Brian Muchmore

Resident Physician

*Resident in the combined Pediatrics-Medical Genetics
program at the University of Michigan, Ann Arbor.*

Skills

○ 10,000+ hours of laboratory bench work experience.
○ 10,000+ hours of data science experience with working proficiency in R, Bash, and Python.
○ Professional proficiency using Docker, Traefik and Guacamole.

Education

06/2021-present	**Resident**, *University of Michigan Combined Pediatrics-Medical Genetics Program*, Ann Arbor, Michigan.
08/2017-05/2021	**M.D.**, *Robert Larner, M.D., College of Medicine at the University of Vermont*, Burlington, Vermont.
09/2009-09/2012	**B.S. in Pre-medicine**, *University of Maryland*, College Park, Maryland.
08/2002-06/2006	**B.A. in Russian Studies**, *Bates College*, Lewiston, Maine.

Lapses in Training

05/24/2021-06/20/2021	**Period between medical school graduation and the beginning of residency**.

Awards

05/2020	**Jerold and Ingela Lucey Early Career Investigator Prize for Innovations in Infant or Child Health**.

Certification/Licensure

06/2021 **Basic Life Support**.

08/2021 **Neonatal Resuscitation Program**.

02/2023 **Advanced Cardiovascular Life Support**.

02/2023 **Pediatric Advanced Life Support**.

Volunteer Experience

08/2012-
08/2016 **Camp Fantastic**, *Volunteer at a sleep-away camp for children with cancer, which is sponsored by the NIH and run by the organization Special Love*, Front Royal, Virginia.

Work Experience

01/2016-
01/2021 **CodoniX**, *Real-time reporting and data mining of Codonix's terabyte-plus of patient data*, Potomac, Maryland.

Research Experience

01/2024-
present **Bioinformatician in the laboratory of Dr. Donna Martin**, *Whole genome analysis of the University of Michigan's Pediatric Genetic Registry in order to diagnose participants and find candidate genes for novel diseases*, Ann Arbor, Michigan.

01/2015-
01/2019 **Research Fellow at GENyO in the laboratory of Dr. Marta Alarcón-Riquelme**, *Lead bioinformatician for the PRECISESADS Flow Cytometry Study Group, which was a subgroup of a multi-national and multi-institutional project to find clinically useful biomarkers for systemic autoimmune diseases. Also, lead bioinformatician and co-laboratory leader of Spain's first CyTOF/Helios core facility*, Granada, Spain.

05/2018-
05/2018 **CyTOF/CODEX Course Attendee**, *Was a participant in the 2018 CyTOF/CODEX mini-course held by the Nolan laboratory at Stanford University in order to help set-up Spain's first CyTOF/Helios core facility. Airfare, accommodation and training fees were provided by the PRECISESADS project*, Palo Alto, California.

01/2013-01/2014	**Research Fellow at Chulalongkorn University in the laboratory of Dr. Yong Poovorawan**, *Evolutionary analysis of SNPs and INDELs using ancient genomes and 1000 genomes data*, Bangkok, Thailand.
09/2009-09/2012	**Cancer Research Training Award Fellow at the National Institutes of Health in the laboratory of Dr. Ludmila Prokunina-Olsson**, *Functional investigation of GWAS cancer signals associated with HCV-related traits and bladder cancer*, Bethesda, Maryland.
05/2009-09/2009	**Research Internship at the National Institutes of Health in the laboratory of Dr. Alasdair Steven**, *Cloned mutants of the fungal prion protein Het-s for analysis of structural motifs with electron microscopy*, Bethesda, Maryland.

Publications

1. Muchmore, B., Muchmore, P., Lee, C. W., Alarcon-Riquelme, M. E., & Muchmore, A. (2020). Tracking potential COVID-19 outbreaks with influenzalike symptoms urgent care visits. *Pediatrics*, *146*(4). https://doi.org/10.1542/peds.2020-1798

2. Onabajo, O. O., Muchmore, B., & Prokunina-Olsson, L. (2019). The IFN-L4 conundrum: When a good interferon goes bad. *Journal of Interferon & Cytokine Research*, *39*(10), 636–641. https://doi.org/10.1089/jir.2019.0044

3. Muchmore, B., & Alarcon-Riquelme, M. E. (2017). CymeR: Cytometry analysis using KNIME, docker and r. *Bioinformatics*, *33*(5), 776–778. https://doi.org/10.1093/bioinformatics/btw707

4. Fu, Y.-P., Kohaar, I., Moore, L. E., Lenz, P., Figueroa, J. D., Tang, W., Porter-Gill, P., Chatterjee, N., Scott-Johnson, A., Garcia-Closas, M., Muchmore, B., Baris, D., Paquin, A., Ylaya, K., Schwenn, M., Apolo, A. B., Karagas, M. R., Tarway, M., Johnson, A., . . . Prokunina-Olsson, L. (2014). The 19q12 bladder cancer GWAS signal: Association with cyclin e function and aggressive disease. *Cancer Research*, *74*(20), 5808–5818. https://doi.org/10.1158/0008-5472.CAN-14-1531

5. Prokunina-Olsson, L., Muchmore, B., Tang, W., Pfeiffer, R. M., Park, H., Dickensheets, H., Hergott, D., Porter-Gill, P., Mumy, A., Kohaar, I., Chen, S., Brand, N., Tarway, M., Liu, L., Sheikh, F., Astemborski, J., Bonkovsky, H. L., Edlin, B. R., Howell, C. D., . . . O-Brien, T. R. (2013). A variant upstream of IFNL3 (IL28B) creating a new interferon gene IFNL4 is associated with impaired clearance of hepatitis c virus. *Nature Genetics*, *45*(2), 164–171. https://doi.org/10.1038/ng.2521

6. Park, H., Serti, E., Eke, O., Muchmore, B., Prokunina-Olsson, L., Capone, S., Folgori, A., & Rehermann, B. (2012). IL-29 is the dominant type III interferon produced by hepatocytes during acute hepatitis c virus infection. *Hepatology*, *56*(6), 2060–2070. https://doi.org/10.1002/hep.25897

7. Fu, Y.-P., Kohaar, I., Rothman, N., Earl, J., Figueroa, J. D., Ye, Y., Malats, N., Tang, W., Liu, L., Garcia-Closas, M., Muchmore, B., Chatterjee, N., Tarway, M., Kogevinas, M., Porter-Gill, P., Baris, D., Mumy, A., Albanes, D., Purdue, M. P., . . . Prokunina-Olsson, L. (2012). Common genetic variants in the PSCA gene influence gene expression and bladder cancer risk. *Proceedings of the National Academy of Sciences of the United States of America*, *109*(13), 4974–4979. https://doi.org/10.1073/pnas.1202189109

8. Shebl, F. M., Pfeiffer, R. M., Buckett, D., Muchmore, B., Chen, S., Dotrang, M., Prokunina-Olsson, L., Edlin, B. R., & O-Brien, T. R. (2011). IL28B rs12979860 genotype and spontaneous clearance of hepatitis c virus in a multi-ethnic cohort of injection drug users: Evidence for a supra-additive association. *The Journal of Infectious Diseases*, *204*(12), 1843–1847. `https://doi.org/10.1093/infdis/jir647`

9. Musunuru, K., Strong, A., Frank-Kamenetsky, M., Lee, N. E., Ahfeldt, T., Sachs, K. V., Li, X., Li, H., Kuperwasser, N., Ruda, V. M., Pirruccello, J. P., Muchmore, B., Prokunina-Olsson, L., Hall, J. L., Schadt, E. E., Morales, C. R., Lund-Katz, S., Phillips, M. C., Wong, J., ... Rader, D. J. (2010). From noncoding variant to phenotype via SORT1 at the 1p13 cholesterol locus. *Nature*, *466*(7307), 714–719. `https://doi.org/10.1038/nature09266`

PRECISESADS Flow Cytometry Study Group Collaborations

1. Teruel, M., Barturen, G., Martinez-Bueno, M., Castellini-Perez, O., Barroso-Gil, M., Povedano, E., Kerick, M., Catala-Moll, F., Makowska, Z., Buttgereit, A., Consortium, P. C., Group, P. F. C. S., Pers, J.-O., Maranon, C., Ballestar, E., Martin, J., Carnero-Montoro, E., & Alarcon-Riquelme, M. E. (2021). Integrative epigenomics in sjogren´s syndrome reveals novel pathways and a strong interaction between the HLA, autoantibodies and the interferon signature. *Scientific Reports*, *11*(1), 23292. `https://doi.org/10.1038/s41598-021-01324-0`

2. Soret, P., Dantec, C. L., Desvaux, E., Foulquier, N., Chassagnol, B., Hubert, S., Jamin, C., Barturen, G., Desachy, G., Devauchelle-Pensec, V., Boudjeniba, C., Cornec, D., Saraux, A., Jousse-Joulin, S., Barbarroja, N., Rodriguez-Pinto, I., Langhe, E. D., Beretta, L., Chizzolini, C., ... Pers, J.-O. (2021). A new molecular classification to drive precision treatment strategies in primary sjogren's syndrome. *Nature Communications*, *12*(1), 3523. `https://doi.org/10.1038/s41467-021-23472-7`

3. Simon, Q., Grasseau, A., Boudigou, M., Le Pottier, L., Bettachioli, E., Cornec, D., Rouviere, B., Jamin, C., Le Lann, L., Borghi, M. O., Aguilar-Quesada, R., Renaudineau, Y., Alarcon-Riquelme, M. E., Pers, J.-O., & Hillion, S. (2021). A proinflammatory cytokine network profile in Th1/type 1 effector b cells delineates a common group of patients in four systemic autoimmune diseases. *Arthritis & Rheumatology*. `https://doi.org/10.1002/art.41697`

4. Bossini-Castillo, L., Villanueva-Martin, G., Kerick, M., Acosta-Herrera, M., Lopez-Isac, E., Simeon, C. P., Ortego-Centeno, N., Assassi, S., Hunzelmann, N., Gabrielli, A., de Vries-Bouwstra, J. K., Allanore, Y., Fonseca, C., Denton, C. P., Radstake, T. R., Alarcon-Riquelme, M. E., Beretta, L., Mayes, M. D., & Martin, J. (2021). Genomic risk score impact on susceptibility to systemic sclerosis. *Annals of the Rheumatic Diseases*, *80*(1), 118–127. `https://doi.org/10.1136/annrheumdis-2020-218558`

5. Beretta, L., Barturen, G., Vigone, B., Bellocchi, C., Hunzelmann, N., De Langhe, E., Cervera, R., Gerosa, M., Kovacs, L., Castro, R. O., Almeida, I., Cornec, D., Chizzolini, C., Pers, J.-O., Makowska, Z., Lesche, R., Kerick, M., Alarcon-Riquelme, M. E., & Martin, J. (2020). Genome-wide whole blood transcriptome profiling in a large european cohort of systemic sclerosis patients. *Annals of the Rheumatic Diseases*, *79*(9), 1218–1226. `https://doi.org/10.1136/annrheumdis-2020-217116`

6. Le Lann, L., Jouve, P.-E., Alarcon-Riquelme, M., Jamin, C., & Pers, J.-O. (2020). Standardization procedure for flow cytometry data harmonization in prospective multicenter studies. *Scientific Reports*, *10*(1), 11567. `https://doi.org/10.1038/s41598-020-68468-3`

7. Ruiz-Limon, P., Ortega-Castro, R., Barbarroja, N., Perez-Sanchez, C., Jamin, C., Patino-Trives, A. M., Luque-Tevar, M., Ibanez-Costa, A., Perez-Sanchez, L., de la Rosa, I. A., Abalos-Aguilera, M., Jimenez-Gomez, Y., Calvo-Gutierrez, J., Font, P., Escudero-Contreras, A., Alarcon-Riquelme, M. E., Collantes-Estevez, E., & Lopez-Pedrera, C. (2019). Molecular characterization of monocyte subsets reveals specific and distinctive molecular signatures associated with cardiovascular disease in rheumatoid arthritis. *Frontiers in Immunology*, *10*, 1111. https://doi.org/10.3389/fimmu.2019.01111

Poster Presentations

03/2024
ACMG

Muchmore, B., *P846 The ClinGenRecs Web Portal: Streamlining Access to Medical Genetics Resources and Tools*, Toronto, Canada.

03/2017
Annals of the
Rheumatic
Diseases

Muchmore, B., Le Lann, L., Jamin, C., consortium PRECISESADS, Marañon, C., Pers, J.O., & Alarcon-Riquelme, M.E., *02.16 Machine learning of flow cytometry data encompassing seven systemic autoimmune diseases and controls.*, Athens, Greece.

09/2013
International
Cytokine and
Interferon
Society

Muchmore, B., Tang, W., Porter-Gill, P., Kohaar, I., Liu, L., Brand, N., Park, H., Dickensheets, H., Sheikh, F., Rehermann, B.,Donnelly, RP., O'Brien, T.R., & Prokunina-Olsson L., *182 : Identification and characterization of interferon-lambda-4 (IFN-lambda-4), a novel class-2 cytokine which impairs clearance of hepatitis C virus*, San Francisco, California.

04/2011
AACR 102nd
Annual
Meeting

Muchmore, B., Park, H., Dickensheets, H., O'Brien, T. R., Rehermann, B., Donnelly, R., & Prokunina-Olsson L., *Abstract 3751: Expression analysis of the IL28A, IL28B, IL29 and IL28L genes in primary human peripheral blood mononuclear cells and hepatocytes: Effects of activation mode, time-course and genotypes*, Orlando, Florida.

Oral Presentations

12/2022

University of Michigan Clinical Genetics Grand Rounds, *No Programming Required: Bioinformatics for the Busy Clinical Geneticist*, Ann Arbor, Michigan.

05/2020

University of Vermont Pediatric Grand Rounds, *Real-time monitoring of influenza and COVID-19 in urgent cares across the United States*, Burlington, Vermont.

03/2017

PRECISESADS General Assembly, *Real-time machine learning of OMICS data*, Suresnes, Spain.

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03/2016   **Conference of Complex Diseases**, *CymeR: Cytometry analysis using KNIME, Docker and R.*, Granada, Spain.

02/2016   **KNIME Spring Summit**, *Dockerizing KNIME - Recipes for a KNIME cocktail*, Berlin, Germany.

Hobbies & Interests

Woodworking, aquaponics, soccer and the R programming language..

Language Fluency

Native	English. I converse easily and accurately in all types of situations.
Basic	Russian. I speak the language imperfectly and only to a limited degree and in limited situations.
Basic	Spanish. I speak the language imperfectly and only to a limited degree and in limited situations.
Basic	Thai. I speak the language imperfectly and only to a limited degree and in limited situations.

Other Awards/Accomplishments

01/2020   **Patent**, *NOVEL INTERFERON-(lambda)-4 (IFNL-4) PROTEIN, RELATED NUCLEIC ACID MOLECULES, AND USESTHEREOF.*, Ref: E-217-2011-1. U.S. Pat: 10,545,147.