

***Distinguishing the Transcriptional Responses Between
the Human and Mouse Circadian Clock Resetting
Mechanisms***

PARRIS WASHINGTON

MSNS Candidate

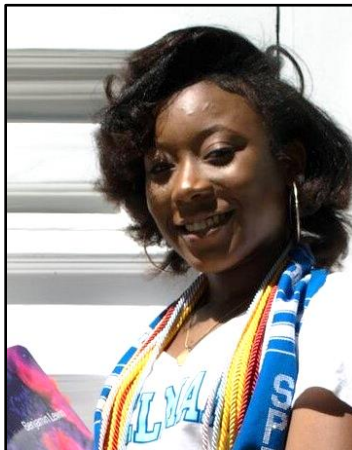
Under the direction of

Jason DeBruyne, Ph.D.

Associate Professor, Department of Pharmacology & Toxicology

In partial fulfillment of the requirements for the degree

Master of Science in Neuroscience



F-233_MRC (Building F)

Neuroscience Institute Conference Room

720 Westview Drive SW, Atlanta, GA 30310

Graduate Education in Biomedical Sciences



Graduate Education in Biomedical Sciences

Final Examination of

PARRIS WASHINGTON

For the Degree

MASTER OF SCIENCE IN NEUROSCIENCE

DISSERTATION COMMITTEE

Jason DeBruyne, Ph.D., Research Advisor

Department of Pharmacology & Toxicology
Morehouse School of Medicine

An Zhou, Ph.D.

Department of Neurobiology
Morehouse School of Medicine

Alec Davidson, Ph.D.

Department of Neurobiology
Morehouse School of Medicine

PROFESSOR IN CHARGE OF RESEARCH

Jason DeBruyne, Ph.D.

Department of Pharmacology & Toxicology
Morehouse School of Medicine

FIELDS OF STUDY

Major Subject: **Neuroscience**

Biomedical Science Presentation I
Critical Thinking & Scientific Communication
Critical Thinking in Neuroscience
Essentials in Neuroscience I
Essentials in Neuroscience II
Essentials in Neuroscience III
Neuroscience Lab Rotation
Neuroscience Lab Techniques
Research Data Analysis
Scientific Integrity
Seminar in Biomedical Sciences I
Seminar in Biomedical Sciences II
Thesis Research

Research Focus: **Chronobiology, Entrainment, Transcriptional Responses of Human and Mouse Circadian Clock Resetting Mechanisms**

BIOGRAPHICAL SKETCH

Undergraduate Study:

B.S., May 2017; Spelman College, Atlanta, Georgia, 2013 – 2017; Biology
Major: Biology, Neuroscience Dual Degree

Graduate Study:

M.S. in Neuroscience Candidate, Aug. 2015; Morehouse School of Medicine,
Atlanta, GA, 2015 – present, Neuroscience.
Major: Neuroscience

Professional Memberships

2017-present Phi Beta Kappa Society
2016-present Society for Advancing Chicanos/Hispanics & Native Americans in Science
2015-present Louis Stokes Alliance for Minority Participation (NSF #15-594)
2014-present Beta Beta Beta Biological Honor Society
2014-2017 Research Initiative for Scientific Enhancement (NIH #2R5GM06566-13)

Professional Service

2017 Science Fair Judge, KIPP Atlanta Collegiate High School
2017 Alumni Scholar Panel Discussion, Louis Stokes Alliance for Minority
 Participation Georgia/Alabama Alliance Scholars Workshop
2016-2017 Directed Supplemental Instructor: Physics, Spelman College
2016-2017 HBCU Rising, Tutor/Mentor, Martin Luther King Middle School
2016 Women in STEM Panel, Women in Construction, Engineering, and Related
 Services Conference
2015-2016 Torch & Laurel Mentor, National Society of Collegiate Scholars
2015-2016 Directed Supplemental Instructor: Molecular Biology & Genomics,
 Spelman College
2015-2017 Mentor, Louis Stokes Alliance for Minority Participation Mentor
2014-2017 Student Researcher, Dr. Tiffany Oliver, Ph.D., Spelman College

Recent Fellowships & Awards

2018 National Science Foundation Graduate Research Fellowship Awardee (NSF GRFP)
2017 Curtis Parker Research Day, Atlanta, GA, Oral Presentation Winner

- 2017 Spelman College Research Day, Atlanta, GA, 1st Place Oral Presentation Winner.
- 2016 Society for the Advancement of Chicanos/Hispanics and Native Americans in Science Conference (SACNAS), Long Beach, CA, Outstanding Poster Presentation Award Winner.
- 2016 Minority Access' 17th National Role Models Conference, Washington, D.C., 2nd Place Oral Presentation Winner.
- 2015 Annual Biomedical Research Conference for Minority Students, Seattle, WA, Outstanding Poster Presentation Award Winner.

Select Presentations

Parris Washington, Jason DeBruyne, Ph.D. Distinguishing the Transcriptional Responses Between the Human and Mouse Circadian Clock Resetting Mechanism. Morehouse School of Medicine Annual Curtis Parker Research Day. Atlanta, GA. 2018. **(Oral Presentation 1st Place Winner)**

Parris Washington, Jason DeBruyne, Ph.D. Distinguishing the Transcriptional Responses Between the Human and Mouse Circadian Clock Resetting Mechanism. Spelman College Research Day. Atlanta, GA. 2017. **(Oral Presentation 1st Place Winner)**

Parris Washington, Tiffany Oliver, Ph.D. The Development of Cancer Due to Organochloride Exposure is Associated with Altered DNA Methylation and Gene Expression. Spelman College Research Day. Atlanta, GA. 2017.

Parris Washington, Tiffany Oliver, Ph.D. Variation in the Zinc Finger of PRDM9 is Associated with the Absence of Recombination Along Nondisjoined Chromosomes 21 of Hispanic Maternal Origin. Society for Advancement of Chicanos/Hispanics and Native Americans in Science Conference. Long Beach, CA. 2016. **(Poster Presentation Award Winner)**

Parris Washington, Tiffany Oliver, Ph.D. Variation in the Zinc Finger of PRDM9 is Associated with the Absence of Recombination Along Nondisjoined Chromosomes 21 of Hispanic Maternal Origin. Minority Access' 17th National Role Models Conference. Washington, DC. 2016. **(2nd Place Oral Presentation Winner)**

Parris Washington, Tiffany Oliver, Ph.D. Variation in the Zinc Finger of PRDM9 is Associated with the Absence of Recombination Along Nondisjoined Chromosomes 21 of Hispanic Maternal Origin. Emory STEM Symposium. Atlanta, GA 2016.

Parris Washington, Tiffany Oliver, Ph.D. Variation in the Zinc Finger of PRDM9 is Associated with the Absence of Recombination Along Nondisjoined Chromosomes 21 of Hispanic Maternal Origin. Spelman College. Atlanta, GA. 2016. **(1st Place Poster Presentation Award Winner)**

Parris Washington, Yonas Tekle, Ph.D. Hybrid Amoeba Formation: Investigating Cellular Fusion Between Related Species of Amoebae. Annual Biomedical Conference for Minority Students. Seattle, WA. 2015. **(Poster Presentation Award Winner)**

Select Presentations Continued

Parris Washington, Yonas Tekle, Ph.D. Hybrid Amoeba Formation: Investigating Cellular Fusion Between Related Species of Amoebae. Minority Access' 16th National Role Models Conference. Baltimore, MD. 2015. (**3rd Place Oral Presentation Award Winner**)

Parris Washington, Yonas Tekle, Ph.D. Hybrid Amoeba Formation: Investigating Cellular Fusion Between Related Species of Amoebae. Vanderbilt M.D-PhD Symposium. Nashville, TN. 2015.

Parris Washington, Yonas Tekle, Ph.D. Hybrid Amoeba Formation: Investigating Cellular Fusion Between Related Species of Amoebae. Spelman College Research Day. Atlanta, GA. 2015. (**1st Place Poster Presentation Award Winner**)

DISSERTATION ABSTRACT

Washington, Parris. M.S., Morehouse School of Medicine, April 2018. Distinguishing the Transcriptional Responses Between the Human and Mouse Circadian Clock Resetting Mechanisms. Chair of Committee: Jason DeBruyne, Ph.D.

The circadian system works to coordinate physiology and behavior with the 24-hour day to provide temporal homeostasis with the external environment. Both mouse NIH3T3 and human U2-OS cell lines have been extensively used to explore and understand circadian mechanisms. However, our lab has observed several differences in circadian timing between the human U2OS and mouse NIH3T3 cell lines. Microarray and qPCR data have shown NIH3T3 cell lines to be ~8-12 hours out of phase with U2OS cell lines in the transcription of 6 different integral clock genes, after the administering of a resetting stimulus. Microarray and qPCR data have also shown a U2OS-specific induction of PER1, as well as a bias in NIH3T3 for the induction of PER2 (Figure 2). Because of these observations, we hypothesize that human and mouse cells possess distinct clock resetting mechanisms. With this research we seek to identify mechanisms responsible for the observed differences in transcriptional responses. U2OS and NIH3T3 cell lines were synchronized with dexamethasone, 50% horse serum, and forskolin. Microarray data was collected, starting at time zero, for eight time-points over nine hours, and validated with quantitative reverse transcription polymerase chain reactions (qRT-PCR). Using a model-based analysis of microarray data, we sought to identify differences in transcriptional responses between the U2OS and NIH3T3 cell lines. With the use of 13 different models, microarray data was sorted and then parsed into genes of interest. We intend to use the genes candidates as points of comparison between the two cell lines through the manipulation of siRNAs. We then seek to determine if observed differences extend to other mouse and human cell lines, in order to identify “human-specific” and “mouse-specific” transcriptional responses that may cause the observed difference in circadian timing.

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