HOWARD UNIVERSITY
APPLICATION SUMMARY

Charles and Mary Latham Fund Board Meeting

Request Date:	October 15, 2019
Project Title:	Destabilization of Transthyretin and Familial Amyloid Cardiomyopathy
Request Amount:	$15,000.00
Program Area:	Medical Research

Organization Information	**Contact Person for Application**
Howard University 2400 Sixth Street NW Washington, DC 20059 Tel: 202-806-6100 Fax: 202-806-4465	Dr. Matthew George, Jr. Department chairman and Associate Professor (202) 806-6289 mgeorge@howard.edu

Organization's annual operating budget: $825,000,000.00

Background
Howard University, located in Washington, DC, is a comprehensive, research-oriented, historically Black private university training more minority physicians and dentists than any other US institution. Howard remains committed to increasing the number of disadvantaged students in the health professions and will provide the administrative leadership, faculty, staff, classrooms and equipment to conduct the proposed objectives. Howard University (HU) is an institution committed to ensuring that students of diverse backgrounds have access to a superior education. An Act of Congress created Howard University in 1867 as a university committed to the education of newly emancipated slaves and their descendants. From generation to generation, it has played a unique role in African-American culture and life and in the affairs of the nation and the world. For example, the legal scholars who worked on the landmark case Brown v. Board of Education of Topeka, which resulted in the decision to end segregated schools in the United States, conducted their research here at Howard University. Our ongoing commitment to educating those from disadvantaged backgrounds is evidenced in the university's vision statement:
Howard University is a comprehensive research university, unique and irreplaceable, defined by its core values, the excellence of all its activities – it's instruction, research

and service, and by its enduring commitment to educating youth, African Americans, and other people of color in particular, for leadership and service to our nation and the global community.
Academic programs at Howard University are provided by the Colleges of (1) Pharmacy, Nursing, and Allied Health Sciences; (2) Dentistry; (3) Medicine; (4) Arts and Sciences; and the Schools of (5) Business; (6) Communications; (7) Divinity; (8) Education; (9) Engineering, Architecture and Computer Science; (10) Law; (11) Social Work; and the (12) Graduate School, which offers the Master's degree in 62 fields and the Ph.D. in 27 disciplines. The University has a total enrollment of approximately 11,000 and awards over 2,000 degrees annually.

Project/Program Budget (if applicable):

Project/Program Title: Destabilization of Transthyretin and Familial Amyloid Cardiomyopathy

Project Summary (250 words or less)
Familial Amyloid Cardiomyopathy (FAC) is a rare, progressive and fatal disease in which deposition of amyloid plaques in heart causes severe organ damage. The amyloid plaques associated with FAC result from the misfolding and subsequent aggregation of either mutant or wild-type Transthyretin (TTR). TTR's main function is the transport of the hormone thyroxine in both the blood and the cerebrospinal fluid. TTR is a tetramer composed of four identical 127 amino acid monomers and the TTR tetramer dissociation precedes pathological TTR aggregation toward fatal fibrillary amyloidosis, leading to a variety of human diseases. Destabilization and dissociation of the native TTR tetramer is the initiating event in the disease mechanism of hATTR (Hereditary ATTR Amyloidosis) and has been confirmed by human genetic studies. Our hypothesis is that the stability of the TTR mutants is related to the mechanism(s) and/or progression of FAC. It is the goal of this proposal to study the structural stabilization of a selected number of TTR mutants. By doing so we will be able to establish the quantitative relationship between the structural stabilities of the TTR mutants and the incident rate of FAC. The results will lay a theoretical foundation for treating FAC by either using gene therapy to decrease/delete the mutation that increases the incident rate of FAC or stabilizing the TTR mutants by designing/developing new drugs that bind to the target TTR mutants. This research will be important for finding a possible cure of FAC by studying the destabilization of the TTR mutants.

Statement of Problem
Familial Amyloid Cardiomyopathy (FAC) is a rare, progressive and fatal disease in which deposition of amyloid plaques in heart causes severe organ damage. These amyloid plaques infiltrate the cardiac muscle and lead to diastolic dysfunction, the malfunctioning of the ventricles, and eventually to heart failure. They can also cause damage to the nerves, lungs, and other organs. Most cases of FAC onset after the age of sixty, and more than 40% have a prior onset of carpal tunnel syndrome. Symptom relief treatments include pacemakers, diuretics, and gene therapy.

The amyloid plaques associated with FAC result from the misfolding and subsequent aggregation of either mutant or wild-type Transthyretin (TTR). TTR is produced in the liver and the brain's choroid plexus. Its main function is the transport of the hormone thyroxine in both the blood and the cerebrospinal fluid. TTR is a tetramer composed of four identical 127 amino acid monomers. Each monomer has eight β-sheets and a shorter α-helix. Two TTR monomers associate via hydrogen bonds to form stable dimers designated as AA' and BB'. The two dimers associate further to form the TTR tetramer. Thyroxine binds to the tetramer in two identical Halogen Binding Pockets (HBP) found at the interface of the two dimers. The TTR tetramer dissociation precedes pathological TTR aggregation toward fatal fibrillary amyloidosis, leading to a variety of human diseases.

Destabilization and dissociation of the native TTR tetramer is the initiating event in the disease mechanism of ATTR, and has been confirmed by human genetic studies. In addition, FAC is associated with one of over 100 TTR mutations typically found present earlier during progression of the disease. Additionally, some mutations are often more severe with several variants exhibiting tissue-selective deposition and pathology. Here our hypothesis is that the stabilities of the TTR mutations are related to the mechanism(s) of FAC. Our studies of the structural stabilities of the TTR mutations will allow us to establish the quantitative relationship between the structural stabilities of the TTR mutation(s) and the incident rate of FAC. These results will lay a theoretical foundation for the design and development of new drugs to treat FAC by stabilizing the TTR mutant protein. It is important to understand the disease and at the same time, open up new avenues for designing drugs to possibly cure FAC by stabilizing the TTR mutations.

Specific Aims
Two aims are proposed to test our hypothesis:

Aim 1: Utilizing MD simulations to study the stabilities of TTR mutations.[5,6,7] In the process of investigation of the stabilities of the different TTR mutations, while over 100 point mutations of TTR have been reported, the TTR mutant investigated here is V122I or a substitution of Val-122 with an Isoleucine. Approximately 3% of the African American community has been shown to carry this mutation.

Aim 2: Utilizing advanced computational technology to explore the mechanism of Familial Amyloid Cardiomyopathy (FAC). With a better understanding of the stabilities of the TTR mutants and their relationship with FAC, further research will be planned for the treatment. For example, in one way, gene therapy technology could be used to correct point mutation(s) on the TTR gene. Another way would be development of new suitable drugs which could bind to the TTR and make it more stable to further decrease the incident rate of FAC.

Research Strategy: Significance
With strong preliminary data, a well-equipped computational lab, advanced computational technologies and skilled investigators, we are in an exceptional position to

carry out the proposed research, which will be the most comprehensive examination to date of the therapeutics to better understand the rare, progressive and fatal disease (FAC).

Research Strategy: Innovation
With the result from the QSAR, we will have clues in designing effective gene therapy by knowing which mutations are more prone in causing FAC. Our ultimate goal also includes discovery of bioactive and selective ligands, which would bind to the Halogen binding pockets (HBP) of the TTR and stabilize it to eventually decrease the incident rate of FAC.These results will lay a theoretical foundation for the design and development of new drugs to treat FAC by stabilizing the TTR mutant protein. It is important to understand the disease and at the same time, open up new avenues for designing drugs to possibly cure FAC by stabilizing the TTR mutations.

Research Strategy: Approach
1. The three-dimensional structure of the Transthyretin (TTR) is known from the X-Ray data obtained from the Protein Data Bank. In the structure, two TTR monomers associate via hydrogen bonds to form stable dimers designated AA' and BB'. The two dimers associate further to form the TTR tetramer. Thyroxine binds to the tetramer via two identical Halogen Binding Pockets(HBP), which were found at the interface of the two dimers. MD simulation will be carried out on this 3-D structure and the following properties will be calculated to investigate the stabilities of the TTR mutation: molecular interactions between the dimmers; electrostatics of each binding pocket, and solvation availabilities over the tetramer. The initial MD simulation will also be used as the protocol to investigate other related TTR mutants as well.
2. The biological activities of TTR mutants related to different TTR mutants have been studied in vitro. The in vitro evaluated relationship between thermodynamic (x Axis; Cm of Urea-Mediated Dissociation/ Denaturation Curve) and kinetic stability (y Axis, t1/2 of Tetramer Dissociation/ Unfolding) indicated the disease phenotype of TTR variants including suppressor mutations (black circles), nonpathogenic mutations (white circles), CNS-prominent mutations (blue diamonds), non-CNS prominent mutations (red diamonds), and non-CNS prominent mutations that sometimes exhibit CNS symptoms (green diamonds). This data has provided us with a starting point to study the biological activities related to FAC and can be used to establish the quantitative structure-activities relationship of the stabilities of TTR mutation with treatment of FAC. This study will give us clues as it relates to designing and developing either gene therapy or new drug treatment for FAC.

Research Design and Methods
1. MD simulation of the interested TTR mutants.
Utilizing MD simulations to study the stabilities of TTR mutations.[5,6,7] In the process of investigation of the stabilities of the different TTR mutations, while over 100 point mutations of TTR have been reported, the TTR mutant investigated here is V122I or a substitution of Val-122 with an Isoleucine.

2. QSAR on the know biological data with the structural data.

Utilizing advanced computational technology to explore the mechanism of Familial Amyloid Cardiomyopathy (FAC). With a better understanding of the stabilities of the TTR mutants and their relationship with FAC, further research will be planned for the treatment. For example, in one way, gene therapy technology could be used to correct point mutation(s) on the TTR gene. Another way would be development of new suitable drugs which could bind to the TTR and make it more stable to further decrease the incident rate of FAC.

Challenges
In the long term thinking, the risk of adverse events (AEs) is difficult to evaluate based on the small number of patients who received any kind of treatment to date.
The long-term efficacy and safety of our design for periods up to 5–8 years appears favorable, based on extension studies from future clinical trial program and real-world experience in hundreds of patients to date.

Future Plans
Manuscripts and newer proposal will be produced from this proposed research. In the future, we hope to run MD simulations on all the representative TTR mutants and make our research as comprehensive as we can.

Budget Breakdown
Charles and Mary Latham Fund: Instability of Transthyretin and the Family Amyloidal Cardiomyopathy

A. SENIOR PERSONNEL:

There is no salary request for PI Dr. Matthew George, Jr. and Co-PI Dr. Yayin Fang.

D. SUPPLY & MATRERIALS
General supplies
One Computer and one Linux workstation will be required for this proposal. They will be used for molecular modeling and MD simulations of molecular micelle bound with ligand in various conditions.
Total = $9,000.00

E. TRAVEL
Domestic travel support is requested for research team to attend annual conference and additional public health related meeting to present project outcomes.
Total = $6,000.00

L. TOTAL DIRECT COSTS
Total = $15,000.00

O. TOTAL REQUESTED (Direct and Indirect)
Total = $15,000.00

Recommendation/Notes

Budget Justification

Charles and Mary Latham Fund: Instability of Transthyretin and the Family Amyloidal Cardiomyopathy

A. SENIOR PERSONNEL:

There is no salary request for PI Dr. Matthew George, Jr. and Co-PI Dr. Yayin Fang.

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BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Fang, Yayin	Associate Professor of Biochemistry
eRA COMMONS USER NAME (credential, e.g., agency login) YAYINFANG	

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

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Beijing Normal University, China	B.S.	07/85	Chemistry
Nankai University, China	M.S.	07/98	Physical Chemistry
Nankai University	Ph. D	07/01	Physical Chemistry
Indiana University Purdue University - Indianapolis (IUPUI)	Postdoctoral	02/05	Biochemistry

A. Personal Statement

I have been working in the field of theoretical study on interactions between small molecules with their targets for more than a decade. The computational methods I have used include all kinds of available molecular modeling methods but my particular area of expertise lies studies on ligand-target interaction energy by using molecular mechanisms (MM) and Quantum Mechanism (QM) and the studies on the dynamic changes of those interactions by using molecular dynamics simulation (MD). The ligand-target systems I studied cover different kind of low molecular weight compounds interacting with macro molecules, polymers, nucleic acid and proteins. The results of my research has been published in various peer-reviewed scientific journals, including *Journal of the American Chemical Society(JACS)*, *Proceedings of the National Academy of Sciences of the United States of America(PNAS)*, *Bioorganic & Medicinal Chemistry(BMC), Journal of Molecular Structure THEOCHEM and et al.* In addition, I am the first or corresponding author in 22 of the 34 research publications, which demonstrate my key role in the research and my significant individual contributions to the field.

As Co-Principal Investigator of this proposed research, I will be the leader of the proposed research work on the training for molecular modeling on the coordination/QSAR between the molecular modeling and molecular biology of the Transthyretin with Family Amyloidal Cardiomyopathy.

B. Positions and Honors

2016 – Present **Associate Professor** Department of Biochemistry, College of Medicine, Howard University, Washington, DC

2012 – 2016 **Assistant Professor** Department of Biochemistry, College of Medicine, Howard University, Washington, DC

2007 – 2012 **Assistant Research Professor** (a non-tenure track position, WOC) Department of Biochemistry, College of Medicine, Howard University, Washington, DC

2005 – 2006 **Research Associate** Research Center of Minority Institute (RCMI), College of Medicine, Howard University Washington, DC

2004 - 2005 **Visiting Research Associate** Center for Computational Biology and Bioinformatics (CCBB), Indiana University School of Medicine, Indianapolis, Indiana

2001 - 2003 **Postdoctoral Fellow** Department of Chemistry & Chemical Biology, Purdue School of Science, Indiana University Purdue University Indianapolis (IUPUI), Indianapolis, Indiana

2000 - 2001 **Associate Professor** Department of Chemistry, Xuzhou Normal University, Xuzhou, Jiangsu Province, China.

C. Selected Peer-reviewed Publications (Selected from 34 peer-reviewed publications)

1. Kevin F. Morris, Eugene J. Billiot, Fereshteh H. Billiot, Jordan A. Ingle, Kevin B. Krauss, Corbin R. Lewis, Kenny B. Lipkowitz, William M. Southerland, and **Yayin Fang**[*]. **"**Using Molecular Dynamics Simulations to Identify the Key Factors Responsible for Chiral Recognition by an Amino Acid-based Molecular Micelle." *Journal of Dispersion Science and Technology*, 2019, 40(5), 716-727.
2. Zoe Ramos, Gabriel A. Rothbauer, Johnathan Turner, Corbin R. Lewis, Kevin F. Morris, Eugene J. Billiot, Fereshteh H. Billiot, and **Yayin Fang.** "Comparison of Chiral Recognition of Binaphthyl Derivatives with L-Undecyl-Leucine Surfactants in the Presence of Arginine and Sodium Counterions" *Journal of Chromatographic Science*, 2018, 57(1), 54-62.
3. Gabriel A. Rothbauer, Elisabeth A. Rutter, Chelsea Reuter-Seng, Simon Vera, Eugene J. Billiot, **Yayin Fang**, Fereshteh H. Billiot, and Kevin F. Morris. "NMR Investigation of the Effect of pH on Micelle Formation by the Amino Acid-Based Surfactant Undecyl L-Phenylalaninate." *Journal of Surfactants and Detergents*, 2018, 21(1), 139-153.
4. Kevin F. Morris, Eugene J. Billiot, Fereshteh H. Billiot, Jordan A. Ingle, Stephanie R. Zack, Kevin B. Krauss, Kenny B. Lipkowitz, William M. Southerland, and **Yayin Fang**[*]. **"**Investigation of Chiral Recognition by Molecular Micelles with Molecular Dynamics Simulations." *Journal of Dispersion Science and Technology*, 2018, 39(1), 45-54.
5. Linyong Mao, **Yayin Fang**, Michael Campbell, and William M. Southerland. **"**Population Differentiation in Allele Frequencies of Obesity-Associated SNPs." *BMC medicinal Genomics*, 2017, 18 (1), 861-876.
6. Kevin F. Morris, Eugene J. Billiot, Fereshteh H. Billiot, Jordan A. Ingle, Stephanie R. Zack, Kevin B. Krauss, Kenny B. Lipkowitz, William M. Southerland, and **Yayin Fang**[*]. **"**Investigation of Chiral Recognition by Molecular Micelles with Molecular Dynamics Simulations." Journal of Dispersion Science and Technology, 2018, 39(1), 45-54.
7. Charles O. Ogindo, Mozna H. Khraiwesh, Matthew George, Jr., Yakini Brandy, Nailah Brandy, Ayele Gugssa, Mohammad Ashraf, Muneer Abbas, William M. Southerland, Clarence M. Lee, Oladapo Bakare and **Yayin Fang***. "Novel Drug Design for Chagas Disease via Targeting *Trypanosoma cruzi* Tubulin: Homology Modeling and Binding Pocket Prediction on *Trypanosoma cruzi* Tubulin Polymerization Inhibition by Naphthoquinone Derivatives." *Bioorganic and Medicinal Chemistry*, 2016, 24, 3849 -3855.
8. Furqan Sami, Ronald K. Gary, **Yayin Fang**, Sudha Sharma*****, "Site-directed mutants of human RECQ1 reveal functional importance of the zinc binding domain". *Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis*. 2016, 790, 8-18.
9. Kevin F. Morris**,** Eugene J. Billiot**,** Fereshteh H. Billiot**,** Kenny B. Lipkowitz**,** William M. Southerland**, Yayin Fang***, **"** Molecular Dynamics Simulation and NMR Investigation of the Association of the β-Blockers Atenolol and Propranolol with a Chiral Molecular Micelle. ", *Chemical Physics*, 2015, 457, 133-146.
10. Kevin F. Morris**,** Eugene J. Billiot**,** Fereshteh H. Billiot**,** Kenny B. Lipkowitz**,** William M. Southerland**, Yayin Fang***, **"** A Molecular Dynamics Simulation Study of the Association of 1,1′-Binaphthyl-2,2′-diyl hydrogen phosphate Enantiomers with a Chiral Molecular Micelle.", *Chemical Physics*, 2014, 439, 36-43
11. Patrice L. Jackson, K.R. Scott, William M. Southerland, Yayin Fang. Enaminones 8: CoMFA and CoMSIA studies on some anticonvulsant enaminones. *Bioorganic & Medicinal Chemistry.* 2009, 17:133-40. NIHMS86019
12. Yayin Fang, Craig A. Claussen, Kenny B. Lipkowitz, Eric C. Long. Diastereoselective DNA Cleavage Recognition by Ni(II)•Gly-Gly-His Derived Metallopeptides. *Journal of the American Chemical Society.* 2006, 128(2):3198–207. PMCID: PMC2538425
13. Yayin Fang, Kenny B. Lipkowitz, Eric C. Long. Molecular Dynamics Simulations of the Orientation of

Ni(II)Gly-Gly-His and Ni(II)Arg-Gly-His Metallopeptide-DNA Association. *Journal of Chemical Theory and Calculation*. 2006, 2(5):1453-63. PMID: 15113212

14. Pedro R. Romero, Saima Zaidi, Yayin Fang, Vladimir N. Uversky, Predrag Radivojac, Christopher J. Oldfield, Marc S. Cortese, Megan Sickmeier, Tanguy LeGall, Zoran Obradovic, A. Keith Dunker. Alternative splicing in concert with protein intrinsic disorder enables increased functional diversity in multicellular organisms. *Proceedings of the National Academy of Sciences of the United States of America.* 2006,103(22):8390-5. PMCID: PMC1482503
15. Yayin Fang, Bruce D. Ray, Craig A. Claussen, Kenny B. Lipkowitz, Eric C. Long. "Ni(II)•Gly-Gly-His Derived Metallopeptide-DNA Interactions: Structural Characterization of Minor Groove Binding and Recognition. *Journal of the American Chemical Society*. 2004, 126(17):5403-12. PMID: 15113212

D. Research Support

Ongoing Research Support

- "HDR DSC: Collaborative Research: Enrich the Data Science Training of STEM". National Science Foundation. PI: Jiang Li, $449,995.00 10/01/2019 to 06/31/2022, **Role**: Co - PI.
- "Understanding DNA Cleavage with Organometallic Molecules" The Office of Naval Research(N00014-19-1-2602). PI: Yayin Fang. $69,993.00, 08/01/2019 to 7/31/2020. Role: Principal Investigator.
- "Computational approach to access the effect of pH variations on chiral recognition of the molecular micelles" The Office of Naval Research(N00014-18-1-2145). PI: Yayin Fang. $75,743.00, 03/01/2018 to 2/28/2020. Role: Principal Investigator.
- The Center for Computational Biology & Bioinformatics component of Howard University Research Center for Minority Health and Health Disparities. PI: William M. Southerland; NIH/NIMHD, 2U54MD007597-31, $3,766,863.00, June 1, 2019 – January 31, 2024. **Role:** Co-director.
- "RUI-Examination of Molecular Recognition of Amino Acid Based Macromolecular Assembles". National Science Foundation Chemical Measurement and Imaging. PI: Fereshteh Billiot, $416,450.00, 9/01/2017 to 8/31/2020, Role: Principle Investigator.

Completed Research Support

- The Center for Computational Biology & Bioinformatics component of the Howard University Research Centers in Minority Institutions PI: William M. Southerland; NIH/NIMHD, #G12 MD007597, $10,249,720, September 2014 – June 2019. **Role:** Co-director.
- "Computational approach to access the effect of pH variations on chiral recognition of the molecular micelles" The Office of Naval Research. PI: Yayin Fang. $75,743.00, 03/01/2018 to 02/29/2020. Role: Principal Investigator.
- HUMAA Endowed Founder's Chair in the Basic Sciences Award. $329,405.36. October 15, 2015 – October 15, 2018, **Role**: Endowed Founder's Co-Chair.
- "Humanized EGFR and EGFRVLLL-Bispecific Immunotoxin for HNSCC Therapy." 1R15DE025138-01(NIH/NIDCR). PI: Liang Shan. $452,911. August 15, 2015 – July 31, 2018. **Role**: Consultant.
- "Examination of Molecular Recognition of Amino Acid Based Macromolecular Assemblies." The Office of Naval Research. PI: Yayin Fang. $75,015.00, 03/01/2017 to 08/31/2018. **Role:** Principal Investigator.
- "Pharmacophore Studies and Organic Synthesis of Small Molecules for Curing Chagas Disease". "HU ADVANCE IT: WOMEN OF COLOR FACULTY IN STEM AS CHANGE AGENTS" The Howard University HU ADVANCE-IT Mini Grant. PI: Yayin Fang. $10,000.00. May 1, 2016 – April 30, 2017. **Role:** Principal Investigator.
- "Development of a Multispecific Recombinant Immunotoxin for Cancer Therapy." The Howard University RCMI-P3 grant. PI: Liang Shan. $99,926. April 1, 2015 - March 31, 2017. **Role**:

Consultant.

- "HU ADVANCE IT: WOMEN OF COLOR FACULTY IN STEM AS CHANGE AGENTS" The Howard University HU ADVANCE-IT Mini Grant. PI: Yayin Fang. $10,000.00. October 1, 2014 - September 30, 2015. **Role:** Principle Investigator.
- The Howard University Bridge Funds and Pilot Study Awards Program (BFPSAP). PI: Yayin Fang. **Grant Proposal**: $24,397.00. November 1, 2012 - October 31, 2013. **Role:** Principle Investigator.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
George, Jr., Matthew	Associate Professor & Chairman, Biochem. & Mol. Biol.
eRA COMMONS USER NAME (credential, e.g., agency login) MGEORGEJR	

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

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Wiley College, Marshall, Texas	B.S.	1971	Biology/Chemistry
Atlanta University, Atlanta, Georgia	M.S.	1974	Microbiology/Biochemistry
University of California, Berkeley, California	Ph.D.	1982	Biochemistry/Mol.Genetics
San Diego Zoo, San Diego, California	Post-doc	1981-1983	Mol. Biology/ Systematics
National Cancer Institute, Frederick, Maryland	Staff-fellow	1983-1984	Mol. Genetics/ Systematics

A. Personal Statement

I have been working in the field of biochemistry and molecular genetics for more than three decades. As the Principal Investigator of this proposed research, I will be the leader of the proposed research work on the coordination/QSAR between the molecular modeling and molecular biology of the Transthyretin with Family Amyloidal Cardiomyopathy.

B. Positions and Honors

2008(October)	Visiting Lecturer, University of Medicine-Health Sciences, St. Kitts
2002(June- July)	Visiting Scientist, University of Siena, Siena Italy (Minority International Training Program)
12/2001- Present	Chair, Department of Biochemistry & Molecular Biology, Howard University, College of Medicine, Washington, D. C.
03/1999-12/2001	Interim Chair, Department of Biochemistry & Molecular Biology, Howard University, College of Medicine, Washington, D. C.
1995 (May- Aug.)	Visiting Scientist, University of Paris, South, Orsay, France (Minority International Research Training Program)
1992 – Present	Associate Professor of Biochemistry, Howard University College of Medicine, Washington, D.C.
1984 – 1992	Assistant Professor of Biochemistry, Howard University College of Medicine, Washington, D.C.
1984 – 1986	Guest Researcher of the National Cancer Institute, Frederick, MD.

C. Selected Peer-reviewed Publications

1. Charles O. Ogindo, Mozna H. Khraiwesh, **Matthew George, Jr.,** Yakini Brandy, Nailah Brandy, Ayele Gugssa, Mohammad Ashraf, Muneer Abbas, William M. Southerland, Clarence M. Lee, Oladapo Bakare and Yayin Fang*. "Novel Drug Design for Chagas Disease via Targeting *Trypanosoma cruzi* Tubulin: Homology Modeling and Binding Pocket Prediction on *Trypanosoma cruzi* Tubulin Polymerization Inhibition by Naphthoquinone Derivatives." *Bioorganic and Medicinal Chemistry*, 2016, 24, 3849 -3855.
2. Ameis, Kamal, Kanaan, Yasmine, Das, Jharna, **Matthew George, Jr.,** (2008). **"**Effect of manual acupuncture-induced injury on rat skeletal muscle". Medical Acupuncture. **20**(4):225-230.
3. F. L. C. Jackson, A. Mayes, M. E. Mack, A. Froment, S. O. Y. Keita, R. A. Kittles, **Matthew George, Jr.,** K. J. Shujaa, M. L. Blakey, and L. M. Rankin-Hill (2009). "Origins of the New York African Burial Ground Population: Biological evidence of geographical and macroethnic affiliations using craniometrics, dental morphology, and preliminary genetic analyses". In: The U.S. General Services Administration's "The New York African Burial Ground: Unearthing the African Presence in Colonial New York, Volume I"; "The Skeletal

Biology of the New York African Burial Ground, Part I", (Michael L. Blakey and Lesley M. Rankin-Hill, editors). Howard University Press, Chapter 5, pp. 69-93

4. George, Y. S. and **Matthew George, Jr.,** 2006. The science, treatment and prevention of HIV/AIDS. In: Humanizing Pedagogy Through HIV/AIDS Prevention, Transforming Teacher Education Knowledge, Paradigm Publishers, Boulder & London, p. 61-74
5. Traore, K., M. A. Trush, **Matthew George, Jr.,** E. W. Spannhake, W. Anderson, and A. Asseffa. 2005. Signal transduction of phorbol 12-myristate 13 acetate (PMA)-induced growth inhibition of human monocytic leukemia THP-1 cells is reactive oxygen dependent. Leukemia Research. **29:** 863-879
6. Dobbins, A.T., **Matthew George, Jr.,** D. A. Basham, M.E. Ford, J. M. Houtz, M.L. Pedulla, J.G. Lawrence, G.F. Hatfull, and R.W. Hendrix. 2004. Complete genomic sequence of the virulent *Salmonella* bacteriophage SP6. Journal of Bacteriology, **186**:1933-1944
7. Zarlenga, D. S. and **Matthew George, Jr.,** 1995. *Taenia crassiceps*: Cloning and mapping of mitochondrial DNA and its application to the phenetic analysis of a new species of *Taenia* from Southeast Asia. Experimental Parasitology. **81:**604-607
8. Basi, N., **Matthew George, Jr.,** and R.H. Pointer. 1994. Regulation of glycogen synthase activity in isolated rat adipocytes by levamisole. Life Sciences. **54:**1027-1034.
9. DeSalle, R., A.K. Williams and **Matthew George, Jr.,** 1993. Isolation and characterization of animal mitochondrial DNA. Methods in Enzymology. Molecular Evolution: Producing the Biochemical Data. **224:**176-204
10. Higuchi, R.G., L.A. Wrischnik, E. Oakes, **Matthew George, Jr.,** B. Tong, and A.C. Wilson 1987. Mitochondrial DNA of the extinct *Quagga:* Relatedness and extent of post-mortem change. J. Mol. Evol. **25**:283-287.
11. **Matthew George, Jr.,** and O.A. Ryder 1986. Mitochondrial DNA evolution in the genus ***Equus***. Mol. Biol. Evol. **3**:525-546.
12. Wilson, A. C., R.L. Cann, S.M. Carr, **Matthew George, Jr.,** U.B. Gyllensten, K. Helm-Bychowski, R.G. Higuchi, S.R. Palumbi, E.M. Prager, R.D. Sage and M. Stoneking. 1985. Mitochondrial DNA in relation to evolutionary genetics. Biol. J. Linnaean Soc. **26**:375-400.
13. Brown, W. M., **Matthew George, Jr.,** and A.C. Wilson. 1979. Rapid evolution of animal mitochondrial DNA. Proc. Natl. Acad. Sci. USA **76**:1967 -1971.
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D. Research Support

Grants

1999 – 2002	Mordecai Wyatt Johnson Grant (With Dr. A. Asseffa)
1999 – 2004	NIH/NINDS Grant (With Dr. M.A. Haxhiu)
1995 – 1999	NIH-NCI Grant (With Dr. A. Day)
1995 – 1997	Senior Scientist: The African Burial Ground Project, GSA Grant (With Dr. M. Blakey)
1994 – 1998	NIH-NIGMS Grant (With Dr. A. Day)
1991 – 1993	NIH/ RCMI-National Center for Human Genome Research Planning Grant (Co-Investigator)
1990 – 1994	NIH - MBRS Grant

Membership

Sigma Xi
American Society for Biochemistry and Molecular Biology
Association of Medical and Graduate Departments of Biochemistry
American Association for the Advancement of Science

PROPOSAL BUDGET WORKSHEET

PROJECT TITLE: Instability of Transthyretin and the Family Amyloidal Cardiomyopathy

PRINCIPAL INVESTIGATOR: Matthew George, Jr.

BUDGET PERIOD: 12/1/19 to 11/30/20

YEAR 1

			% effort devoted to Project			Person-months			Institutional Base Salary	Salary	Funds Requested	Cost Sharing
			CAL	ACAD	SUM	CAL	ACAD	SUM				
(A)	**KEY PERSONNEL (Howard University Only)**											
	Name	**Role on Project**										
	Matthew George,Jr.	PI	1.00%	0.00%	0.00%	0.12	0.00	0.00	$ -	$ -	$ -	$ -
	Yayin Fang	Co-PI	1.00%	0.00%	0.00%	0.12	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
	SUBTOTAL PERSONNEL										**$ -**	**$ -**

			Funds Requested	Cost Sharing
(B)	**WAGED PERSONNEL**			
			$ -	$ -
			$ -	$ -
			$ -	$ -
	SUBTOTAL WAGES		**$ -**	**$ -**
	TOTAL PERSONNEL		**$ -**	**$ -**
(C)	**BENEFITS**			
	Salaried Faculty & Staff @ 29.1%	Enter the applicable rate in the yellow box.	$ -	$ -
	Waged Employees @ 8.6%	Enter the applicable rate in the yellow box.	$ -	$ -
	TOTAL BENEFITS		**$ -**	**$ -**
	TOTAL PERSONNEL AND FRINGE BENEFITS		**$ -**	**$ -**
(D)	**SUPPLIES & MATERIALS**			
	General Supplies		$ 9,000	$ -
	Misc. Supplies		$ -	$ -
	TOTAL SUPPLIES & MATERIALS		**$ 9,000**	**$ -**
(E)	**TRAVEL**			
	Local		$ 6,000	$ -
	Foreign		$ -	$ -
	TOTAL TRAVEL		**$ 6,000**	**$ -**
(F)	**FOOD**			
			$ -	$ -
	TOTAL FOOD		**$ -**	**$ -**
(G)	**CONSULTANTS FEES**			
			$ -	$ -
	TOTAL CONSULTANTS FEES		**$ -**	**$ -**
(H)	**PARTICIPANT SUPPORT COSTS**			
	(1) Stipends		$ -	$ -
	(2) Travel		$ -	$ -
	(3) Subsistence		$ -	$ -
	(4) Tuition		$ -	$ -
	(5) Other		$ -	$ -
	TOTAL PARTICIPANT SUPPORT COSTS		**$ -**	**$ -**
(I)	**EQUIPMENT**			
	(1)		$ -	$ -
	(2)		$ -	$ -
	TOTAL EQUIPMENT		**$ -**	**$ -**
(J)	**SUBCONTRACTS**			
	(1)		$ -	$ -
	(2)		$ -	$ -
	(3)		$ -	$ -
	(4)		$ -	$ -
	(5)		$ -	$ -
	TOTAL SUBCONTRACTS		**$ -**	**$ -**
(K)	**OTHER DIRECT COSTS**			
	(1)		$ -	$ -
	(2)		$ -	$ -
	(3)		$ -	$ -
	(4)		$ -	$ -
	TOTAL OTHER		**$ -**	**$ -**
(L)	**TOTAL DIRECT COST (TDC)**		**$ 15,000**	**$ -**
(M)	**MODIFIED TOTAL DIRECT COST (MTDC)**		**$ 15,000**	**XXXXXXX**
(N)	**Total Facilities & Administrative Cost @ 0.0%**	**of Modified Total Direct Cost (Enter the applicable rate in the yellow box.)**	**$ -**	**XXXXXXX**
	Choose one: ● Organized Research ○ Instruction ○ Other Sponsored Activities			
(O)	**GRAND TOTAL**		**$ 15,000**	**$ -**

PROPOSAL BUDGET WORKSHEET

PROJECT TITLE: Instability of Transthyretin and the Family Amyloidal Cardiomyopathy

PRINCIPAL INVESTIGATOR: Matthew George, Jr.

BUDGET PERIOD: ____________ to ____________

	YEAR 2		% effort devoted to Project			Person-months			Institutional Base Salary	Salary	Funds Requested	Cost Sharing
			CAL	ACAD	SUM	CAL	ACAD	SUM				
(A)	**KEY PERSONNEL (Howard University Only)**											
	Name	**Role on Project**										
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
	SUBTOTAL PERSONNEL										$ -	$ -
(B)	**WAGED PERSONNEL**											
											$ -	$ -
											$ -	$ -
											$ -	$ -
	SUBTOTAL WAGES										$ -	$ -
	TOTAL PERSONNEL										$ -	$ -
(C)	**BENEFITS**											
	Salaried Faculty & Staff @	29.1%	Enter the applicable rate in the yellow box.								$ -	$ -
	Waged Employees @	8.6%	Enter the applicable rate in the yellow box.								$ -	$ -
	TOTAL BENEFITS										$ -	$ -
	TOTAL PERSONNEL AND FRINGE BENEFITS										$ -	$ -
(D)	**SUPPLIES & MATERIALS**											
	General Supplies										$ -	$ -
	Misc. Supplies										$ -	$ -
	TOTAL SUPPLIES & MATERIALS										$ -	$ -
(E)	**TRAVEL**											
	Local										$ -	$ -
	Foreign										$ -	$ -
	TOTAL TRAVEL										$ -	$ -
(F)	**FOOD**											
											$ -	$ -
	TOTAL FOOD										$ -	$ -
(G)	**CONSULTANTS FEES**											
											$ -	$ -
	TOTAL CONSULTANTS FEES										$ -	$ -
(H)	**PARTICIPANT SUPPORT COSTS**											
	(1) Stipends										$ -	$ -
	(2) Travel										$ -	$ -
	(3) Subsistence										$ -	$ -
	(4) Tuition										$ -	$ -
	(5) Other										$ -	$ -
	TOTAL PARTICIPANT SUPPORT COSTS										$ -	$ -
(I)	**EQUIPMENT**											
	(1)										$ -	$ -
	(2)										$ -	$ -
	TOTAL EQUIPMENT										$ -	$ -
(J)	**SUBCONTRACTS**											
	(1)										$ -	$ -
	(2)										$ -	$ -
	(3)										$ -	$ -
	(4)										$ -	$ -
	(5)										$ -	$ -
	TOTAL SUBCONTRACTS										$ -	$ -
(K)	**OTHER DIRECT COSTS**											
	(1)										$ -	$ -
	(2)										$ -	$ -
	(3)										$ -	$ -
	(4)										$ -	$ -
	TOTAL OTHER										$ -	$ -
(L)	**TOTAL DIRECT COST (TDC)**										$ -	$ -
(M)	**MODIFIED TOTAL DIRECT COST (MTDC)**										$ -	XXXXXXX
(N)	**Total Facilities & Administrative Cost @**	0.0%	**of Modified Total Direct Cost (Enter the applicable rate in the yellow box.)**								$ -	XXXXXXX
	Choose one:	● Organized Research		○ Instruction			○ Other Sponsored Activities					
(O)	**GRAND TOTAL**										$ -	$ -

PROPOSAL BUDGET WORKSHEET

PROJECT TITLE: Instability of Transthyretin and the Family Amyloidal Cardiomyopathy

PRINCIPAL INVESTIGATOR: Matthew George, Jr.

BUDGET PERIOD: ________ to ________

	YEAR 3		% effort devoted to Project			Person-months			Institutional Base Salary	Salary	Funds Requested	Cost Sharing
			CAL	ACAD	SUM	CAL	ACAD	SUM				
(A)	**KEY PERSONNEL (Howard University Only)**											
	Name	Role on Project										
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
	SUBTOTAL PERSONNEL										**$ -**	**$ -**
(B)	**WAGED PERSONNEL**											
											$ -	$ -
											$ -	$ -
											$ -	$ -
	SUBTOTAL WAGES										**$ -**	**$ -**
	TOTAL PERSONNEL										**$ -**	**$ -**
(C)	**BENEFITS**											
	Salaried Faculty & Staff	@	29.1%	Enter the applicable rate in the yellow box.							$ -	$ -
	Waged Employees	@	8.6%	Enter the applicable rate in the yellow box.							$ -	$ -
	TOTAL BENEFITS										**$ -**	**$ -**
	TOTAL PERSONNEL AND FRINGE BENEFITS										**$ -**	**$ -**
(D)	**SUPPLIES & MATERIALS**											
	General Supplies										$ -	$ -
	Misc. Supplies										$ -	$ -
	TOTAL SUPPLIES & MATERIALS										**$ -**	**$ -**
(E)	**TRAVEL**											
	Local										$ -	$ -
	Foreign										$ -	$ -
	TOTAL TRAVEL										**$ -**	**$ -**
(F)	**FOOD**											
											$ -	$ -
	TOTAL FOOD										**$ -**	**$ -**
(G)	**CONSULTANTS FEES**											
											$ -	$ -
	TOTAL CONSULTANTS FEES										**$ -**	**$ -**
(H)	**PARTICIPANT SUPPORT COSTS**											
	(1) Stipends										$ -	$ -
	(2) Travel										$ -	$ -
	(3) Subsistence										$ -	$ -
	(4) Tuition										$ -	$ -
	(5) Other										$ -	$ -
	TOTAL PARTICIPANT SUPPORT COSTS										**$ -**	**$ -**
(I)	**EQUIPMENT**											
	(1)										$ -	$ -
	(2)										$ -	$ -
	TOTAL EQUIPMENT										**$ -**	**$ -**
(J)	**SUBCONTRACTS**											
	(1)										$ -	$ -
	(2)										$ -	$ -
	(3)										$ -	$ -
	(4)										$ -	$ -
	(5)										$ -	$ -
	TOTAL SUBCONTRACTS										**$ -**	**$ -**
(K)	**OTHER DIRECT COSTS**											
	(1)										$ -	$ -
	(2)										$ -	$ -
	(3)										$ -	$ -
	(4)										$ -	$ -
	TOTAL OTHER										**$ -**	**$ -**
(L)	**TOTAL DIRECT COST (TDC)**										**$ -**	**$ -**
(M)	**MODIFIED TOTAL DIRECT COST (MTDC)**										**$ -**	XXXXXXX
(N)	**Total Facilities & Administrative Cost @**	0.0%	**of Modified Total Direct Cost (Enter the applicable rate in the yellow box.)**								**$ -**	XXXXXXX
	Choose one:	● Organized Research		○ Instruction			○ Other Sponsored Activities					
(O)	**GRAND TOTAL**										**$ -**	**$ -**

PROPOSAL BUDGET WORKSHEET

PROJECT TITLE: Instability of Transthyretin and the Family Amyloidal Cardiomyopathy

PRINCIPAL INVESTIGATOR: Matthew George, Jr.

BUDGET PERIOD: ____________ to ____________

YEAR 4

	Name	Role on Project	% effort devoted to Project CAL	% effort ACAD	% effort SUM	Person-months CAL	Person-months ACAD	Person-months SUM	Institutional Base Salary	Salary	Funds Requested	Cost Sharing
(A)	KEY PERSONNEL (Howard University Only)											
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
	SUBTOTAL PERSONNEL										$ -	$ -

	Item	Funds Requested	Cost Sharing
(B)	WAGED PERSONNEL		
		$ -	$ -
		$ -	$ -
		$ -	$ -
	SUBTOTAL WAGES	$ -	$ -
	TOTAL PERSONNEL	$ -	$ -
(C)	BENEFITS		
	Salaried Faculty & Staff @ 29.1% Enter the applicable rate in the yellow box.	$ -	$ -
	Waged Employees @ 8.6% Enter the applicable rate in the yellow box.	$ -	$ -
	TOTAL BENEFITS	$ -	$ -
	TOTAL PERSONNEL AND FRINGE BENEFITS	$ -	$ -
(D)	SUPPLIES & MATERIALS		
	General Supplies	$ -	$ -
	Misc. Supplies	$ -	$ -
	TOTAL SUPPLIES & MATERIALS	$ -	$ -
(E)	TRAVEL		
	Local	$ -	$ -
	Foreign	$ -	$ -
	TOTAL TRAVEL	$ -	$ -
(F)	FOOD		
		$ -	$ -
	TOTAL FOOD	$ -	$ -
(G)	CONSULTANTS FEES		
		$ -	$ -
	TOTAL CONSULTANTS FEES	$ -	$ -
(H)	PARTICIPANT SUPPORT COSTS		
	(1) Stipends	$ -	$ -
	(2) Travel	$ -	$ -
	(3) Subsistence	$ -	$ -
	(4) Tuition	$ -	$ -
	(5) Other	$ -	$ -
	TOTAL PARTICIPANT SUPPORT COSTS	$ -	$ -
(I)	EQUIPMENT		
	(1)	$ -	$ -
	(2)	$ -	$ -
	TOTAL EQUIPMENT	$ -	$ -
(J)	SUBCONTRACTS		
	(1)	$ -	$ -
	(2)	$ -	$ -
	(3)	$ -	$ -
	(4)	$ -	$ -
	(5)	$ -	$ -
	TOTAL SUBCONTRACTS	$ -	$ -
(K)	OTHER DIRECT COSTS		
	(1)	$ -	$ -
	(2)	$ -	$ -
	(3)	$ -	$ -
	(4)	$ -	$ -
	TOTAL OTHER	$ -	$ -
(L)	TOTAL DIRECT COST (TDC)	$ -	$ -
(M)	MODIFIED TOTAL DIRECT COST (MTDC)	$ -	XXXXXXX
(N)	Total Facilities & Administrative Cost @ 0.0% of Modified Total Direct Cost (Enter the applicable rate in the yellow box.)	$ -	XXXXXXX
	Choose one: ● Organized Research ○ Instruction ○ Other Sponsored Activities		
(O)	GRAND TOTAL	$ -	$ -

OSP-RA
BUDGET WORKSHEET

PROPOSAL BUDGET WORKSHEET

PROJECT TITLE: Instability of Transthyretin and the Family Amyloidal Cardiomyopathy

PRINCIPAL INVESTIGATOR: Matthew George, Jr.

BUDGET PERIOD: ____________ to ____________

	YEAR 5		% effort devoted to Project			Person-months			Institutional Base Salary	Salary	Funds Requested	Cost Sharing
			CAL	ACAD	SUM	CAL	ACAD	SUM				
(A)	KEY ERSONNEL (Howard University Only)											
	Name	Role on Project										
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
	SUBTOTAL PERSONNEL										$ -	$ -
(B)	WAGED PERSONNEL											
											$ -	$ -
											$ -	$ -
											$ -	$ -
	SUBTOTAL WAGES										$ -	$ -
	TOTAL PERSONNEL										$ -	$ -
(C)	BENEFITS											
	Salaried Faculty & Staff	@ 29.1%	Enter the applicable rate in the yellow box.								$ -	$ -
	Waged Employees	@ 8.6%	Enter the applicable rate in the yellow box.								$ -	$ -
	TOTAL BENEFITS										$ -	$ -
	TOTAL PERSONNEL AND FRINGE BENEFITS										$ -	$ -
(D)	SUPPLIES & MATERIALS											
	General Supplies										$ -	$ -
	Misc. Supplies										$ -	$ -
	TOTAL SUPPLIES & MATERIALS										$ -	$ -
(E)	TRAVEL											
	Local										$ -	$ -
	Foreign										$ -	$ -
	TOTAL TRAVEL										$ -	$ -
(F)	FOOD											
											$ -	$ -
	TOTAL FOOD										$ -	$ -
(G)	CONSULTANTS FEES											
											$ -	$ -
	TOTAL CONSULTANTS FEES										$ -	$ -
(H)	PARTICIPANT SUPPORT COSTS											
	(1) Stipends										$ -	$ -
	(2) Travel										$ -	$ -
	(3) Subsistence										$ -	$ -
	(4) Tuition										$ -	$ -
	(5) Other										$ -	$ -
	TOTAL PARTICIPANT SUPPORT COSTS										$ -	$ -
(I)	EQUIPMENT											
	(1)										$ -	$ -
	(2)										$ -	$ -
	TOTAL EQUIPMENT										$ -	$ -
(J)	SUBCONTRACTS											
	(1)										$ -	$ -
	(2)										$ -	$ -
	(3)										$ -	$ -
	(4)										$ -	$ -
	(5)										$ -	$ -
	TOTAL SUBCONTRACTS										$ -	$ -
(K)	OTHER DIRECT COSTS											
	(1)										$ -	$ -
	(2)										$ -	$ -
	(3)										$ -	$ -
	(4)										$ -	$ -
	TOTAL OTHER										$ -	$ -
(L)	TOTAL DIRECT COST (TDC)										$ -	$ -
(M)	MODIFIED TOTAL DIRECT COST (MTDC)										$ -	XXXXXXX
(N)	Total Facilities & Administrative Cost @ 0.0%		of Modified Total Direct Cost (Enter the applicable rate in the yellow box.)								$ -	XXXXXXX
	Choose one:	● Organized Research			○ Instruction			○ Other Sponsored Activities				
(O)	GRAND TOTAL										$ -	$ -

PROPOSAL BUDGET WORKSHEET

PROJECT TITLE: Instability of Transthyretin and the Family Amyloidal Cardiomyopathy

PRINCIPAL INVESTIGATOR: Matthew George, Jr.

PROJECT PERIOD: 12/1/19 to 11/30/20

ALL YEARS

	Name	Role on Project	% effort devoted to Project CAL	% effort ACAD	% effort SUM	Person-months CAL	Person-months ACAD	Person-months SUM	Institutional Base Salary	Salary	Funds Requested	Cost Sharing
(A)	**KEY PERSONNEL (Howard University Only)**											
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
			0.00%	0.00%	0.00%	0.00	0.00	0.00	$ -	$ -	$ -	$ -
	SUBTOTAL PERSONNEL										**$ -**	**$ -**

	Item			Funds Requested	Cost Sharing
(B)	**WAGED PERSONNEL**				
				$ -	$ -
				$ -	$ -
				$ -	$ -
	SUBTOTAL WAGES			**$ -**	**$ -**
	TOTAL PERSONNEL			**$ -**	**$ -**
(C)	**BENEFITS**				
	Salaried Faculty & Staff	@ 29.1%	Enter the applicable rate in the yellow box.	$ -	$ -
	Waged Employees	@ 8.6%	Enter the applicable rate in the yellow box.	$ -	$ -
	TOTAL BENEFITS			**$ -**	**$ -**
	TOTAL PERSONNEL AND FRINGE BENEFITS			**$ -**	**$ -**
(D)	**SUPPLIES & MATERIALS**				
	General Supplies			$ 9,000	$ -
	Misc. Supplies			$ -	$ -
	TOTAL SUPPLIES & MATERIALS			**$ 9,000**	**$ -**
(E)	**TRAVEL**				
	Local			$ 6,000	$ -
	Foreign			$ -	$ -
	TOTAL TRAVEL			**$ 6,000**	**$ -**
(F)	**FOOD**				
				$ -	$ -
	TOTAL FOOD			**$ -**	**$ -**
(G)	**CONSULTANTS FEES**				
				$ -	$ -
	TOTAL CONSULTANTS FEES			**$ -**	**$ -**
(H)	**PARTICIPANT SUPPORT COSTS**				
	(1) Stipends			$ -	$ -
	(2) Travel			$ -	$ -
	(3) Subsistence			$ -	$ -
	(4) Tuition			$ -	$ -
	(5) Other			$ -	$ -
	TOTAL PARTICIPANT SUPPORT COSTS			**$ -**	**$ -**
(I)	**EQUIPMENT**				
	(1)			$ -	$ -
	(2)			$ -	$ -
	TOTAL EQUIPMENT			**$ -**	**$ -**
(J)	**SUBCONTRACTS**				
	(1)			$ -	$ -
	(2)			$ -	$ -
	(3)			$ -	$ -
	(4)			$ -	$ -
	(5)			$ -	$ -
	TOTAL SUBCONTRACTS			**$ -**	**$ -**
(K)	**OTHER DIRECT COSTS**				
	(1)			$ -	$ -
	(2)			$ -	$ -
	(3)			$ -	$ -
	(4)			$ -	$ -
	TOTAL OTHER			**$ -**	**$ -**
(L)	**TOTAL DIRECT COST (TDC)**			**$ 15,000**	**$ -**
(M)	**MODIFIED TOTAL DIRECT COST (MTDC)**			**$ 15,000**	**XXXXXXX**
(N)	**Total Facilities & Administrative Cost @**	**0.0%**	**of Modified Total Direct Cost (Enter the applicable rate in the yellow box.)**	**$ -**	**XXXXXXX**
	Choose one:	● Organized Research	○ Instruction ○ Other Sponsored Activities		
(O)	**GRAND TOTAL**			**$ 15,000**	**$ -**

PROPOSAL BUDGET WORKSHEET

GENERAL INSTRUCTIONS

This form is designed to assist PI's in the budget calculations for sponsored program(s) applications. Worksheets entitled 'Year 1' through 'Year 5' are the data input sheets for hard-coded entries and the sheet entitled 'All Years' will automatically populate based on the entries made on the data input sheets.

In preparing the budget, please adhere to any agency requirements which prescribe how and whether the budgeted amounts should be shown separately. If you are not using funds in a particular line category then use the default $0.00.

NOTE: Not all budget categories are eligible for funding under all programs. Please see eligible activities under the specific program for which you are seeking.

BUDGET CATEGORIES

The budget categories identifies how funds will be allocated by type of use (funds going for salaries, travel, contracts, etc.) Each of the line items should be broken out under each applicable section.

Section A

Enter the name of the key personnel on the project and their respective roles. Enter the percentage effort to be devoted to the project over the calendar, academic, and summer months and the individuals institutional base salary. Person months will be automatically calculated based on the following examples.

Coversion % Effort to Person Months

25% of a 9-month appointment = 2.25 (AY) person months (9 x 0.25 = 2.25).
10% of a 12-month calendar appointment = 1.2 (CY) person months (12 x 0.10 = 1.2).
35% of a 3-month summer term appointment = 1.05 (SM) person months (3 x 0.35 = 1.05).

Example 1: A PI on an AY appointment at a salary of $63,000 will have a monthly salary of $7,000 (one-ninth of the AY). 25% of AY effort would equate 2.25 person months (9 x 0.25 = 2.25). The budget figure for that effort would be $15,750 ($7,000 x 2.25 AY months).

Example 2: A PI on a CY appointment at a salary of $72,000 will have a monthly salary of $6,000 (one-twelfth of the CY). 25% of CY effort would equate to 3 CY months (12 x 0.25 = 3.00). The budget figure for that effort would be $18,000 ($6,000 x 3.00 CY months).

Example 3: If the regular pay schedule of an institution is a 9-month academic year and the PI will devote 9 months at 30% time/ffort and 3 months summer term at 30% time/effort to the project, then 2.7 academic months and 0.9 summer months should be listed in the academic and summer term block of the budget (9 x 30% = 2.7 person months; 3 x 30% = 0.9).

Section B

Enter the name of the wage personnel and their estimated cost to the grant

Section C

The fringe benefits will automatically calculate based on the entries in sections A and B.

Section D

Enter the estimated cost of supplies for the project.

Section E

Enter the estimates for local and domestic travel (mileage for local travel is calculated at $0.375/mile)

Section F

Enter the estimated cost of meals and refreshments for the project.

Section G

Enter the estimated cost for consultants on the project (not to exceed $150/day for a maximum of 10 days/month).

Section H

Enter stipend payment, estimated travel, subsistence, tuition, and any other related participant costs. **These costs are not subject to F&A charges**.

Section I

Enter the estimated cost of equipment for the project.

Section J

Enter the estimated cost for subcontracts for the project (prepare a separate budget worksheet for each subcontract).

Section K

Enter any other associated direct cost for the project.

Sections L-M

These cells will automatically calculate and populate.

Section N

Enter the F&A cost rate in the space provided. The total cost will automatically populate. Choose the appropriate F&A rate type.

Section O

This cell will automatically calculate

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