BIOGRAPHICAL SKETCH

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NAME: Michael R. Garrett

eRA COMMONS USER NAME (credential, e.g., agency login): MGARRETT

POSITION TITLE: Professor and Director

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of California-Riverside, Riverside, CA	BS	05/1993	Biochemistry
University of California-Riverside, Riverside, CA	MS	05/1994	Biochemistry
Bowling Green State University, Bowling Green, OH	MBA	05/1999	Finance
University of Toledo-College of Medicine, Toledo, OH	PhD	12/2006	Molecular Basis of Disease

A. Personal Statement

I have 25 years' experience in molecular biology, animal models of disease, and genetic and genomics techniques, including DNA methods (cloning, sequencing, and NGS, etc.) and RNA based methods (quantitative real-time PCR, microarray, and next generation sequencing, etc.). I have an active research program involving studying the genetics of complex disease including hypertension, kidney disease, and congenital birth defects. My laboratory takes a multidisciplinary approach to achieve this goal by utilizing systems biology approaches including animal models, cell-culture based systems, genetic and genomics methods, proteomics, and bioinformatics.
I am the founding Director of the UMMC Molecular and Genomics Core (2010). I am responsible for meeting with research investigators, aiding in the design of experiments, providing oversight of technical staff and training, evaluating equipment needs, and conducting seminars to educate and promote core capabilities. My demonstrated record of accomplishment, including an independent research program with extramural funding [NIH, AHA, etc. (continuously funded since 2006 and cumulatively either as PI or Co-I has assisted in acquiring >$30 million in research funding)], a strong publication history in high-quality journals (JASN, Hypertension, JCI, and Genome Research), a record of conducting collaborative research, along with my leadership abilities and diverse skill set provides the necessary tools to facilitate and execute diverse research projects.

Current Funding and Role

2018/09/06 – 2022/06/30
1R01HL137673, NIH/NHLBI
GARRETT, MICHAEL, R (PI)
Genetic Targets of Hypertension End Organ Damage
The goal is to investigate the role of Arhgef11 in the onset and progression of hypertensive chronic kidney disease through the use of animal models and omics technologies.
Role: PI (15%)

2017/01/01-2022/12/31
R01 HL134711, NIH/NHLBI

SASSER, JENNIFER (PI), GARRETT, MICHAEL, R (PI-Year 5)
Mechanisms of Cardiorenal Disease following Preeclampsia
This goal of this application is to investigate the pathophysiological/molecular mechanisms of development of preeclampsia using Dahl salt-sensitive model.
Role: Co-I/PI (2020) (15%)

2020/01/24- 2022/02/01
GARRETT, MICHAEL, R (PI)
AMAG Pharmaceuticals (sub-contract Indiana University, Jaipal Singh, PhD)
Pharmacological and molecular validation of DDAH as a therapeutic target for preeclampsia and renal disease
To goal is to evaluate the effect of reduced ADMA on the pathological and molecular changes associated with preeclampsia, we will administer VN-812 to the DSS rat model of superimposed preeclampsia.
Role: PI (in-kind effort)

2021/01/06- 2022/31/05
75D30121C11159, CDC
GARRETT, MICHAEL, R (PI)
Spatiotemporal sequence analysis of SARS-CoV-2 in Mississippi
The study will perform genomic sequencing of SARS-CoV-2 samples collected throughout the state of MS from the University of Mississippi Medical Center (UMMC) and through a partnership with Mississippi Department of Health (MSDH). The goal will be to investigate viral emergence, evolution, and spread of infection with a particular focus on racial disparities between AA and Caucasians.
Role: PI (10%)

2018/07/01-2023/06/30
1P20GM104357, NIGMS
HALL, JOHN (PI)
Cardiorenal and Metabolic Diseases Research Center COBRE
This application requests support for a Center of Biomedical Research Excellence focused on cardiovascular, renal and metabolic diseases.
Role: Co-I/ PI-Core C Director (10%)

2018/07/01-2023/06/30
P20GM103476, NIGMS
ELASRI, MOHAMED (PI)
IDeA Networks of Biomedical Research Excellence (INBRE)
The overall goal of the project is to provide research core support to MS-INBRE investigators interested in molecular genetics and genomic technologies.
Role: Co-I/Core Director (sub-contract) (10%)

2021/03/01- 2022/02/28
Mississippi Department of Health- Contract
ROBINSON, D. ASHLEY (PI)
Enhancing Genomic Surveillance of SARS-CoV-2 in Mississippi
The study will perform genomic sequencing of SARS-CoV-2 samples collected throughout the state of MS from the University of Mississippi Medical Center (UMMC).
Role: Co-I (10%)

Highlighted Publications

1. Keele GR, Prokop JW, He H, Holl K, Littrell J, Deal AW, Kim Y, Kyle PB, Attipoe E, Johnson AC, Uhl KL, Sirpilla OL, Jahanbakhsh S, Robinson M, Levy S, Valdar W, **Garrett MR***, Solberg Woods LC*. *authors contributed equally to this study as senior authors. “Sept8/SEPTIN8 involvement in cellular structure and kidney damage is identified by genetic mapping and a novel human tubule hypoxic model” Sci Rep. 2021 PMID: 33483609
2. Cobb, M, Wu W., Attipoe, E.M., Johnson, A.C., and **Garrett, M.R.**, “Nephron-Deficient HSRA Rats exhibit Renal Injury with Age but have Limited Renal Damage from Streptozotocin-Induced Hyperglycemia” Am J Physiol Renal Physiol. 2021 Apr 12 PMID: 33843272

3. **Garrett, M.R**. and Korstanje, R., "Using Genetic and Species Diversity to Tackle Kidney Disease." Trends in Genetics, 2020 Apr 30. (Invited Review- Cover) PMID: 32362446
4. Johnson, A.C. Wu, W., Attipoe, E., Sasser, J.M. Taylor, E, Showmaker, M.L., Lindsey, M.L, Kyle, P.B. **Garrett, M.R.**, "Loss of Arhgef11-/- in the Dahl salt-sensitive rat leads to Renal Protection and Attenuation of Salt-Sensitive Hypertension" Hypertension 2020 Apr;75(4):1012-1024. PMID: 32148127

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2016 - Present **Professor (Tenured)**, UMMC, Department of Pharmacology, Departments of Medicine (Nephrology) and Pediatrics (Genetics), Jackson, MS

2010 - 2016 **Associate Professor (Tenured)**, University of Mississippi Medical Center (UMMC), Department of Pharmacology, Departments of Medicine(Nephrology) and Pediatrics(Genetics), Jackson, MS

2010 - Present **Director**, Molecular and Genomics Core Facility, UMMC, Jackson, MS

2007 - 2010 **Assistant Professor**, Medical College of Wisconsin, Department of Medicine (Nephrology), Milwaukee, WI

2003 - 2007 **Assistant Professor**, University of Toledo-College of Medicine, Department of Physiology and Pharmacology, Toledo, OH

2001 - 2003 **Research Assistant Professor**, University of Toledo-College of Medicine, Department of Physiology and Pharmacology, Toledo, OH

1999 - 2001 **Research Instructor**, Medical College of Ohio, Department of Physiology and Molecular Medicine, Toledo, OH

Other Experience and Professional Memberships

2021 Ad Hoc Reviewer, Special Emphasis Panel- 2021/05 ZRG1 DKUS-J (05)

2021 Ad Hoc Reviewer, Special Emphasis Panel-2021/05 ZDK1 GRB-M (M4, RC2 grants)

2020 Ad Hoc Reviewer, "Pathobiology of Kidney Disease (PBKD)" Study Section

2020 Ad Hoc Reviewer, DiaComp Pilot and Feasibility Study Section

2019 Ad Hoc Reviewer, "Pathobiology of Kidney Disease (PBKD)" Study Section

2018 Ad Hoc Reviewer, NIDDK George M. O'Brien Urology Opportunity Pool Program

2018 Ad Hoc Reviewer, NIEHS Special Emphasis Panel ZES1 LWJ-S, " Model systems for examining GxE interactions and susceptibility genes/pathways in disease"

2014 Ad hoc reviewer, NIH Peer Review Committee: Biomarkers of Diabetes, Digestive, and Kidney

2013 Ad hoc reviewer, NIH Peer Review Committee: SEP- EDIC/GoKind DP3

2012 - 2016 Member, AHA Peer Review Committee: Basic Cell, Genetics and Epigenetics

2012 Ad hoc reviewer, NIH Peer Review Committee: Comparative Medicine

2010 Ad hoc reviewer, NIH Peer Review Committee: Conference Grant Applications (2 times)

2010 Ad hoc reviewer, NIH Peer Review Committee: Mechanisms of Arterial Stiffening

2005 Ad hoc reviewer, NIH Peer Review Committee: Genomics of Transplantation

Editorial Board Experience

2021– Present Deputy Editor, Physiological Genomics

2019 – Present Editorial Board, Kidney360 (American Society of Nephrology)

2008 – 2021 Associate Editor, Physiological Genomics

2008 – 2012 Editorial Board, Physiological Genomics

2008 – 2012 Editorial Board, Frontiers in Genomics Physiology

2003 – 2006 Editorial Board, Journal of Hypertension

Honors and Awards

2020 UMMC Platinum Medal for Excellence in Research

2017 Carl G Evers MD Society- M2 All Star Professor

2016 APS Star Reviewer, Physiological Genomics

2015 UMMC Gold Medal for Excellence in Research

2012 Fellow of American Heart Association (FAHA)-Council for High Blood Pressure Research

2012 UMMC Leadership Development Program

2011 UMMC Silver Medal for Excellence in Research
2010 Robert M. Hearin Foundation Research Scholar

C. Contributions to Science

1. The genetic basis of chronic kidney disease (CKD) in the Dahl salt-sensitive (S) rat. My work in this area has provided some of the first genetic analyses in animal models of kidney injury and renal dysfunction. These genetic studies were particularly unique in comparing two models of hypertension (S and SHR) that differ with respect to extent of kidney damage. The advantage of these analyses has been the ability to identify loci that influence kidney injury on differing genetic backgrounds (either S or SHR) permissive for hypertension. I subsequently transitioned to identifying genomic regions (linkage analysis) to elucidate specific genes/genetic variants and molecular mechanisms that explain susceptibility of the S rat to develop CKD. We are one of only a few teams that have achieved this breath of success in positional cloning novel genes. The significance of this research is the identification of gene/genetic variants for kidney injury in the context of hypertension to serve as novel therapeutic targets for CKD.

a. **Garrett MR**, Dene H, Rapp JP. Time-course genetic analysis of albuminuria in Dahl salt-sensitive rats on low-salt diet. J Am Soc Nephrol. 2003 May;14(5):1175-87. PubMed PMID: 12707388.
b. Williams JM, Johnson AC, Stelloh C, Dreisbach AW, Franceschini N, Regner KR, Townsend RR, Roman RJ, **Garrett MR**. Genetic variants in Arhgef11 are associated with kidney injury in the Dahl salt-sensitive rat. Hypertension. 2012 Nov;60(5):1157-68. PubMed PMID: 22987919;
c. Jia Z, Johnson AC, Wang X, Guo Z, Dreisbach AW, Lewin JR, Kyle PB, and **Garrett MR**. Allelic Variants in Arhgef11 via the Rho-Rock Pathway are linked to Epithelial–Mesenchymal Transition and Contributes to Kidney Injury in the Dahl S Rat. PLOS One 2015 Jul 14;10(7) PMID:26172442
d. Zhou Y, Castonguay P, Sidhom EH, Clark AR, Dvela-Levitt M, Kim S, Sieber J, Wieder N, Jung JY, Andreeva S, Reichardt J, Dubois F, Hoffmann SC, Basgen JM, Montesinos MS, Weins A, Johnson AC, Lander ES, **Garrett MR**, Hopkins CR, Greka A. A small-molecule inhibitor of TRPC5 ion channels suppresses progressive kidney disease in animal models. Science. 2017 Dec 8;358(6368):1332-1336 PMCID: PMC6014699

2. The development and analysis of novel genetic models of disease including renal agenesis/congenital abnormalities of kidney and urinary tract (CAKUT). I have led efforts to develop novel animal models to study human complex disease. In particular, my laboratory was the first to perform an analysis of renal phenotypes in the NIH Heterogeneous Stock (HS) rat model to explore its potential utility in identifying novel genes of kidney disease. My team used a family of rats born with a single kidney and other urogenital abnormalities to develop a new inbred model (the HSRA rat) that exhibits high incidence of congenital solitary kidney/CAKUT (50-75%). This model has provided the opportunity to address hypotheses on the relationship between early development *in utero* with a solitary kidney and increased susceptibility to renal injury and hypertension, expanding on what was previously possible using in either two-kidney animals or two-kidney animals subjected to uninephrectomy with age. The significance of this research is the firm foundation on which to build our understanding of the genetic basis of kidney development in the setting of confounding factors (hypertension and diabetes) that impact susceptibility for kidney injury in single kidney individuals.

a. Wiessner JH, **Garrett MR**, Roman RJ, Mandel NS. Dissecting the genetic basis of kidney tubule response to hyperoxaluria using chromosome substitution strains. Am J Physiol Renal Physiol. 2009 Aug;297(2):F301-6. PubMed PMID: 19493966; PubMed Central PMCID: PMC2724241.
b. Solberg Woods LC, Stelloh C, Regner KR, Schwabe T, Eisenhauer J, **Garrett MR**. Heterogeneous stock rats: a new model to study the genetics of renal phenotypes. Am J Physiol Renal Physiol. 2010 Jun; 298(6):F1484-91.PMID: 20219828; Central PMCID: PMC2886820.
c. Wang X, Johnson AC, Williams JM, White T, Chade AR, Zhang J, Liu R, Roman RJ, Lee JW, Kyle PB, Solberg-Woods L, **Garrett MR**. Nephron Deficiency and Predisposition to Renal Injury in a Novel One-Kidney Genetic Model. J Am Soc Nephrol. 2014 Oct 27; PMID: 25349207. PMCID:PMC4483580
d. Wang X, Johnson AC, Sasser JM, Williams JM, Solberg Woods LC, Garrett MR. Spontaneous one-kidney rats are more susceptible to develop hypertension by DOCA-NaCl and subsequent kidney injury compared with uninephrectomized rats. Am J Physiol Renal Physiol. 2016 May 1;310(10); PMID: 26936874, PMCID:PMC5002061

3. The investigation, identification, and characterization of genes involved in monogenic and polygenic diseases using of genetic analyses, cutting-edge genomic technologies, and knockout animal models. I have led projects that use animal models to identify novel single gene defects. By generating null/knockout rats, our team has revealed the functional consequence of these individual genes within the context of complex disease. For example, my laboratory was the first to report that loss of nuclear hormone receptor NR4A1 contributes to progressive kidney injury, specifically through an immune-mediated mechanism. My laboratory has demonstrated success in projects that span from physiology and pathology assessments (blood pressure, renal hemodynamics, and histology) to whole transcriptome analysis to bone marrow cross transplantation studies and *in vitro* assays to fully explore cause and effect mechanisms.

a. Joe B, Saad Y, Dhindaw S, Lee NH, Frank BC, Achinike OH, Luu TV, Gopalakrishnan K, Toland EJ, Farms P, Yerga-Woolwine S, Manickavasagam E, Rapp JP, **Garrett MR**, Coe D, Apte SS, Rankinen T, Pérusse L, Ehret GB, Ganesh SK, Cooper RS, O'Connor A, Rice T, Weder AB, Chakravarti A, Rao DC, Bouchard C. Positional identification of variants of Adamts16 linked to inherited hypertension. Hum Mol Genet. 2009 Aug 1;18(15):2825-38. PMID: 19423552; Central PMCID: PMC2706685.

b. Johnson AC, Lee JW, Harmon AC, Morris Z, Wang X, Fratkin J, Rapp JP, Gomez-Sanchez E, **Garrett MR**. A mutation in the start codon of γ-crystallin D leads to nuclear cataracts in the Dahl SS/Jr-Ctr strain. Mamm Genome. 2013 Apr;24(3-4):95-104. PMID: 23404175; PubMed Central PMCID: PMC3628938.

c. Westbrook L, Johnson AC, Regner KR, Williams JM, Mattson DL, Kyle PB, Henegar JR, **Garrett MR**. Genetic susceptibility and loss of Nr4a1 enhances macrophage-mediated renal injury in CKD. J Am Soc Nephrol. 2014 Nov;25(11):2499-510. PMID: 24722447; PMCID: PMC4214519.

d. Muroya Y, Fan F, Regner KR, Falck JR, **Garrett MR**, Juncos LA, Roman RJ. Deficiency in the Formation of 20-Hydroxyeicosatetraenoic Acid Enhances Renal Ischemia-Reperfusion Injury. J Am Soc Nephrol. 2015 Feb 2; PMCID: PMC4587700

4. Linkage analysis and positional cloning of genetic factors causative to hypertension using the Dahl salt-sensitive (S) rat. My early research reported some of the first systematic genetic analyses of blood pressure regulation using rodent models. These studies employed extensive linkage analyses using multiple F2 populations generated from a variety of strains, including the S rat, to map genetic loci associated with high blood pressure. Subsequently, I have given significant effort to generate a large number of congenic strains to narrow and focus the location of causative genetic elements that underlie each locus. This work has been instrumental in highlighting the extent of genetic complexity of a quantitative trait such as blood pressure. This complexity includes the large number of genes/genomic regions that control blood pressure, the role of gene-gene interactions and the many small genomic regions that contain multiple genetic factors to control trait (both positive and negative regulators). This research laid a strong foundation for the development of my research program.

a. Rapp JP, **Garrett MR**, Deng AY. Construction of a double congenic strain to prove an epistatic interaction on blood pressure between rat chromosomes 2 and 10. J Clin Invest. 1998 Apr 15;101(8):1591-5. PMID: 9541488; PubMed Central PMCID: PMC508739.

b. **Garrett MR**, Dene H, Walder R, Zhang QY, Cicila GT, Assadnia S, Deng AY, Rapp JP. Genome scan and congenic strains for blood pressure QTL using Dahl salt-sensitive rats. Genome Res. 1998 Jul;8(7):711-23. PubMed PMID: 9685318.

c. **Garrett MR**, Zhang X, Dukhanina OI, Deng AY, Rapp JP. Two linked blood pressure quantitative trait loci on chromosome 10 defined by dahl rat congenic strains. Hypertension. 2001 Oct;38(4):779-85. PubMed PMID: 11641286.

d. **Garrett MR**, Meng H, Rapp JP, Joe B. Locating a blood pressure quantitative trait locus within 117 kb on the rat genome: substitution mapping and renal expression analysis. Hypertension. 2005 Mar;45(3):451-9. PubMed PMID: 15655120.

Complete List of Published Works in My Bibliography (n>90)
https://www.ncbi.nlm.nih.gov/myncbi/michael.garrett.1/bibliography/public/