Nigel Kurgan

Postdoctoral Research Fellow

Novo Nordisk Foundation Center for Basic Metabolic Research

nigel.kurgan@sund.ku.dk | cbmr.ku.dk/research/research-groups/deshmukh-group/ | 0000-0002-5011-0297 | Daqi2XQAAAAJ | nigelkurgan | nigelkurgan

Exercise physiologist with expertise in metabolic assays, proteomics, and bioinformatics. I'm interested in combining these approaches to better understand interorgan communication mediated by secreted proteins during exercise and in individuals with metabolic diseases. I am an avid R user for data processing, visualization, communication, reports/dashboards, and am passionate about open and reproducible science.

Current Appointments

Novo Nordisk Foundation Center for Basic Metabolic Research, University of Copenhagen *Copenhagen, Denmark*

Postdoctoral Research Fellow *Sep 2022–Present*

Education

Brock University *St. Catharines, Canada*

Ph.D. Health Biosciences *2022*

- Conferred with Distinction and a Graduate Student Research Excellence Award
- Funded by Scholarships from NSERC (2017-21) and QEII-GSST (2021-2022)
- Thesis: Sclerostin influences body composition adaptations to exercise training

Brock University *St. Catharines, Canada*

M.Sc. Applied Health Sciences *2017*

- Funded by an Ontario Graduate Scholarship
- Thesis: Physical training, inflammation, and bone integrity in elite female rowers

Brock University *St. Catharines, Canada*

B.Sc. Biomedical Sciences *2015*

- Conferred June 2015 with First-Class Standing
- Thesis: Mitochondrial function and phospholipid composition changes in mdx mice skeletal muscle

Research Experience

Universidad San Francisco de Quito *Quito, Ecuador*

Visiting Scientist, Institute of Microbiology *Oct 2021–Present*

- Provide support for the coordination and data analysis of a population-based cohort study in Quito to understand vaccine and infection-induced immunity to SARS-CoV-2
- Support data analyses on the genomic epidemiology and phylogenetics of different SARS-CoV-2 variants circulating in Ecuador

Walter and Eliza Hall Institute of Medical Research *Melbourne, Australia*

Postdoctoral Scientist, Population Health and Immunity Division, Mueller and Robinson Labs *Feb 2019–Present*

- My postdoc work involves the application of a suite of genomic epidemiology approaches to better understand residual and resurgent malaria transmission dynamics in the Asia-Pacific and Americas regions
- Support the field implementation and lead the overall analysis of a 12-month longitudinal cohort study in Papua New Guinea. The aim of this study is to understand the spatiotemporal risk factors for malaria infections in 1000 individuals of all ages residing across four villages on the North Coast of PNG.
- Apply novel genotyping and molecular diagnostic techniques to samples collected from several large-scale epidemiological field studies in Asia-Pacific to identify and track malaria infections over space and time and within individuals. Downstream analysis involves relating genetic data to epidemiological data to better understand spatiotemporal infection dynamics and risk factors
- Outputs: Co-author publications(2), Honors and awards/grants (9), Student/staff supervision (5) PNG

The University of Melbourne *Melbourne, Australia*

Research Fellow in Malaria Population Genetics, Day Lab *May 2018–Feb 2019*

- Applied genomic epidemiology approaches that employed bioinformatic and population genetic methods to better understand the diversity and geographic population structure of *var* genes in Ecuador and Ghana
- Lead the analysis and preparation of manuscripts on the epidemiology and population genetics of malaria in Ecuador and Ghana
- Outputs: Co-author publications (1), Student supervision (1)

Center for Research on Health in Latin America *Quito, Ecuador*

Visiting Scientist *Nov 2017–Feb 2018*

- I was awarded a JD Smyth Postgraduate Student Travel Award by the Australian Society for Parasitology to support a Researcher Exchange to establish an international research collaboration
- Implemented protocols and novel population genetic analytical methods to examine malaria field samples to better understand malaria transmission patterns in Ecuador
- Trained laboratory staff on molecular genetic protocols and developed analytical skills workshops

The University of Melbourne *Melbourne, Australia*

Postgraduate Researcher, Day Lab *Feb 2014–May 2018*

- Developed a high-throughput amplicon sequencing genotyping tool and customised computational and analytical methods for characterizing antigenic diversity in *P. falciparum*
- My PhD work involved the generation of microsatellite genotyping and *var* gene illumina sequence data and downstream analysis using population genetic, bioinformatic, phylodynamic and epidemiology approaches to relate parasite diversity data to epidemiological data collected in the field
- Visited our field site in Bongo District, Ghana in 2014 and was directly involved in the field coordination and data collection as part of a cross-sectional survey in Bongo
- Outputs from my PhD: First-author publications (2), Co-author publications (3), Honors and awards (7), Student supervision (1)

New York University of School of Medicine *New York, USA*

Research Assistant, Day Lab, Division of Medical Parasitology *Jun 2012–Jan 2014*

- Analyzed the molecular epidemiology and population genetics of the *Plasmodium falciparum var* multi-gene family encoding the major variant surface antigen of malaria

New York Blood Center Lindsley F. Kimball Research Institute *New York, USA*

Research Intern, Lustigman Lab, Molecular Parasitology *Jul 2011–Aug 2011*

- Research project: Polymorphisms in invasion ligand genes from Peruvian, Colombian and Brazilian *Plasmodium falciparum* field isolates
- Identified novel polymorphisms in DNA sequences coding for proteins critical to the invasion process and pathogenicity of *P. falciparum*

Teaching

In addition to the formal roles listed below, I also actively curate teaching resources/presentations for bioinformatic pipelines and metabolics assays.

Instructor *St. Catharines, Canada*

Brock University *2019-2020*

- KINE 2P09 – Human Physiology

Teaching Assisstant *St. Catharines, Canada*

Brock University *2016-2022*

- KINE 2P09 – Human Physiology
- KINE 2P97 – Exercise Metabolism
- GERO 5P88 – The Process of Aging
- KINE 1P98 – Musculoskeletal Anatomy
- KINE 1P90 – Human Anatomy and Physiology
- HLSC 1F90 – Introduction to Health Sciences

Laboratory Demonstrator *St. Catharines, Canada*

Brock University *2015-2022*

- AHSC 7P96 – Top-Down Proteomics
- HLSC 4P95 – Human Pathology
- HLSC 3P02 – Introduction to Human Immunology

Supervision

Ph.D. Student co-supervisor *Copenhagen, Denmark*

University of Copenhagen, NNF CBMR *2023-2027*

- Designed and co-supervised a Ph.D. project on adipokine release during exercise

M.Sc Student co-supervisor *Copenhagen, Denmark*

University of Copenhagen, NNF CBMR *2023-2024*

- Designed and co-supervised a M.Sc. project on exercise regulated peptides that influence neurogenesis

M.Sc Student co-supervisor *St. Catharines, Canada*

Brock University, Faculty of Applied Health Sciences *2020-2022*

- Co-supervised a M.Sc. project bone derived proteins influencing muscle fibre type

Undergraduate Student co-supervisor *St. Catharines, Canada*

Brock University, Faculty of Applied Health Sciences *2017-2020*

- Co-supervised an undergraduate research project on cytokine response to acute exercise

Leadership, Service & Community Engagement

Journal Peer Reviewing: NA (NA) *2020-Present*

- Computational and Structural Biotechnology Journal (2), Archives of Physiology and Biochemistry (1), Physiological Reports (1)

Conference Planning: Brock University's Muscle Health and Education Forum (Quito, Ecuador) *2021*

- Designed the program, recruited speakers, and chaired sessions

Conference Symposia Chair: NA (NA) *2018-Present*

- Free Communication chair – Health Science and Biotechnology, Mapping the New Knowledges Meetingx2
- Sessional Chair – Powerhouse Physiology, Ontario Exercise Physiology Conference
- Chair and Master of Ceremony – Brock's Math and Science Undergraduate Research Conference

Additional training and professional development

2022 **Course in Laboratory Animal Science EU Function ABD (felasa)** (University of Copenhagen, Department of Experimental Medicine)

2022 **DDA Reproducible Research in R – an advanced workshop on creating collaborative and automated analysis for PhD Students and Postdocs** (Danish Diabetes and Endocrine Academy (DDEA))

2022 **Just Bash It** (University of Copenhagen, Center for Health Data Science)

2022 **From Excel to R** (University of Copenhagen, Center for Health Data Science)

2022 **DDA Postdoc Summit - Challenge** (Danish Diabetes and Endocrine Academy (DDEA))

2020 **Canadian Council of Animal Care and Use of Experimental Animals Certification** (Brock University, ACC)

Skills

Laboratory	Analytical	Programming	Software/Tools
NA	y	Univariate/multivariate data analysis	R
PCR/qPCR	y	Reproducible research	Rstudio
Illumina amplicon sequencing	y	Proteomics data preperation and analysis	RMarkdown
PacBio long-read sequencing	y	y	Git/Github
Whole-genome sequencing	y	y	SPSS
y	y	y	GraphPad Prism
y	y	y	Luminex and Bioplex manager
y	y	y	ImageJ/Image Lab
y	y	y	Delta2D
y	y	y	Spectronaut
y	y	y	DIA-NN
y	y	y	MaxQuant
y	y	y	Perseus

Awards and Funding

2023-25 **NSERC Postdoctoral Fellowship** (University of Copenhagen): Awarded 90,000 CAD to study mechanisms of tissue crosstalk mediated by extracellular vesicles

2022 **Distinguished Graduate Student** (Brock University): Awarded 100 CAD for being the most distinguished graduate from my graduate program

2021 **CSEP Graduate Student Oral Presentation Finalist** (CSEP Conference): Awarded 250 CAD for being selected as a finalist for best graduate student oral presentation

2020-21 **QEII Graduate Scholarship in Science and Technology** (Brock University): Awarded a 15,000 CAD scholarship for my Ph.D. work

2020 **Jack M Miller Excellence in Research** (Brock University): Awarded 1,341 CAD in recognition for my excellence in researc

2017-19 **NSERC Postgraduate Scholarship – Doctoral** (Brock University): Awarded 63,000 CAD to study bone-secreted proteins during exercise

2017-19 **Dean of Graduate Studies Excellence Scholarship** (Brock University): Awarded 21,000 CAD for my academic excellence

2017 **Dean of Graduate Studies Entrance Scholarship – Doctoral** (Brock University): Awarded 2,000 CAD for my academic excellence

2016-17 **Ontario Graduate Scholarship – Masters** (Brock University): Awarded 15,000 CAD to study bone health in elite female rowers

2016-17 **Dean of Graduate Studies Excellence Scholarship – Masters** (Brock University): Awarded 2,500 CAD for my academic excellence

2016 **CSEP Poster Award Finalist** (CSEP Conference): Selected as a finalist for best poster

2016 **Dean of Graduate Studies Spring Research Fellowship** (Brock University): Awarded 4,000 CAD for my academic excellence

2015-16 **Dean of Graduate Studies Entrance Scholarship** (Brock University): Awarded 2,500 CAD for my academic excellence

2015 **Graduate Studies Fellowship** (Brock University): Awarded 7,000 CAD to study the bone response to acute exercise

2012-14 **Brock Returning Scholars Award/Deans Honour List** (Brock University): Awarded 1,500 CAD for my academic excellence

2010 **Brock Entrance Scholars Award** (Brock University): Awarded 2,500 CAD for my academic excellence

Publications

*indicates equal contribution

2022

Charnaud, S., Munro, J., Semenec, L., Mazhari, R., Brewster, J., Bourke, C., **Ruybal-Pesántez, S.**, James, R., Lautu-Gumal, D., Karunajeewa, H., & Mueller, I. (2022, *accepted*). *PacBio long-read amplicon sequencing for scalable high-resolution population allele typing of the complex CYP2D6 locus*. Communications Biology.

Ruybal-Pesántez, S., Tiedje, K. E., Pilosof, S., Tonkin-Hill, G., He, Q., Rask, T. S., Amenga-Etego, L., Oduro, A. R., Koram, K. A., Pascual, M., & Day, K. P. (2022). *Age-specific patterns of DBLa var diversity can explain why residents of high malaria transmission areas remain susceptible to Plasmodium falciparum blood stage infection throughout life.* International Journal for Parasitology. https://doi.org/10.1016/j.ijpara.2021.12.001

- This work was featured on the Herminthology #WomenBehindTheWork initiative

Feng, Q., Tiedje, K. E., **Ruybal-Pesántez, S.**, Tonkin-Hill, G., Duffy, M. F., Day, K. P., Shim, H., & Chan, Y. (2022). *An accurate method for identifying recent recombinants from unaligned sequences.* Bioinformatics. https://doi.org/10.1093/bioinformatics/btac012

2021

Ruybal-Pesántez, S., Sáenz, F., Deed, S. L., Johnson, E. K., Larremore, D. B., Vera-Arias, C. A., Tiedje, K. E. & Day, K. P. (2021, *preprint*). *Clinical malaria incidence following an outbreak in Ecuador was predominantly associated with Plasmodium falciparum with recombinant variant antigen gene repertoires.* medRxiv. https://doi.org/10.1101/2021.04.12.21255093

Mazhari, R., **Ruybal-Pesántez, S.**, Angrisano, F., Kiernan-Walker, N., Hyslop, S., Longley, R. J., Bourke, C., Chen, C., Williamson, D. A., Robinson, L. J., Mueller, I., & Eriksson, E. M. (2021). *SARS-CoV-2 Multi-Antigen Serology Assay*. Methods and Protocols, 4(4), 72. https://doi.org/10.3390/mps4040072

Argyropoulos, D. C.* , **Ruybal-Pesántez, S.*** , Deed, S. L., Oduro, A. R., Dadzie, S. K., Appawu, M. A., Asoala, V., Pascual, M., Koram, K. A., Day, K. P., & Tiedje, K. E. (2021). *The impact of indoor residual spraying on Plasmodium falciparum microsatellite variation in an area of high seasonal malaria transmission in Ghana, West Africa*. Molecular Ecology, 30(16), 3974–3992. https://doi.org/10.1111/mec.16029

- This work was chosen by the editors to be featured in the Molecular Ecology blog

Tonkin-Hill, G., **Ruybal-Pesántez, S.**, Tiedje, K. E., Rougeron, V., Duffy, M. F., Zakeri, S., Pumpaibool, T., Harnyuttanakorn, P., Branch, O. H., Ruiz-Mesía, L., Rask, T. S., Prugnolle, F., Papenfuss, A. T., Chan, Y., & Day, K. P. (2021). *Evolutionary analyses of the major variant surface antigen-encoding genes reveal population structure of Plasmodium falciparum within and between continents*. PLOS Genetics, 17(2), e1009269. https://doi.org/10.1371/journal.pgen.1009269

- This work was chosen by the editors to be featured with an accompanying Perspectives piece

2020

Narh, C. A., Ghansah, A., Duffy, M. F., **Ruybal-Pesántez, S.**, Onwona, C. O., Oduro, A. R., Koram, K. A., Day, K. P.* , & Tiedje, K. E.* (2020). *Evolution of antimalarial drug resistance markers in the reservoir of Plasmodium falciparum infections in the Upper East Region of Ghana*. The Journal of Infectious Diseases. https://doi.org/10.1093/infdis/jiaa286

2019

Pilosof, S., He, Q., Tiedje, K. E., **Ruybal-Pesántez, S.**, Day, K. P., & Pascual, M. (2019). *Competition for hosts modulates vast antigenic diversity to generate persistent strain structure in Plasmodium falciparum.* PLOS Biology, 17(6), e3000336. https://doi.org/10.1371/journal.pbio.3000336

2018

He, Q., Pilosof, S., Tiedje, K. E., **Ruybal-Pesántez, S.**, Artzy-Randrup, Y., Baskerville, E. B., Day, K. P., & Pascual, M. (2018). *Networks of genetic similarity reveal non-neutral processes shape strain structure in Plasmodium falciparum*. Nature Communications, 9(1), 1817. https://doi.org/10.1038/s41467-018-04219-3

Rorick, M. M., Artzy-Randrup, Y., **Ruybal-Pesántez, S.**, Tiedje, K. E., Rask, T. S., Oduro, A., Ghansah, A., Koram, K., Day, K. P., & Pascual, M. (2018). *Signatures of competition and strain structure within the major blood-stage antigen of Plasmodium falciparum in a local community in Ghana*. Ecology and Evolution, 8(7), 3574–3588. https://doi.org/10.1002/ece3.3803

2017

Ruybal-Pesántez, S., Tiedje, K. E., Rorick, M. M., Amenga-Etego, L., Ghansah, A., Oduro, A. R., Koram, K. A., & Day, K. P. (2017). *Lack of Geospatial Population Structure Yet Significant Linkage Disequilibrium in the Reservoir of Plasmodium falciparum in Bongo District, Ghana*. The American Journal of Tropical Medicine and Hygiene, 97(4), 1180–1189. https://doi.org/10.4269/ajtmh.17-0119

Ruybal-Pesántez, S.* , Tiedje, K. E.* , Tonkin-Hill, G., Rask, T. S., Kamya, M. R., Greenhouse, B., Dorsey, G., Duffy, M. F., & Day, K. P. (2017). *Population genomics of virulence genes of Plasmodium falciparum in clinical isolates from Uganda*. Scientific Reports, 7(1), 11810. https://doi.org/10.1038/s41598-017-11814-9

Digital tools

For other non-traditional academic contributions, I have also developed several `R Shiny` web applications to support COVID-19 surveillance efforts and `R flexdashboard` for real-time updates and data visualization of both programmatic/operational aspects and preliminary epidemiological trends as part of the coordination of population-based field studies. Check out my GitHub

CovidClassifyR

Shazia Ruybal-Pesántez *Sep 2021*

- This Shiny web application was developed to support COVID-19 serosurveillance in Papua New Guinea enabling classification of unknown samples as recently exposed to SARS-CoV-2. This tool makes the downstream processing, quality control and interpretation of the raw data generated from a validated COVID-19 serological assay (Mazhari et al 2020) accessible to all researchers without the need for a specialist background in statistical methods and advanced programming. Funding was provided by a COVID-19 Digital Grant, media release

COVID-19 VaccinationScore

Raúl Fernández, Shazia Ruybal-Pesántez, Esteban Ortíz *Feb 2021*

- This Shiny web application was developed during the initial vaccine roll-out in Ecuador to help individuals better understand their "priority status" to receive their COVID-19 vaccine. An algorithm was applied to calculate a priority score based on an individuals answers to a set of questions on socioeconomic status, occupation, exposure, risk behavior, comorbidities, etc. Newspaper article (in Spanish)

Serosurveillance of COVID-19 in Ecuadorian blood donors dashboard (not open-source)

Shazia Ruybal-Pesántez *Jun 2020*

- This R flexdashboard was developed to support COVID-19 serosurveillance in Ecuadorian blood donors in collaboration with the Ecuadorian Red Cross National Blood Bank as part of the emergency response to COVID-19 (active early in the pandemic, June 2020-Dec 2020). This dashboard presented anonymized and aggregated data generated from monthly screening of blood donation samples to visualize seroprevalence trends. Due to confidentiality and internal permissions at ERC this tool is not publicly available.

ICEMR weekly dashboard (not open-source)

Shazia Ruybal-Pesántez *Mar 2020*

- This R flexdashboard was developed to support the ICEMR field teams in Madang, Papua New Guinea (active during the entire longitudinal cohort study March 2020 until Sep 2021). This dashboard was updated weekly and presented operational data (e.g. follow-up rates in each field site) that could be used by the team to plan field activies and identify any areas for improvement as well as preliminary epidemiological trends (e.g. RDT positivity, prevalence of fever). As this tool was meant for internal use within the ICEMR project, it is not publicly available.

processqpcR

Shazia Ruybal-Pesántez *In development*

- This Shiny web application is in development to support laboratory researchers with little to no programming skills with a tool for downstream processing of raw data generated from several qPCR machines (e.g. Lightcyler480, Quantstudio, etc). Functions will include automatic matching of sample IDs using a user-supplied 96-well or 384-well plate map, quantification of unknown samples using the assay standard curve/positive controls (e.g. to detect malaria-positive samples) and some preliminary visualizations of the data.

Selected presentations

Conference Presentations - I have participated in oral and poster presentations at 18 conferences (13 international, 5 national).

2023 **Basic Metabolic Research and Critical Thinking Ph.D. Seminar – Lead seminars on the application of mass-spectrometry-based proteomics and metabolomics**, University of Copenhagen, Center for Protein Research

2018-21 **HLSC 4P98 – Leveraging proteomics to understand the molecular response to exercise**, Brock University, Faculty of Biological Sciences

2019-20 **GERO 5P88 – Molecular mechanisms of age-related bone loss, Annually**, Brock University, Faculty of Applied Health Sciences

2017-20 **KINE 1P90 – Gas Exchange and Transport, Annually**, Brock University, Faculty of Applied Health Sciences

2017-20 **KINE 1P90 – The Blood and its Constituents, Annually**, Brock University, Faculty of Applied Health Sciences

2017-18 **HSLC 2P09 – Ion Channels and Action Potentials, Annually**, Brock University, Faculty of Applied Health Sciences

About me

I am half Ecuadorian and half American, born in The Netherlands, I am fluent in English and Spanish (beginner French and Dutch), and grew up overseas in several countries in Africa and Latin America: Ecuador, Tanzania, Guatemala, and Honduras. I am an Australian Permanent Resident and have been living in Melbourne, Australia since 2014 when I moved to pursue my PhD. Apart from my research, I am highly committed to furthering health and development initiatives, particularly in my home country of Ecuador. From early 2016 until the COVID-19 pandemic, I was CEO and co-founder of the The Artisan Project, a social enterprise that worked hand in hand with talented indigenous artisans in Ecuador. We used fashion as a tool to create income-generating opportunities, particularly for indigenous women, and impulse social impact and innovation. During the COVID-19 pandemic I was actively involved as a consultant epidemiologist providing analyses on case and testing trends, importation dynamics, Reff calculations, among others, to the Ecuadorian National COVID-19 Emergency Response committee - most of this work remains unpublished due to competing political agendas and turnover of public health officials.