

Nathan Balukoff

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Education

Medical Scientist Training Program:

MD, 2022, PhD in Cancer Biology, 2020

University of Miami Miller School of Medicine Miami, FL, USA

Bachelor of Science: Biology: Genetics and Biotechnology track, with honors, 2013

Minor: Psychology, 2013

University of Iowa Iowa City, IA, United States

Medical Residency

Transitional Year Internship, PGY1, July 2022-July 2023

University of Miami - Holy Cross Hospital

4725 N Federal Hwy, Fort Lauderdale, FL 33308

Dermatology Residency, Residency-Research track, July 2023-2027

Dr. Phillip Frost Department of Dermatology and Cutaneous Surgery

University of Miami/Jackson Health System Program

1600 Northwest 10th avenue, Miami, FL 33136

Research Experience

Medical Student and Post-Doctoral/Resident Research

November 2020 to Present

Dr. Tomic-Canic; Professor, Vice Chair of Research and William H. Eaglstein Chair in Wound Healing

Director, Wound Healing and Regenerative Medicine Research Program; University of Miami Dr Phillip

Frost Department of Dermatology and Cutaneous Surgery Miami, FL

- Molecular characterization of autoimmune wounding diseases such as Hidradenitis Suppurative and Pyoderma Gangrenosum
- Explored the regulation of targets of the transcriptional activators TREM1 and FOXM1 in human diabetic foot ulcers
- Investigated the genomic pathways that differentiate healing chronic wounds from nonhealing chronic wounds
- Probed the role of PDL1 in diabetic foot ulcers and their role in healing outcome

Graduate Student

March 2016 to July 2020 (part time as medical student Spring 2016 to Spring 2017)

Dr. Lee, Professor, University of Miami Department Biochemistry and Molecular Biology Program Miami, FL

- Characterized the translation profile of cancer cells in a combination of acidic and hypoxic environment- a tumor microenvironment
- Discovered the role of translation initiation factor, eIF5B, that controls anaerobic translation
- Discovered a network of RNA binding proteins essential for controlling translation of glycolytic mRNAs
- Explored the crucial effect of eukaryotic initiation factor eIF5A on the adaptive cellular response to fermentation induced acidosis
- Helped discover a type of nuclear translation that occurs in nuclear amyloid bodies.
- Received NCI F30 fellowship for thesis project, 7/01/2019

Research Assistant

June 2013 to June 2015

Dr. Smolikove, University of Iowa Biology Department Iowa City, IA

- Planned, prepared and analyzed experiments with the goal of elucidating the pathways in which AKIRIN (conserved protein with a role in meiosis) is a part of which include defining AKIRIN and its partners' roles in meiosis, the possibility of a germline-tissue response, and its molecular mechanism.
- Planned, executed and analyzed experiments with the aim of characterizing the effects of mutations of the CSN/COP9 signalosome in relation to meiotic prophase I.

Undergraduate Biology Honors Student

June 2011 to May 2013

Dr. Smolikove, University of Iowa Biology Department Iowa City, IA

- Studied and characterized an age dependent mutant, named *low2*, that displays chromosome fragmentation in late prophase I of meiosis using techniques such as classical genetics, cytological immunohistochemistry, FISH, and

NSF Research Experience for Undergraduate Supplement

June 2012 to August 2012

Dr. Smolikove, University of Iowa Biology Department Iowa City, IA

Conducted Y2H screen to saturation using the protein AKIRIN, a conserved protein that has a role in meiotic prophase I, as bait and *C. elegans* library as prey. Hits were assayed using immunohistochemistry and high resolution imaging for a meiotic phenotype.

Publications

- Bokros M, **Balukoff NC**, Grunfeld A, Sebastiao M, Beurel E, Bourgault S, Lee S. RNA tailing machinery drives amyloidogenic phase transition. *Proc Natl Acad Sci U S A*. 2024 Jun 4;121(23):e2316734121.
- Vecin N.M.*, Yaghi M.*, **Balukoff, NC.**, Tomic-Canic M., Lev-Tov H., Pastar I. (*Co-first authorship). (2023, Sep). Contribution of tunnels to the pathogenesis of Hidradenitis Suppurativa. *Journal of Investigative Dermatology*. *In submission 2023*.
- **Balukoff, NC***, Vecin, N.M*, Gonzalez, T., Sawaya, A., Marjanovic, J., Siegfried, L., Verpile, R., Lev-Tov, H., Tomic-Canic, M., Pastar, I.. (2023, Sep). Elucidating the pro-inflammatory profile of Hidradenitis Suppurativa from defined histopathology. *British Journal of Dermatology*. *In submission, 2023*.
- Pastar, I., **Balukoff NC.**, Vecin, N.M., Sawaya, A., Tomic-Canic, M.. (2023). Physiology and Pathophysiology of Wound Healing in Diabetes. In Veves, A., Giurini, J.M., Guzman, R.J. (Ed.), (pp. N/A). Berlin: The Diabetic Foot Medical and Surgical Management Cham Humana.
- Chopra D, **Balukoff NC**, Catherine C Motosko; Effect of Skin Type on Efficacy of Laser Treatment for Androgenetic Alopecia: A Review of the Literature. *Skin Appendage Disord* 2023.
- Sawaya AP, Stone RC, Mehdizadeh S, Pastar I, Worrell S, **Balukoff NC**, Kaplan MJ, Tomic-Canic M, Morasso MI. FOXM1 network in association with TREM1 suppression regulates NET formation in diabetic foot ulcers. *EMBO Rep* 2022 Aug 3;23(8):e54558.
- Pastar I, **Balukoff NC**, Marjanovic J, Chen VY, Stone RC, Tomic-Canic M. Molecular Pathophysiology of Chronic Wounds: Current State and Future Directions. *Cold Spring Harb Perspect Biol*. 2022 Sep 19:a041243.
- Theodoridis PR, Bokros M, Marijan D, **Balukoff NC**, Wang D, Kirk CC, Budine TD, Goldsmith HD, Wang M, Audas TE, Lee S. Local translation in nuclear condensate amyloid bodies. *Proc Natl Acad Sci USA*. 2021 Feb 16;118(7):e2014457118.
- **Balukoff NC***, Ho JJD, Theodoridis PR, Wang M, Bokros M, Llanio LM, Krieger JR, Schatz JH, Lee S. A translational program that suppresses metabolism to shield the genome. *Nat Commun*. 2020 Nov 13;11(1):5755.
- Ho JJD, **Balukoff NC***, Theodoridis PR, Wang M, Krieger JR, Schatz JH, Lee S. A network of RNA-binding proteins controls translation efficiency to activate anaerobic metabolism. *Nat Commun*. 2020 May 29;11(1):2677.
- Bowman R, **Balukoff NC**, Clemons A, Koury E, Ford T, Baxi K, Egydio de Carvalho C, Smolikove S. Akirin Is Required for Muscle Function and Acts Through the TGF- β Sma/Mab Signaling Pathway in *Caenorhabditis elegans* Development. *G3 (Bethesda)*. 2020 Jan 7;10(1):387-400.
- Bowman R, **Balukoff NC**, Ford T, Smolikove S. A Novel Role for α -Importins and Akirin in Establishment of Meiotic Sister Chromatid Cohesion in *Caenorhabditis elegans*. *Genetics*. 2019 Feb;211(2):617-635.
- Ho JJD, **Balukoff NC**, Cervantes G, Malcolm PD, Krieger JR, Lee S. Oxygen-Sensitive Remodeling of Central Carbon Metabolism by Archaic eIF5B. *Cell Rep*. 2018 Jan 2;22(1):17-26.
- Alleva B, **Balukoff NC**, Peiper A, Smolikove S. Regulating chromosomal movement by the cochaperone FKB-6 ensures timely pairing and synapsis. *J Cell Biol*. 2017 Feb;216(2):393-408.
- Brockway H, **Balukoff NC**, Dean M, Alleva B, Smolikove S. The CSN/COP9 signalosome regulates synaptonemal complex assembly during meiotic prophase I of *Caenorhabditis elegans*. *PLoS Genet*. 2014 Nov 6;10(11):e1004757.

* = equal contribution

Conferences/Presentations/Workshops

Annual Meeting ETRS-WHS-SKIN TERM, Amersfoort, Netherland 9/25-9/27/24; Oral presentation: "Microbial Dysbiosis and AhR Inactivation in Hidradenitis Suppurative: Implications for Aberrant Wound-Activated Tunnel Formation ", Nathan Balukoff, Tammy Gonzalez, Jelena Marjanovic, Ali Kamier, Nicole Vecin, Hadar Lev-Tov, Barry Resnik, Andrew Sawaya, Marjana Tomic-Canic Irena Pastar.

Innovations in Wound Healing, Islamor, FL 12/3-12/06/23; Oral and poster presentation: "Novel tunnel-directed therapy decreases inflammation, scarring, and bacterial load and restores microbial dybiosis in hidradentitis patients", Nathan Balukoff, Tammy Gonzalez, Nicole Vecin, Jamie Burgess, Divya Chopra, Marita Yaghi, Caralin Schneider, Natasa Strbo, Hadar Lev-Tov, Marjana Tomic-Canic, Irena Pastar

2023 Symposium on Hidradentitis Suppurative Advances: Pheonix, AZ 10/13-10/15/23; Oral and poster presentation:

"Inflammatory modulation correlates with clinical scarless tunnel resolution after novel anti-biofilm therapy for hidradenitis suppurativa tunnels", Nathan Balukoff, Hadar Lev-Tov, Jamie Burgess, Tammy Gonzalez, Divya Chopra, Marita Yaghi, Caralin Schneider, Nicole Vecin, Natasa Strbo, Marjana Tomic-Canic, Irena Pastar

2023 Gordon Research Conference: The Barrier Function of Mammalian Skin; Waterville Valley, NH, 8/6-8/11/23; Oral and poster presentation: "Inflammatory modulation correlates with clinical scarless tunnel resolution after novel anti-biofilm therapy for hidradenitis suppurativa tunnels", Nathan Balukoff, Hadar Lev-Tov, Jamie Burgess, Tammy Gonzalez, Divya Chopra, Marita Yaghi, Caralin Schneider, Nicole Vecin, Natasa Strbo, Marjana Tomic-Canic, Irena Pastar

2023 7th Annual Celia & Samuel Resnik Research Day; University of Miami, FL, 6/21/23; Oral presentation
"To Heal or Not to Heal: The Answer may be in the Histology", Nathan Balukoff, Irena Pastar, Marjana Tomic-Canic

2023 Symposium on Advanced Wound Care (SAWC) & Wound Healing Society (WHS) Annual Meeting; National Harbor, MD, 4/5-4/9/22; Oral presentation:
"Aberrant Wound Healing Response in Hidradenitis Suppurativa", Nathan Balukoff, Jelena Marjanovik, Watcharee Amornpairoj, Nicole Vecine, Jamie L. Burgess, Hadar Lev-Tov, Marjana Tomic-Canic, Irena Pastar

2022 Symposium on Advanced Wound Care (SAWC) & Wound Healing Society (WHS) Annual Meeting; Phoenix, AZ, 4/26-4/29/23; Oral presentation:
"Genomic and phenotypic fibrotic cutaneous response to radiation injury extends beyond the treatment field in a murine model of radiation-induced skin fibrosis", Nathan Balukoff, Jamie L. Burgess, Tongyu Wikramanayake, vGregory Azzam, Stuart Samuels, Sharon Elliot, Marjana Tomic-Canic, Rivka C. Stone

2022 American Association of Dermatology Annual Meeting, 3/24-3/27/22, poster presented by Catherine Motosko:
"Skin Type and Efficacy of Laser Treatment for Androgenic Alopecia", Nathan Balukoff, Catherine Motosko, Antonella Tosti

2021 Innovations in Wound Healing meeting; 12/9-12/12/21; Duck Key, FL, poster:
"Radiation Induced Skin Fibrosis Extends Far Beyond Phenotypic Lines;" Nathan Balukoff, Jamie Burgess, Tongyu Wikramanayake, Gregory Azzam, Sharon Elliot, Marjana Tomic-Canic, Rivka Stone

2021 AAP/ASCI/APSA 17th Annual Joint Meeting; Virtual; 4/9-4/10/21; Poster

2021 UM MSTP Virtual Revisit, Student Research Presentation, 3/30/21

47th Annual Eastern-Atlantic Student Research Forum, Eastern Atlantic Student Research Forum, 2/8-2/10/21

Dissertation Defense, 7/08/2020, Cancer Biology Program, University of Miami Miller School of Medicine, Miami, FL
"Adaptive Translational Reprogramming in Response to Anaerobiosis"

Translational Medicine: Doing the Right Research Right, Eureka Institute and Science in Transition, Utrecht Summerschool Course; Utrecht, The Netherlands; 7/7-7/12/19.

Frontiers in Molecular Science – RNA Regulatory Networks (ISFMS 2019); Lisbon, Portugal; 6/26-6/28/19:
"Adaptation to Extracellular Acidosis by pH-Dependent eIF5A"

2019 MSTP Annual Research Symposium; Miami, FL; 4/11/19:
"Adaptation to Extracellular Acidosis by pH-Dependent eIF5A"

45th Annual Eastern-Atlantic Student Research Forum; Miami, FL; 2/19-2/22/19:
"Adaptation to Extracellular Acidosis by pH-Sensing eIF5A"

2018 MSTP Annual Research Symposium; Miami, FL; 4/12/18:
"Hypoxia-Acidosis Induces Adaptive Translatome Remodeling in Human Cancer Cells"; Nathan Balukoff, David Ho, Stephen lee.

American Physician Scientist Association Local Chapter Talk; Miami, FL; 10/7/16:
"Translatome of Cancer Cells in Tumor Microenvironment"

2016 Department of Biochemistry and Molecular Biology Research Day.; Miami, FL; 8/28/16:
"Hypoxia-Acidosis Induces Adaptive Translatome Remodeling in Human Cancer Cells"; Nathan Balukoff, David Ho, Stephen lee

Discussion of my Honors research through the Biology program to prospective students and faculty: Undergraduate Biology Information Session, 10/25/12; Ways of Knowing Science class, 11/15/12; Honors Biology Colloquium, 5/2013, Iowa City, IA

Summer Undergraduate Research Conference; Iowa City, IA; 7/25/12:
"Using yeast-two hybrid approach to identify proteins involved in synaptonemal complex disassembly;" Nathan Balukoff, Sarit Smolikove

Annual Student Interdisciplinary Health Research Poster Session; Iowa City, IA; 4/10/12:
"Age-dependent meiotic chromosome fragmentation in *C. elegans*"; Nathan Balukoff, Michael Molumby, Sarit Smolikove.

Research at the Capitol; Des Moines, IA; 4/4/12:

"Age-dependent meiotic chromosome fragmentation in *C. elegans*"; Nathan Balukoff, Michael Molumby, Sarit Smolikove.

Spring Undergraduate Research Conference; Iowa City, IA; 3/24/12:

"Age Dependent Chromosomal Fragmentation in *C. elegans*"; Nathan Balukoff, Michael Molumby, Sarit Smolikove.

Biology Department Worm Meeting; Iowa City, IA; 1/13/12:

"Analysis of 123 Mutant"; Nathan Balukoff, Michael Molumby, Sarit Smolikove.

2011 Summer Undergraduate Research Conference; Iowa City, IA; 7/27/11:

"Analysis of a mutant exhibiting age-dependent chromosomal fragmentation in *C. elegans* meiotic oocytes"; Nathan Balukoff, Michael Molumby, Sarit Smolikove.

Awards

2024 Wound Healing Foundation, 3M Fellowship (\$20,000)

2024 Dermatology Foundation Research Grant (\$20,000)

Travel Award (\$500) Innovations in Wound Healing, Oral Presentation, 12/3-12/06/23, Islamor, FL

Travel Award (\$800) Gordon Research Conference-Barrier Function, Oral Presentation, 8/6-8/11/23, Waterville Valley, NH

2020 Louis J. Elsas Research Award in Biochemical Genetics (\$1,875), 7/14/2020, Miami, FL

NCI F30 Ruth L. Kirschstein National Research Service Award (NRSA) Individual Fellowship (\$200,000 over 4 years), 7/2019-5/2022, Miami, FL

Best Data Image in 2019 University of Miami MSTP Symposium, 4/11/19, Miami, FL

ICRU Fellows Program (\$2500), University of Iowa, Fall 2012-Spring 2013

NSF Research Experience for Undergraduates supplement (\$4800), University of Iowa, Summer 2012

Flora D Levin Teaching and Research Scholarship in Biology (\$500), University of Iowa, Spring 2012

ICRU Fellows Program (\$1250), University of Iowa, Spring 2012

Health Research Poster Session Award (\$100), University of Iowa, April 10, 2012

Making a Difference Award at University of Iowa Hospitals and Clinics, University of Iowa, September 2011

School/Community Involvement

- Member Wound Healing Society
- Volunteer for STAR hour, Chapman Partnership and The Brokerage Miami; Miami, FL Fall 2022-Present: Monthly, help lead activity with children of families who are experiencing homelessness on subjects related to Science, Technology, Art
- Co-founder of University of Miami chapter of APOLLO Society for Translational Medicine; Miami, FL; Fall 2020-Spring 2022: Led monthly meetings using creative formats to critically evaluate, debate, and discuss current, real-world topics and trends in medicine. We also host open events each year bringing translational medicine to the medical student body at large.
- MS3 Transition to Clerkship Boot Camp Station Leader; Miami, FL; 07/02/21: Led a workshop about medical student pre-rounding and rounding responsibilities to new MS3 students entering their clinical clerkships.
- Chair for 2020 University of Miami Miller School of Medicine MSTP 12th Annual Student Research Symposium; Miami, FL; Fall 2019- Spring 2020: Directed the organization and implementation of the annual symposium held by the MSTP program
- Co-chair for 2019 University of Miami Millers School of Medicine MSTP 11th Annual Symposium; Miami, FL; Fall 2018- Spring 2019: Helped lead and organize annual symposium held by the MSTP program
- E-board and author, 2019 MSTP Annual Newsletter; Miami, FL; Spring 2019: Oversaw and wrote articles for annual newsletter celebrating MSTP accomplishments and activities and outreach to previous UMMSM MD/PhD program alumni
- Research Coordinator for the student run Oncology Interest Group; Miami, FL; Fall 2017-Spring 2019; Helped connect students interested in cancer related research to faculty at the University of Miami Miller School of Medicine.
- American Physician Scientist Association (APSA) National Public Relations Committee; Fall 2016-2017: Helped promote and market APSA via social media, development of promotional material for distribution at conferences and meetings, and interfacing with APSA's membership-at-large through monthly email.
- American Physician Scientist Association (APSA) Undergraduate Mentor Program; Miami, FL; Fall 2015-Spring 2022: Mentored undergraduate students at various schools about the process and benefits of pursuing a combined MD/PhD program.
- Secretary and mentor for local American Physician Scientist Association (APSA) Chapter; Miami, FL; Fall 2015-Spring 2017: Helped establish new APSA organization on campus. Record meeting notes and help organize and plan events.
- MSTP Clinical Case Review; Miami, FL; Fall 2016-Spring 2022: Attended/led monthly case reviews led

by MSTP students and a physician that engage students in clinical reasoning skills throughout their MD/PhD training. Students work together to develop a differential diagnosis and work up plan for each case.

- MSTP Scientific and Professional Development; Miami, FL; Fall 2016-Spring 2022: Attended monthly seminars led by different MD/PhD mentors that talked about their experiences as physician scientists, as well as professional development skills such as writing grants.
- Judge for The Miami Dade STEM Expo's South Florida Regional Science and Engineering Fair; Miami, FL; Feb. 6 2016: Listened and provided feedback to local Miami student's science project, promoted excitement for science based careers
- Public Relation Director for MedicOUT; Miami, FL; October 2015-May 2017: Assisted in the assembly and dissemination of the monthly MedicOUT newsletter and advertised MedicOUT sponsored events to students, residents, and the other university LGBTQ interest groups.
- MD/PhD Journal Club; Miami Florida; Fall 2016- May 2017: Participated in monthly journal clubs led by different faculty at the University of Miami over their area of expertise.
- Teacher for Community Outreach Teaching Services (COATS); Miami, FL; Fall 2016-Spring 2017: Helped lead events to teach kids at local schools about healthy and diseased human anatomy and what they can do to keep themselves healthy, using real human organs as a teaching tool.
- Meiosis Journal Club; Iowa City, IA; Summer 2011-Spring 2013: Presentations once a week given/attended by undergraduates, faculty, graduate students, and post-docs.
- Tutor for TRIO Student Services; Iowa City, IA; Fall 2010-Spring 2012: Tutored first generation and minority students: chemistry, biology, genetics, psychology and physics.
- Volunteer University of Iowa Hospital and Clinics; Iowa City, IA; Fall 2010-Spring 2012: Child Psychiatric Inpatient Unit and Circle School.
- Big Brothers Big Sisters; Iowa City, IA; Spring 2010-Spring 2013: Mentored 1st and 2nd graders at Roosevelt Elementary School and one on one mentoring of a 1st grader at Mark Twain Elementary School.
- AXE Professional Chemistry Fraternity; Iowa City, IA; Fall 2011
- Supplemental Instructor for Fundamental of Genetics; Iowa City, IA; Fall 2012-Spring 2013: Led additional classes to aid students understanding of genetics and how to succeed in the class.
- Teaching Intern for Foundations of Biology; Iowa City, IA; Fall 2012-Spring 2013: TA in for the laboratory section of the introductory biology class Foundations of Bio.