

MICHAEL JAVIER BALE

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GitHub: <http://www.github.com/michaelbale>

EDUCATION

Weill Cornell Medical College, New York, NY **2020-Present**

Ph.D.

Thesis Adviser: Steven Z. Josefowicz, PhD
<https://josefowiczlab.org>

Johns Hopkins University, Baltimore, MD

M.Sc. in Bioinformatics **2016-2020**

University of Kentucky, Lexington, KY

B.A. in Chemistry

B.A. in Physics

Minor: Mathematics

Honors: *Magna Cum Laude*

2012-2016

CURRENT POSITION

PhD student at Weill Cornell Medical College in the Immunology and Microbial Pathogenesis program. My current work is in the lab of Steven Josefowicz, PhD defining the role of stimulation-induced deposition of histone post-translational modifications in T cell function, differentiation, and exhaustion. I also consult with others in the lab in projects involving the *Immunological Genome (ImmGen) Consortium* as well as our industry partners at *EpiCypher*.

PUBLICATIONS

IA Wright, **MJ Bale**, W Shao, W-S Hu, JM Coffin, GU van Zyl, MF Kearney, “HIVIntact: A Python-Based Tool for HIV-1 Genome Intactness Inference”, *Retrovirology* (Jun 2021)

- Associated Software: <https://github.com/ramics/HIVIntact>

VF Boltz, C Ceriani, JW Rausch, W Shao, **MJ Bale**, BF Keele, R Hoh, JM Milush, SG Deeks, F Maldarelli, MF Kearney, JM Coffin, “CpG Methylation Profiles of HIV-1 Pro-Viral DNA in Individuals on ART”, *Viruses* (Apr 2021)

MJ Bale, M G Katusiime, D Wells, X Wu, J Spindler, EK Halvas, JC Cyktor, A Wiegand, W Shao, MF Cotton, SH Hughes, JW Mellors, JM Coffin, GU van Zyl, MF Kearney, “Early Emergence and Long-Term Persistence of HIV-Infected T-Cell Clones in Children”, *mBio* (Apr 2021)

- Associated GitHub repo: github.com/michaelbale/cher_bale/

JM Coffin, **MJ Bale**, DW Wells, S Guo, B Luke, JM Zerbato, MD Sobolewski, T Sia, W Shao, X Wu, F Maldarelli, MF Kearney, JW Mellors, SH Hughes, “Integration in Oncogenes plays only a Minor Role in Determining the In Vivo Distribution of HIV Integration Sites Before or During Suppressive Antiretroviral Therapy”, *PLoS Pathogens* (Apr 2021)

W Shao, VF Boltz, J Hattori, **MJ Bale**, F Maldarelli, JM Coffin, MF Kearney, “Short Communication: HIV-DRLink: A Tool for Reporting Linked HIV-1 Drug Resistance Mutations in Large Single-Genome Data Sets Using the Stanford HIV Database”. AIDS Research and Human Retroviruses (Nov 2020)

- Associated software: <https://github.com/Wei-Shao/HIV-DRLink>

EK Halvas, KW Joseph, LD Brandt, S Guo, MD Sobolewski, JL Jacobs, C Tumiotto, JK Bui, JC Cyktor, BF Keele, GD Morse, **MJ Bale**, W Shao, MF Kearney, JM Coffin, JW Rausch, X Wu, SH Hughes, JW Mellors, “HIV-1 Viremia not Suppressible by Antiretroviral Therapy can Originate from Large T Cell Clones Producing Infectious Virus”. Journal of Clinical Investigations (Nov 2020)

DW Wells, S Guo, W Shao, **MJ Bale**, JM Coffin, SH Hughes, X Wu, “An Analytical Pipeline for Identifying and Mapping the Integration Sites of HIV and Other Retroviruses”, BMC Genomics (Mar 2020)

- Associated software: <https://github.com/HughesLab-FNL/ISA-Analysis-Pipeline>

M G Katusiime, EK Halvas, I Wright, K Joseph, **MJ Bale**, B Kirby-McCullough, S Engelbrecht, W Shao, W-S Hu, MF Cotton, JW Mellors, MF Kearney, GU van Zyl, “Intact HIV Proviruses are Detectable in Children 7-9 Years after Initiation of ART in the First Year of Life”. Journal of Virology (Jan 2020).

SC Patro, L Brant, **MJ Bale**, EK Halvas, W Shao, X Wu, S Guo, B Murrell, A Wiegand, J Spindler, C Raley, C Hautman, M Sobolewski, CM Fennessey, W-S Hu, BT Luke, JM Hasson, A Niyongabo, BF Keele, J Milush, R Hoh, SG Deeks, F Maldarelli, SH Hughes JM Coffin, JW Rausch, JW Mellors, MF Kearney, “Combined Full-length HIV-1 Sequencing and Integration Site Analysis Allows for Reconstruction of Intact Variants and Reveals Expanded Clones with Drug Resistant Proviruses”. Proc Natl Acad Sci (Nov 2019).

- Associated software: https://michaelbale.shinyapps.io/prob_identical/

A Musick, J Spindler, E Boritz, L Perez, D Crespo-Velez, SC Patro, MD Sobolewski, **MJ Bale**, C Reid, BF Keele, W Shao, A Wiegand, FR Simonetti, JW Mellors, SH Hughes, JM Coffin, F Maldarelli, MF Kearney, “HIV Infected T Cells Can Proliferate In vivo Without Inducing Expression of the Integrated Provirus”. Frontiers in Microbiology (Octo 2019).

ER Wonderlich, K Subramanian, B Cox, A Wiegand, C Lackman-Smith, **MJ Bale**, R Hoh, MF Kearney, F Maldarelli, SG Deeks, MP Busch, RG Ptak, DA Kulpa, “Effector Memory Differentiation Increases Detection of Replication-Competent HIV-1 in Resting CD4⁺ T Cells from Virally Suppressed Individuals”. PLoS Pathogens (Oct 2019).

G Bozzi, FR Simonetti, SA Watters, EM Anderson, M Gouzoulis, MF Kearney, P Rote, CM Lange, W Shao, R Gorelick, B Fullmer, S Kumar, S Wank, S Hewitt, D Kleiner, J Hattori, **MJ Bale**, S Hill, J Bell, C Rehm, Z Grossman, R Yarchoan, T Uldrick, F Maldarelli, “No Evidence of Ongoing HIV Replication or Compartmentalization in Tissues During Combination Antiretroviral Therapy: Implications for HIV Eradication”. Science Advances (Sept 2019).

VF Boltz, W Shao, **MJ Bale**, EK Halvas, JA McIntyre, RT Schooley, Shahin Lockman, JS Currier, F Sawe, E Hogg, MD Hughes, MF Kearney, JM Coffin, JW Mellors, “Linked Dual-Class HIV Resistance Mutations are Associated with Treatment Failure”. Journal of Clinical Investigations (Sept 2019).

WR McManus, **MJ Bale**, J Spindler, A Wiegand, A Musick, SC Patro, MD Sobolewski, VK Musick, EM Anderson, JC Cyktor, EK Halvas, W Shao, D Wells, X Wu, BF Keele, JM Milush, R Hoh, JW Mellors, SH Hughes, JM Coffin, MF Kearney, “Absence of Detectable HIV-1 Replication or Compartmentalization in Lymph Nodes During Antiretroviral Therapy”. *Journal of Clinical Investigations* (Jul 2019).

JM Coffin, D Wells, JM Zerbato, JD Kuruc, S Guo, B Luke, JJ Eron, **MJ Bale**, J Spindler, FR Simonetti, S Hill, MF Kearney, F Maldarelli, X Wu, JW Mellors, SH Hughes, “Clones of Infected Cells Arise Early in HIV-Infected Individuals”. *JCI Insight* (Jun 2019).

MF Kearney, A Wiegand, W Shao, WR McManus, **MJ Bale**, B Luke, F Maldarelli, JW Mellors, JM Coffin, “Ongoing HIV Replication During ART Reconsidered”. *Open Forum Infectious Disease* (Sept 2017).

GU van Zyl, M-G Katusiime, A Wiegand, WR McManus, **MJ Bale**, EK Halvas, B Luke, VF Boltz, J Spindler, B Laughton, S Engelbrecht, JM Coffin, MF Cotton, W Shao, JW Mellors, MF Kearney, “No evidence of HIV replication in children on antiretroviral therapy”. *Journal of Clinical Investigations* (Sept 2017).

INVITED REVIEWS

AA Capoferri, **MJ Bale**, FR Simonetti, MF Kearney, “Phylogenetic inference for the study of within-host HIV-1 dynamics and persistence on antiretroviral therapy”. *The Lancet HIV* (Apr 2019).

MJ Bale, MF Kearney, “Review: HIV-1 phylogeny during suppressive antiretroviral therapy”. *Curr Opin HIV AIDS* (Apr 2019).

GU van Zyl, **MJ Bale**, MF Kearney, “HIV Evolution and Diversity in ART-Treated Patients”. *Retrovirology* (Jan 2018).

PRESENTATIONS

MJ Bale*, M-G Katusiime, D Wells, X Wu, J Spindler, EK Halvas, JC Cyktor, A Wiegand, W Shao, JM Coffin, MF Cotton, SH Hughes, JW Mellors, GU van Zyl, MF Kearney, “Long-Term Persistence of HIV-Infected Cell Clones in Children Treated Early”. Presented as Poster at the Conference on Retroviruses and Opportunistic Infections (Mar 2019) and HIV Dynamics and Evolution Meeting (Mar 2019) and HIV Persistence Workshop (Dec 2019)

MJ Bale*, VF Boltz, JW Mellors, JM Coffin, SH Hughes, MF Kearney, “Modeling Residual HIV Replication and the Emergence of Drug Resistance on ART”. Presented as Poster at HIV Dynamics and Evolution Meeting (Apr 2018) and Viral Evolution and Molecular Epidemiology Workshop (Aug 2018)

WR McManus, MJ Bale*, J Spindler, A Wiegand, A Musick, X Wu, D Wells, SH Hughes, B Keele, R Hoh, J Milush, JM Coffin, JW Mellors, SG Deeks, MF Kearney, “No Evidence for Ongoing HIV Replication in Lymph Nodes During Suppressive ART”. Presented as Oral Abstract at HIV Persistence Workshop (Dec 2017)

MJ Bale*, MG Katusiime, A Wiegand, G van Zyl, M Cotton, WR McManus, JW Mellors, MF Kearney, W Shao, JM Coffin, “Assessment of Neighbor-Joining and Bayesian Methods for use in Phylgenetic

Analyses of Intra-Patient HIV-1 Populations”. Presented as Oral Abstract at HIV-DRP Think Tank Meeting (Apr 2017) and as Poster at the HIV Dynamics and Evolution Meeting (May 2017)

MJ Bale*, J Spindler, A Wiegand, F Maldarelli, JW Mellors, JM Coffin, W Shao, MF Kearney, “Assessing Intra-patient HIV Genetic Diversity to Identify Genomic Regions with Appropriate Phylogenetic Signal for Target NGS”. Poster presented at Cold Spring Harbor HIV/AIDS History and Future (Oct 2016)

MJ Bale*, W Lu, Y Wei, “Inhibition of AcrB Expression by Antisense Knockdown as a Mechanism for Reduction of Drug Resistance in *E. coli*”. Poster presented at Annual Regional Poster Competition at the University of Kentucky (Apr 2016). Poster Presented at Naff Symposium at the University of Kentucky (Apr 2016).

MJ Bale*, MA Gouzoulis, NP Johnson, A Wiegand, J Spindler, W Shao, RJ Bosch, CM Lalama, DK McMahon, JM Coffin, MF Kearney, JW Mellors, "Possible association between pre-ART CD4+ T-cell count and the emergence of identical HIV-1 sequences after long-term antiretroviral therapy" (Aug 2014). Poster presented at NIH Summer Poster Day.

- Presented as oral presentation at the 100th Annual Meeting of the

- Kentucky Academy of Science; Molecular/cellular Biology (Nov 2014)

- Received 2nd place in undergraduate oral presentation Molecular/Cellular Biology

PEER REVIEW

PLoS Pathogens – 1 Manuscript

Journal of Clinical Investigations – Review Collaborator

Nature Communications – Review Collaborator

PREVIOUS RESEARCH POSITIONS

Cancer Research Training Award Post-Baccalaureate

June 2016-June 2020

Post-baccalaureate research fellow in Dr. Mary Kearney’s lab. I provide bioinformatics and statistical support on various projects that are ongoing within the group such as developing a statistical analysis for the probability of identical sub-genomic sequences being more present than by chance. My main project involves the analysis of the integration site landscape of HIV-infected Children on ART for many years. In addition to looking at the clonal structure of these children on- and pre-ART, we statistically compare this “integrome” to a library of integration sites from *ex vivo* infected PBMCs to look for selection of integrations into certain genes and/or regions of the genome.

Cancer Research Training Award Intern

Summer 2015

Summer intern in the HIV Dynamics and Replication Program at NCI-Frederick under Dr. Mary Kearney. My main project involved preparation of data and figures for publication on study of identical sequences in patients on long-term suppressive therapy as a comparison between populations in plasma and in cells. A secondary project was the development of a test statistic to assess the confidence with which deep sequencing assay data can be interpreted with respect to identical sequences—a measure of phylogenetic signal within sequencing data.

Cancer Research Training Award Intern**Summer 2014**

Summer intern in the HIV Drug Resistance Program at NCI-Frederick under Dr. Mary Kearney. My main project was to utilize Single-Genome Sequencing to study the relationship between CD4+ T-cell count at the initiation of ARV Therapy and the emergence of identical proviral sequences after long term suppression. Other projects included the development of Cell-Associated RNA and DNA SGS, protocol development of a simpler way to determine results of PCR without using electrophoresis, and primer study to account for hypermutation of the HIV genome by APOBEC-mediated hypermutation.

Undergraduate Researcher**Fall 2013-Spring 2016**

Undergraduate researcher in the lab of Dr. Yinan Wei at the University of Kentucky. I worked with Xinyi Zhang on a mechanism study of an essential inorganic Pyrophosphatase in *S.aureus* characterizing metal affinity and specificity. In addition, I developed an antisense RNA-based platform for the analysis of drug-efflux efficiency of the AcrAB-TolC complex in *E. coli* as a function of relative WT expression levels.

Research Intern**Summer 2013**

Research intern at the Benjamin Levich Institute of Physico-Chemical Hydrodynamics in the Department of Chemical Engineering at the City College of New York as a part of the Center for the Exploitation of Nanostructures in Sensors and Energy Systems (CENSES) Research Experience for Undergraduates under the mentorship of Dr. Charles Maldarelli and Elizabeth Knapp, BS. I worked in developing a mechanism for Self-diffusiophoresis in microenvironments for applications in drug and cargo delivery via particle tracking analysis.

LAB SKILLS

Phylogenetic Analysis

Gel-electrophoresis

PCR

Microscopy-light and fluorescent

Protein Extraction and Purification

(Big) Data Analysis

“Seq” data analysis and processing

-ATAC, RNA, ChIP/CUT&RUN

Statistical Analysis

Data Modeling

Bayesian Phylogenetic Inference

Isothermal Titration Calorimetry

Western Blot

Transformation/Transfection

Cell culturing

Flow Cytometry

CUT&RUN/Tag

Pipeline Development using Nextflow

COMPUTER SKILLS

Intermediate proficiency with Python3, R, Linux Environment/Shell Scripting

High fluency with basic computer programs including, but not limited to: Power Point, Excel, Word, Photoshop (and other pictorial programs)

Low-level Basic competency with Computer languages: C

LANGUAGES

English—first native language

Spanish—speak, read, write with high fluency