways to advance the modern practice of telemedicine. Donald “Trey” Clark serves as the Medical Director and runs a robust remote patient monitoring program for patients with hypertension.



Richard Roman



Babbette LaMarca

The Department of Pharmacology

The department ([click here](#)) has a record of outstanding research in hypertension and cardiorenal diseases. Richard Roman led the department from 2007 to 2021 and developed a strong research program focused on the molecular genetics of hypertension and kidney disease. Babbette LaMarca assumed the chair position in 2021 and continues the research excellence of the department while building new programs focused on the immune system and inflammation in hypertension and preeclampsia.

Summary

UMMC has a rich history of seminal contributions to basic, clinical and population research in hypertension, cardiorenal and metabolic diseases. These topics continue to be a focus of research, education, and clinical programs at UMMC. A major driver of these chronic diseases in Mississippi and the rest of the world is the growing prevalence of obesity. Unfortunately, Mississippi leads the nation in the prevalence of obesity and associated disorders. Therefore, much work remains for all of us who are dedicated to improving lives through discovery, patient care, and education.

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