OMB No. 0925-0001 and 0925-0002 (Rev. 03/2020 Approved Through 02-28-2023)

BIOGRAPHICAL SKETCH

**Provide the following information for the Senior/key personnel and other significant contributors.**

**Follow this format for each person. DO NOT EXCEED FIVE PAGES**.

NAME: Southerland, William M.

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

POSITION TITLE: Professor of Biochemistry

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 DateMM/YYYY | FIELD OF STUDY |
| --- | --- | --- | --- |
| North Carolina State Univ., Raleigh, North Carolina  | B.S | 05/1973 | Chemistry  |
| Duke University, Durham, North Carolina  | Ph.D. | 05/1977 | Biochemistry  |
|  |  |  |  |

# A. Personal Statement

I am Professor of Biochemistry in the Howard University College of Medicine. I am also the Director of the Howard University Center for Computational Biology and Bioinformatics (CCBB), Interim Director of the Howard University Center for Applied Data Science and Analytics (CADSA), and the Principal Investigator of the Howard University Research Centers in Minority Institutions (RCMI) Program. My research interests include utilization of data science principles to probe health data to better understand the chronic disease burden among different ethnic groups and investigations on the impact of gene sequence variation data on disease expression among different ethnic groups. Additional interests include investigating the rules of molecular recognition and interactions using molecular dynamics simulation to correlate conformational changes with time-dependent changes in atom-atom contacts between interacting species and with any associated changes in time-dependent interaction energies. This approach is used to study interaction mechanisms of small molecules with both proteins and DNA and has important implications for design of therapeutic agents. Also, of interest is the utilization of molecular dynamics and time-dependent interaction energy calculations to decode the nucleotide sequence dependency on ligand recognition by DNA. Additional interests include the design of proteins with increased thermal stability for application to industrial, environmental and diagnostic arenas.

# B. Positions and Honors

**Positions and Employment**

1977 - 1978 Post-Doctoral Fellow, Department of Biochemistry, Duke University Medical Center, Durham, North Carolina. Investigated the packaging and assembly mechanisms of hepatic sulfite oxidase

1978 - 1984 Assistant Professor of Biochemistry, Howard University College of Medicine, Washington,DC

1984 - 1995 Associate Professor of Biochemistry, Howard University College of Medicine, Washington, D.C

1990 Sabbatical Researcher, Division of Computer Research and Technology, National Institutes of Health. Worked in the laboratory of Dr. Bernard R. Brooks

1995 - Present Professor of Biochemistry, Howard University College of Medicine, Washington, D.C.

1998 - Present Graduate Professor of Biochemistry, Howard University Graduate School of Arts and

Sciences, Washington, DC

Achievements/Professional development

Vice-President RCMI Program Directors Association, December 2005 - 2014

External Examiner

External examiner for Medical Biochemistry course the University of the West Indies, St. Augustine, Trinidad, May 2006

# C. Contribution to Science

1. **My early work involved the development of a three-dimensional model for the active site of Pneumocystis carinii dihydrofolate reductase. This model provided an early detailed target for the design of potential agents for the treatment of pneumocystis carinii pneumonia.**
2. **Southerland**, WM. Molecular Modeling of the Pneumocystis carinii Methotrexate active site. J. Comp Aided Mol. Design. 1994; 8:113-122.
3. **We have also applied the protein-based drug design strategy to studying the interaction between DNA and small molecule ligands. This approach holds the potential to expand the exploitation of DNA sequences as drug design targets.**
4. Fang Y, Morris VR, Lingani GM, Long EC, **Southerland** WM. 2010. Genome-Targeted Drug Design: Understanding the Netropsin-DNA Interaction. The Open Conference Proceedings Journal 1:157-63. PMC3032215
5. **My laboratory also participated in the design of chircal-selective mixed micelles. These structures possess the ability to discriminate between ‘R’ and ‘S’ enantiomers of small molecules. This is an important component of the synthetic scheme during the drug development process.**
6. **Morris KF, Billiot EJ, Billiot FH, Lipkowitz KB, Southerland, WM, Fang Y. A Molecular Dynamics Simulation Study of Two Dipeptide Based Molecular Micelles: Effects of Amino Acid Order. Open J Phys Chem. 2013 Feb 1:3(1):20-29. PMC2742116**
7. **Morris KF, Billiot EJ, Billiot FH, Gladis AA, Lipkowtiz KB, Southerland WM, Fang Y. A Molecular Dynamics Simulation Study of the Association of 1, 1’-Binaphthyl-2, 2’-diyl hydrogenphosphate Enantiomers with a Chiral Molecular Micelle. Chem Phys. 2014 Aug 17; 439:36-43. PMC4112194**
8. **Morris KF, EugeBilliot EJ, Billiot FH, Ingle JA, Zack SR, Krauss KB, Lipkowitz KB, Southerland WM, Fang**Y. “Investigation of Chiral Recognition by Molecular Micelles with Molecular Dynamics Simulations.” Journal of Dispersion Science and Technology, Published online: 16 Feb. 2017, <http://dx.doi.org/10.1080/01932691.2017.1292462>
9. 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.
10. Additionally, our work investigating allele frequencies in different populations have indicated substantial

population differentiation in allele frequencies of obesity-associated SNPs. These findings may help elucidate the genetic basis that contribute to population disparities in obesity prevalence.

1. Mao L, Fang Y, Campbell M, **Southerland** WM. Population differentiation in allele frequencies of

obesity-associated SNPs**.** BMC Genomics 2017:**18**:861-876

1. An additional publication on the epigenectic effects of exercise is shown below.
2. Ngwa JS, Nwulia E, Ntekim O, Bedada FB, Kwabi-Addo B, Nadarajah S, Johnson S, Southerland WM, Kwagyan J, Obisesan TO. Aerobic Exercise Training-Induced Changes on DNA Methylation in Mild Cognitively Impaired Elderly African Americans: Gene, Exercise, and Memory Study -GEMS-I. Front Mol Nuerosci 2021:14:752403. Published online 2022 Jan 17. Doi: 10.3389/fnmol.2021.752403 PMC8802631
3. Additonal publication on Inter-Institutioal Research Collaboration and Partnerships
4. Hedges JR, Soliman KFA, Southerland WM, D'Amour G, Fern ndez-Repollet E, Khan SA, Kumar D,

Shikuma CM, Rivers BM, Yates CC, Yanagihara R, Thompson WE, Bond VC, Harris-Hooker S,

McClure SA, Ofili EO. Strengthening and Sustaining Inter-Institutional Research Collaborations and

Partnerships. Int J Environ Res Public Health. 2021 Mar 8;18(5). doi: 10.3390/ijerph18052727. PubMed

PMID: 33800316; PubMed Central PMCID: PMC7967451.

Additional List of Published Work in MyBibliography: <http://www.ncbi.nlm.nih.gov/sites/myncbi/1xiByd76opXkZ/bibliography/48035149/public/?sort=date&direction=ascending>

# D. Additional Information: Research Support and/or Scholastic Performance

## Ongoing Research Support

U54MD007597 Southerland (PI) 07/01/19-01/31/24

NIH/NIMHD $17,000,000

*Howard University Research Center on Minority Health and Health Disparities*

*Howard University RCMI Program*

The major goal of this grant is to provide research infrastructure at Howard University for the support of research in the general areas of minority health and health disparities by enhancing collaborative translational projects, strengthening core facilities and improving faculty development. The RCMI Program also interacts with the national RCMI Coordinating Center which is a consortium of biomedical, behavioral and clinical researchers from 21 RCMI-supported institutions working with healthcare providers and the community to address health disparities through collaboration to increase research on diseases related to underrepresented minorities and expand faculty outreach and competitiveness.

Role: Principal Investigator

U54MD007597 Southerland (PI)/Kwagyan (Project Lead) 07/01/19-01/31/24

NIH/NIMHD $386,250

*Virtual Applied Data Science Training Institute (VADSTI)*

*Howard University RCMI Program*

Skill sets in data science, from ethical practices in data collection, use of complex computational and analytic

techniques including machine learning, to data visualization and reporting, are particularly critical for advancing

the science of minority health and health disparities. The ability of minority researchers in the behavioral,

biomedical and clinical science to recognize, and use big dataset, however, is limited for various reasons

including lack of exposure to relevant databases, knowledge, and incorporation of cutting-edge data science tools

and capabilities, and expertise in data analytics. The significance of this application is training the next generation

of investigators in using data science methodology and its application in minority health and health disparities

research, and promoting the creation of data science ecosystem at Howard University.

Role: Principal Investigator

U54MD007597 Southerland (PI)/ Johnson (Project Lead) 07/01/19-01/31/24

NIH/NIMHD $1,545,000

*HIV Improvement During COVID*

*Howard University RCMI Program*

Research has shown that case management can be effective in improving HIV outcomes via the initiation and maintenance of therapy either for prevention or treatment. Likewise, peer support has been helpful. Finally, there have been projects that use electronic communication to transmit educational messages. These three options can be considered part of a menu of “best practices.” The common point in each of these is that they all provide actionable education to the targeted populations. This project will measure the relative effectiveness of each and study the relative impact of any combinations of the three. Finally, this study will give initial data that would be able to predict which of the three would be most effective in an individual patient based on certain characteristics.

U54MD007597 Southerland (PI)/ Akala (Project Lead) 07/01/19-01/31/24

NIH/NIMHD $772,500

HIV Reservoirs for HIV Cure

*Howard University RCMI Program*

Highly active combination antiretroviral therapy (cART) has revolutionized the treatment of HIV/AIDS; however,

cART must be maintained for life, as HIV-1 continues to replicate in anatomical and cellular reservoirs for the

lifetime of the individuals receiving cART; the reservoirs represent a major impediment to eradication. HIV-1

cure research aims at removal of HIV-1 provirus from latent cells and targeted delivery of cARVs to the reservoirs.

We envisage the development of biodegradable polymeric nanotechnological platforms using CD4 binding

peptide and monoclonal antibody (ibalizumab) to target the lymph nodes with cARVs and LRAs and rituximab,

which targets splenic antigens (i.e., CD20 antigens on B cells and splenocytes) as a targeting moiety (a) to target

cART drugs (in the core of nanoparticles) to the spleen and (b) separately to deliver combination LRAs (in the

core of nanoparticles) of different modes of action to the spleen to effect shock and kill eradication of the HIV-1

reservoir.

## Pending Research Support

U54MD007597 Southerland (PI) 02/01/24-01/31/29

NIH/NIMHD $27,638,645

*Howard University Research Center on Minority Health and Health Disparities*

*Howard University RCMI Program*

## Completed Research Support

HU Genomics-Enhanced Medicated-Assisted Treatment Registry (HUGE-MAT), Medication Assisted Treatment Genomics Registry Grant, (with Ettienne), DC Gov, Healthcare Finance, 2018-2019.

The Biomedical Informatics Component to the Georgetown-Howard Universities Center for Clinical and

Translational Science (GHUCCTS), (with Mellman and Verbolis), NIH/NCATS, August 2015-June2019.

Administrative Supplement Health Disparities Research Training, Biomedical Infrastructure for Health Disparities Research, Research Centers in Minority Institutions Grant, NIH-NIMHD, June 2015-March 2016.

The Biomedical Informatics Component to the Georgetown-Howard Universities Center for Clinical and Translational Science, William M. Southerland (with Madhavan, Mellman, and Verbolis), NIH-NCRR, June 2010 – June 2015.

Administrative Supplement for Relocation of Imaging Equipment to HU, Biomedical Infrastructure for Health Disparities Research, Research Centers in Minority Institutions Grant, NIH-NIMHD, July 2014-March 2015.

Computational Biology, Bioinformatics, Imaging & Proteomics Research, Research Centers in Minority Institutions Grant, NIH-NIMHD, September 2009-June 2014.

The Laboratory of Molecular Computations component of the NIH/Howard University Research Centers in Minority Institutions Grant, NIH-NCRR, September 1996-2001.

The Laboratory of Molecular Computations & Bioinformatics component of the Howard University Research Centers in Minority Institutions Grant, NIH-NCRR, July 2003 - May 2008.

Internet2 NIH/Howard University Research Centers in Minority Institutions Administrative Supplement Grant, NIH-NCRR, May 2003.

Research Centers in Minority Institutions (RCMI) Administrative Supplement for Enhancement of local IT Infrastructure, NIH-NCRR, September 26, 2005.

Howard University component of the RCMI Translational Research Network Parent Grant, William M. Southerland (with Norris), NIH-NCRR, June 30, 2011.

Howard University component of the Community Engagement Research Administrative Supplement to the RCMI Translational Research Network Parent Grant, William M. Southerland (with Norris), NIH-NCRR, September 2011.

**E. Selected Presentations & Conference Planning**

1. Yaadira Brown; Olubode A. Olufajo; Edward E. Cornwell, III; William Southerland, The Interplay of Obesity and Race/Ethnicity on Major Perinatal Complications, **Pacific Symposium on Biocomputing, Kona, Hawaii, January, 2020**
2. Yayin Fang, Kevin F. Morris, Eugene J. Billiot, Fereshteh H. Billiot, Kenny B. Lipkowitz, William M. Southerland, “MD simulations on Chiral Drugs bind in Molecular Micelles” RCMI Translational Science 2019 Conference, Bethesda, MD, December 15 -17, 2019
3. **Abiodun Otolorin, Nana Osafo, William Southerland, HUeMR: Intuitive Mining of Electronic Medical Records, Pacific Symposium on Biocomputing, Kona, Hawaii, January 5, 2017.**
4. Abiodun Otolorin, Immanuel Chadzamira, Nana Osafo, William Southerland, HUeMR: Intuitive Mining of Electronic Medical Records for Disease Informatics, Intelligent Systems for Molecular Biology, International Society for Computational Biology, Orlando, Florida, **July 2016**
5. Oliver E, Fang Y, Sherif Z. The Role of Murine Double Minute 4 (MDM4) in Polyubiquititination and Requisite Degradation of TP53. First Coomes/Nandedkar Graduate Research Day, April 28, 2015
6. Ogindo CO, Fang Y, Southerland WM, Bakare O. The Use of Molecular Modeling Modeling to Design Safe and Effective Drugs for Chagas Disease. Howard University Research Symposium, Howard University, Washington DC, April 16, 2015.
7. **Kevin Morris,** Eugene Billiot, Fereshteh Billiot, Kenny Lipkowitz, Yayin Fang, William Southerland. "Investigation of chiral molecular micelles by means of molecular dynamics simulation and NMR spectroscopy". 245th ACS National Meeting and Exposition, New Orleans, Louisiana. April 7-11, 2013
8. HU Center for Applied Data Science and Analytics (CADSA)

Meeting/Audience: The Mastercard Center for Inclusive Impact Summit, New York, New York, September 2022

1. HU Center for Applied Data Science and Analytics (CADSA)

Meeting/Audience: Governor of US Virgin Islands and staff at HU, February 7, 2023

1. HU Center for Applied Data Science and Analytics (CADSA)

Meeting/Audience: Essence Conference, July 2, 2022

1. HU Center for Applied Data Science and Analytics (CADSA)

Meeting/Audience: HUCM Health and Technology club, March 15, 2023

1. HU Center for Applied Data Science and Analytics (CADSA)

Meeting/Audience: HU Research Month panel on ML/AI in academia/HU, April 20, 2023

**F. Service**

Committees

1. Data Science Faculty Advisory Committee, member Spring 2021 – August 2021
2. Data Science Faculty Advisory Committee, Chair – August 2021- present
3. Anatomy Department Chair Search Committee, Chair – summer 2021 – Present
4. Departmental APT committee – ongoing
5. College of Medicine Dean Search Committee, member, Fall 2021 – present

Other Service

1. Interim Director, HU Center for Applied Data Science and Analytics (CADSA)

Teaching

1. Medical Biochemistry -annually and ongoing

(Served as exam coordinator)

1. Dental biochemistry – annually and ongoing
2. Graduate biochemistry – annually and ongoing

National service

1. National Institute of Minority Health and Health Disparities (NIMHD) Advisory Council, member, 2019 – present

**Conference Organizing Committees**

Planning committee for Academic Data Science Alliance Leadership Summit, June 2022 – May 2023

Planning committee for National RCMI Conference (xxx please get dates for this)

**Conference session moderator**

Session Co-chair for Developing the Data Science Workforce session at the Academic Data Science Alliance Leadership Summit, May 9, 2023

Moderator of the Awards Ceremony at the National RCMI Conference, April 13, 2023

Moderator of Presidential breakfast meeting at the National RCMI Conference, April 14, 2023

**Additional Conference Attendance**

Mastercard Inclusive Growth Grantees meeting, Washington, DC, April 11-14, 2023

National RCMI Conference, Washington, DC, April 11-14, 2023