BIOGRAPHICAL SKETCH

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NAME: Edward Moreira Bahnson

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

POSITION TITLE: Assistant Professor

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
Universidad de la República, Montevideo, Uruguay	BSc	11/2002	Biochemistry
Kent State University, Kent, OH	PhD	05/2010	Cell Biology / Bioinorganic Chemistry / Pharmacology
Northwestern University, Chicago, IL		02/2016	Research Fellow, Vascular Biology

A. Personal Statement

I am an Assistant Professor with a long-standing interest in in redox vascular biology. I am interested in developing redox-based interventions using nanotechnology to target sites of arterial disease. My interest in redox biology began as an undergraduate studying analytical luminescent probes for the detection of reactive species. During my graduate training I majored in Cell Biology with Bioinorganic and Pharmacology minors. I focused on the redox biology and pharmacology of vitamin B12 derivatives in the vascular endothelium. Particularly, I studied non-coenzyme functions of this micronutrient, and its redox activity in the endothelium. As a post-doctoral fellow, I conducted research on whole-animal integrated responses, the redox regulation of the vasculature, and the development of redox-based targeted therapies for the treatment of arterial restenosis after surgical interventions. To study vascular disease we use a variety of techniques analysis including but not limited to whole animal models, cell models, quantitative 3D imaging, machine learning- and virtual reality-based analyses imaging, etc. I have 20 years of experience in vascular biology and how redox-interventions affect the vascular wall. Additionally, I have 12 years experience in developing targeted drug delivery system for the vasculature. I currently have 32 published peer-reviewed articles and an h index of 17(Google Scholar).

Besides my passion of scientific research, I have a strong commitment to excellent teaching and mentorship. Throughout my career, I have mentored numerous undergraduates, 5 graduate students (2 Masters and 3 PhD students in my lab), numerous rotation graduate students, and 2 postdocs, who are both assistant professors. Even though I am a relatively junior faculty member, I have taken advantage of many available resources to maximize my mentorship effectiveness. I have taken the PI Development Series offered by the Center for Faculty Excellence at UNC. I have joined the National Research Mentoring Network (NMRN). Additionally I have taken the Faculty Mentoring Workshop for Biomedical Researchers led by the Office of Graduate Education at UNC, and I have participated in annual Brown Bag Lunch Mentoring Workshops. Finally, I have taken the Culturally Aware Mentorship Workshop, part of the NRMN Mentor Training Core.

Diversity and inclusion. My personal experiences have strongly shaped my approach to diversity and inclusion as I am a Latino and LGBTQ person in the sciences. Throughout my training years it was noticeable that there is a lack of minority mentors and role models in the sciences. This has strongly motivated me to become a mentor to encourage Latinx and LGBTQ trainees to pursue careers in the sciences. In every aspect of my live, I proactively promote accepting and inclusive environments. I am currently pursuing a DEI certificate at UNC. I am currently member of our SACNAS chapter and I co-

founded an organization called STEM Pride to “create a visible and interconnected community of LGBTQ+ and allied STEM students and professionals committed to pursuing their careers with pride.”

Ongoing Research Support

2021-12880 USDA **Bahnson (MPI)**
(05/01/2023-04/30/2024) $ 159,186 (UNC Subcontract)
“Build Research Capacity through a Multi-Institution Research of Antihypertensive Properties of Peanut Protein Hydrolysate Derived from Defatted Peanut Flour.”
This grant aims to study the antihypertensive properties of a peanut protein hydrolysate using a rat model.
Effort 6%

R56AI158511 NIAID **Bahnson (Co-I)**
(08/22/22-07/31/23) $674,578 ($40,102 - Bahnson) direct costs
“The contribution of respiratory burst to antibiotic failure in Staphylococcus aureus bacteremia.”
This grant studies the host-pathogen interaction that leads to the development of antibiotic tolerance.
Effort 10%

K01HL145354 NHLBI **Bahnson (PI)**
12/15/19-11/30/23 $460,000 direct costs.
Cell-Mediated Targeted Redox Intervention for the Treatment and Prevention of Atherosclerosis.
Goal: To develop a targeted delivery system for nrf2 activators for the treatment of atherosclerosis.
Effort 75%

Citations relevant to contributions to science not described in section C

1. Grova M, Donohue SJ, Bahnson M, Meyers M, **Bahnson EM**. “Allyship in Surgical Residents: Evidence for LGBTQ Competency Training in Surgical Education” J. Surg. Res. 2020 Dec 17; 260:169-176 PMID: 33341680
2. Musetti B, González-Ramos H, González M, **Bahnson EM**, Varela J, Thomson L “Cannabis sativa extracts protect LDL from Cu 2+-mediated oxidation” J Cannabis Res. 2020;2:37. doi: 10.1186/s42238-020-00042-0. Epub 2020 Oct 15. PMID: 33123676 PMCID: PMC7592720
3. Beam JE, Maiocchi S, Cartaya A, Rowe SE, **Bahnson ESM**, Conlon BP. The Use of Acute Immunosuppressive Therapy to Improve Antibiotic Efficacy against Intracellular Staphylococcus aureus. Microbiol Spectr. 2022 Jun 29;10(3):e0085822. doi: 10.1128/spectrum.00858-22. PMID: 35575507; PMCID: PMC9241675
4. Beam JE, Wagner NJ, Shook JC, **Bahnson ESM**, Fowler VG Jr, Rowe SE, Conlon BP. Macrophage-Produced Peroxynitrite Induces Antibiotic Tolerance and Supersedes Intrinsic Mechanisms of Persister Formation. Infect Immun. 2021 Sep 16;89(10):e0028621. doi: 10.1128/IAI.00286-21. PMID: 34097475; PMCID: PMC8445188.

B. Positions, Scientific Appointments, and Honors

Positions and Employment

8/16-present	Assistant Professor, University of North Carolina, School of Medicine, Chapel Hill, NC
3/16-7/16	Research Assistant Professor, Northwestern University, Feinberg School of Med., Chicago, IL
2/15-6/16	Adjunct Faculty, Health Sciences, Blitstein Institute, Hebrew Theological College, Chicago, IL
3/10-3/16	Postdoctoral Research Fellow, Northwestern University, Feinberg School of Med., Chicago, IL
7/09-2/10	Teaching Assistant, Integrative Medical Sciences, NE Ohio Medical University, Rootstown, OH
6/06-6/07	**Research Assistant**, Dept. of Chemistry, Kent State University, Kent, OH

Other Experience and Professional Memberships

Society Membership:

2020-present	Member of the North American Vascular Biologist Organization (NAVBO)
2018-present	Member of the Society for Redox Biology and Medicine Council
2016-2017	Vice-Chair of the Trainee Council, Society for Redox Biology and Medicine
2015-2017	Member of the Trainee Council, Society for Redox Biology and Medicine
2009-present	Member, American Heart Association
2013	Member, National Organization of Gay and Lesbian Scientists and Technical Professionals

2010-2016 Candidate Member, Association for Academic Surgery
2010-present Member, Society for Redox Biology and Medicine

Peer Review Duties: Journal of Surgical Research; Redox Biology; Nitric Oxide, Oxidative Medicine and Cellular Longevity, Criculation Research, PLOS One, Redox Biology, ATVB, JAHA

Honors

2018 Society for Free Radical Research International Award. SFRRI 2018. Lisbon, Portugal.
2015 SFRBM Young Investigator Award. SFRBM 2015. Boston, MA
2014 Best Presentation at the Nitric Oxide – Nitrite/Nitrate Conference. Cleveland, OH
2014 Larry Oberley Young Investigator Award. SFRBM 2014. Seattle, WA
1996 Scholarship Award to participate at the 28th Dr. Bessie F. Lawrence Summer Science Camp at the Weizmann Institute of Science, Rehovot, Israel

C. Contributions to Science

Non-coenzyme roles of vitamin B12 in the vasculature. The overarching focus of my research has been to study vascular redox biology. During my doctorate, I started focusing on the synthesis and characterization of vitamin B12 derivatives as pharmacological agents for the vasculature. I developed a method to synthesize vitamin B12 derivatives with potential pharmacological applications. This work resulted in a patent that was licensed to PamLab LLC, a Louisiana-based pharmaceutical company. My research on the redox properties of cobalamin lead to the discovery that the reduced form of B12, reacts with superoxide as fast as superoxide dismutase. This work, published in JACS has over 70 citations to date (Google Scholar). To study the cellular processing of B12 in the vascular endothelium, I was involved in the development of an innovative analytical technique, we named "cold trapping." This technique allows for the accurate differentiation of natural vs artifactual forms of B12. Finally, I studied the protective properties of B12 as a cellular redox regulator. Altogether my work made a significant contribution to further the understanding of the role of vitamin B12 in the vasculature beyond its coenzyme activities, and the potential use of B12 derivatives for pharmacological intervention.

a. Li F, **Bahnson EM**, Wilder J, Siletzkky R, Hagaman J, Nickekeit V, Hiller S, Ayesha A, Fen L, Levine JS, Takahashi N, Maeda-Smithies N. Oral high dose vitamin B12 decreases renal superoxide and post-ischemia/reperfusion injury in mice. Redox Biology May 2020: 32:101504. DOI: 10.1016/j.redox.2020.101504 PMID: 32182573 PMCID: PMC7078436
b. **Suarez-Moreira E**, Yun J, Birch CS, Williams JH, McCaddon A, Brasch NE. Vitamin B(12) and redox homeostasis: cob(II)alamin reacts with superoxide at rates approaching superoxide dismutase (SOD). J Am Chem Soc. 2009 Oct 28;131(42):15078-9. PMID: 19799418. PMCID:N/A
c. **Moreira ES**, Brasch NE, Yun J. Vitamin B12 protects against superoxide-induced cell injury in human aortic endothelial cells. Free Radic Biol Med. 2011 Aug 15;51(4):876-83. PMID: 21672628; PMCID: PMC3163124.
d. **Suarez-Moreira E**, Hannibal L, Smith CA, Chavez RA, Jacobsen DW, Brasch NE. A simple, convenient method to synthesize cobalamins: synthesis of homocysteinylcobalamin, N-acetylcysteinylcobalamin, 2-N-acetylamino-2-carbomethoxyethanethiolatocobalamin, sulfitocobalamin and nitrocobalamin. Dalton Trans. 2006 Nov 28; PMID: 17088966; PMCID: PMC2754772.

1. *Redox-based therapies to inhibit restenosis.* My long-term goal is to develop a specific targeted therapy for the vasculature to normalize the redox imbalance of injured arteries. In order to successfully develop a redox-based therapy for the vasculature it is important to understand how these interventions act on the vasculature. My research efforts have focused on how nitric oxide- and nrf2-based therapies regulate the cells in the vascular wall following arterial injury. We have identified novel and specific effects of nitric oxide donors as well as Nrf2 activators on the arterial wall. Our findings shed light into vasculoprotective redox mechanisms. Moreover, they led to the rational design of redox-based approaches that we incorporated in targeted systems described in 3: targeted drug delivery for the vasculature.

a. Buglak NE, Jiang W, **Bahnson ESM**. Cinnamic aldehyde inhibits vascular smooth muscle cell proliferation and neointimal hyper plasia in Zucker Diabetic Fatty rats. Redox Biol. 2018 Oct;19:166-178. PMID: 30172101; PMCID: PMC6122148
b. **Bahnson ESM**, Vavra AK, Flynn ME, Vercammen JM, Jiang Q, Schwartz AR, Kibbe MR. Long-term effect of PROLI/NO on cellular proliferation and phenotype after arterial injury. Free Radic Biol Med. 2016 Jan;90:272-86. PMID: 26627935; PMCID: PMC4698201.
c. **Bahnson ESM**, Havelka GE, Koo N C, Jiang Q, Kibbe MR. Periadventitial adipose tissue modulates

the effect of PROLI/NO on neointimal hyperplasia. J Surg Res. 2016;205(2):440-445. PMID: 27664894; PMCID: PMC5081220.

d. Havelka GE, **Moreira ES**, Rodriguez MP, Tsihlis ND, Wang Z, Martinez J, Hrabie JA, Kiefer LK, Kibbe MR. Nitric oxide delivery via a permeable balloon catheter inhibits neointimal growth after arterial injury. J Surg Res 2013; 180(1):35-42 PMID: 23164361. PMCID: PMC3578007

2. *Targeted and local drug delivery for the vasculature.* Whereas human studies using antioxidant-based therapies have for the most part not shown differences in clinical outcomes, some studies using local delivery have shown promising results in humans. Hence, the biggest challenge for successful clinical translation of redox therapies is the targeted delivery of the therapeutic in the right amount at the right site. In this context I have contributed to the development of peptide-based tailored nanocarriers capable of targeting specific locations. Using what we learned about redox regulation in the vascular wall, we designed targeted redox therapies to the sites of arterial injury. Specifically, I designed an S-nitrosated version of a targeted peptide that successfully inhibits arterial restenosis. Later I designed a cell-mediated delivery system for antioxidant response activating nanoparticles for vascular applications, including CDDO-methyl delivery nanoparticles that localize specifically to the atherosclerotic plaque.

a. Maiocchi S, Cartaya A, Thai s, Akerman a, BahnsonE. “Antioxidant Response Activating nanoParticles (ARAPas) localize to atherosclerotic plaque and locally activate the Nrf2 pathway.” Biomaterial Science. 3033; 10(5):1231-47 PMID:35076645

b. Cartaya AE*, Lutz H*, Maiocchi S, Nalesnik M, **Bahnson EM**. “Delivery of Cinnamic Aldehyde Antioxidant Response Activating nanoParticles (ARAPas) for Vascular Applications.” Antioxidants (Basel) 2021 Apr; 10(5):709, PMID: 33946889. *These authors contributed equally and share first authorship.*

c. **Bahnson ESM**, Kassam HA, Moyer TJ, Jiang W, Morgan CE, Vercammen JM, Jiang Q, Flynn ME, Stupp SI, Kibbe MR. Targeted Nitric Oxide Delivery by Supramolecular Nanofibers for the Prevention of Restenosis After Arterial Injury. Antioxid Redox Signal. 2016 Jan 21; PMID: 26593400.PMCID: N/A

d. Patent: Kibbe MR, Stupp S, Moyer T, **Bahnson EM**, Inventors. Targeted Therapy for the Prevention of Restenosis in the Cardiovascular System. US Patent 9,517,275. 2016, December 13.

3. *Redox regulation in cardiovascular disease.* My long-term goal is to translate redox interventions to the clinic to treat cardiovascular disease. In order to successfully develop a redox-based it is important to understand the role of redox biology in cardiovascular pathophysiology. One such research effort is understanding the role of nitric oxide in regulating vascular cells. I discovered that the enzyme superoxide dismutase 1 is redox-regulated in rat arteries. Additionally, I discovered that the regulation is sex-specific. My interest in the role of redox biology goes beyond arterial disease. Recently, I contributed to finding that engulfment and cell motility protein 1 contributes to cardiomyopathy via increase in reactive species production. I measured reactive species levels in tissue and cells of mice expressing different levels of ELMO1. My findings contributed to establish that ELMO1 promote diabetic cardiomyopathy through NADPH oxidase dependent mechanisms.

a. Kakoki M, **Bahnson EM**, Hagaman JR, Siletzky RM, Grant R, Kayashima Y, Li F, Sun MT, Taylor JM, Rice JC, Almeida MF, Bahr BA, Jennette JC, Smithies O, Maeda-Smithies N. Engulfment and cell motility protein 1 potentiates diabetic cardiomyopathy via Rac-dependent and Rac-independent ROS production. JCI Insight 2019; 4(12):127660. PMID: 31217360 PMCID: PMC6629098

b. **Bahnson ESM**, Koo N, Cantu-Medellin N, Tsui AY, Havelka GE, Vercammen JM, Jiang Q, Kelley EE, Kibbe MR. Nitric oxide inhibits neointimal hyperplasia following vascular injury via differential, cell-specific modulation of SOD-1 in the arterial wall. Nitric Oxide. 2015 Jan 30;44:8-17. PMID: 25460325; PMCID: PMC4304904.

c. Morales RC,* **Bahnson ESM**,* Havelka GE, Cantu-Medellin N, Kelley EE, Kibbe MR. Sex-based differential regulation of oxidative stress in the vasculature by nitric oxide. Redox Biol. 2015;4:226-33. PMID: 25617803. PMCID: PMC4803798 **These authors contributed equally and share first authorship*

d. Gregory EK, Vavra AK, **Moreira ES**, Havelka GE, Jiang Q, Van Lith R, Ameer GA, Kibbe MR. Antioxidants modulate the antiproliferative effects of nitric oxide on vascular smooth muscle cells and adventitial fibroblasts by regulating oxidative stress. Am J Surg. 2011; 202(5):536-40. PMID: 21944289. PMCID: PMC3216467.

4. *Unbiased analysis of vascular injury.* My research program requires animal models of vascular injury. Literature review of preclinical cardiovascular studies revealed that methodological sources of bias

compound the preexisting limitations of interpreting animal data in modelling human disease. Thus, poor translation of preclinical models is in part due to the lack of rigor and reproducibility in preclinical study design and analysis. I developed a new unbiased three-dimensional methodology to visualize and quantify stenosis and remodeling after vascular injury.

a. Buglak NE, Lucitti J, Ariel P, Maiocchi S, Miller FJ, **Bahnson ESM**. Light Sheet Fluorescence Microscopy as a New Method for Unbiased Three-Dimensional Analysis of Vascular Injury. Cardiovasc Res. 2021 Jan 21; 117(2):520-532 doi: 10.1093/cvr/cvaa037. PMID: 32053173 PMCID: PMC7820842
b. Buglak NE, and **Bahnson ESM**. A Rat Carotid Artery Pressure-Controlled Segmental Balloon Injury with Periadventitial Therapeutic Application J. Vis. Exp. 2020 Jul 9;(161):10.3791/60473. doi: 10.3791/60473.PMID: 32716387 PMCID: PMC7546436
c. Cartaya AE, Maiocchi S, Torzone S, Messinger G, **Bahnson ESM**. Application of Machine Learning for Volumetric Analysis of Atherosclerotic Burden bioRxiv 2022.12.23.521811; **[pre-print]** doi:10.1101/2022.12.23.521811

A complete list of my published work can be found at:
https://www.ncbi.nlm.nih.gov/myncbi/1zoYcGwpHOCQj/bibliography/public/