



## **Feilim Mac Gabhann, Ph.D.**

### **Titles & Department**

Associate Professor of Biomedical Engineering  
Institute of Computational Medicine and Institute for NanoBioTechnology

### **Specialization Area**

Systems and computational pharmacology.

### **Unmet Need**

Building computational models to simulate therapeutic efficacy and interaction in the body, which allows for drug target discovery with reduced in vitro/in vivo screening requirements.

### **Summary of Research & Work**

Dr. Mac Gabhann is an expert in systems pharmacology and builds computational models to simulate different therapies like biologic drugs, cell transplant and gene therapy. This research could improve therapies in a broad range of disease areas, including vascular diseases, cancer, HIV, and gynecological disorders. He tests therapies that may upregulate tissue perfusion in tissues vulnerable to ischemia (e.g., muscle). Using computational models of VEGF signaling, his lab also tests therapies that inhibit pathways that lead to tumor vascularization and metastasis in cancer. Current projects include the design of antibody-drug conjugates to improve cancer therapies, molecular-level simulations of HIV to test new therapies that boost host antiviral responses, and computational models of endometriosis that probe the relationship between molecular and phenotypic variation to support therapeutic development.

### **Value Proposition**

- Accurate computational models of drug/target interactions are less expensive and time consuming than in vitro or in vivo experimentation.
- Allows for high throughput drug screening, reducing drug discovery timelines.
- Studies biological systems as integrated, functional units rather than isolated pieces, improving prediction of therapeutic outcomes and leading to key insights in disease pathology.
- Computational models allow researchers to zero in on required future wet lab/clinical experiments, saving money and time.
- Large volumes of data can be compared across cell lines and mouse strains to provide key insights on disease phenotype, modelling, and progression.
- Provides accurate research models of diseases that are difficult to study in vivo (e.g., endometriosis, fibroids).

## Recent Publications

- Miller M., Brightman AO, Epstein FH, Grande-Allen KJ, Green JJ, Haase E, Laurencin CT, Logsdon E, Mac Gabhann F, Ogle B, Wang C, Wodicka GR, Winslow R. BME 2.0: Engineering the Future of Medicine. *BME Frontiers*. 2023, Vol 4.
- Lam I, Reddy VP, Ball K, Arends RH, Mac Gabhann F. Development of and insights from systems pharmacology models of antibody-drug conjugates. *CPT: Pharmacometrics & Systems Pharmacology*. 2022; 11(8): 967-990.
- Sarabipour S, Mac Gabhann F. Targeting neuropilins as a viable SARS-CoV-2 treatment. *The FEBS Journal*. 2021; 228(17): 5122-5129.
- Terwilliger ZS, Ryan TE, Goldberg EJ, Schmidt CA, Yamaguchi DJ, Karnekar R, Brophy P, Green TD, Zeczycki TN, Mac Gabhann F, Annex BH, McClung JM. Racial differences in the limb skeletal muscle transcriptional programs of patients with critical limb ischemia. *Vascular Medicine*. 2021; 26(3): 247-258.
- Mbuguiro W, Gonzalez AN, Mac Gabhann F. Computational models for diagnosing and treating endometriosis. *Frontiers in Reproductive Health*. 2021; 104.
- Papin JA, Mac Gabhann F, Sauro HM, Nickerson D, Rampadarath A. Improving reproducibility in computational biology research. *PLOS Computational Biology*. 2020; 16(5): e1007881.
- Abreu CM, Veenhuis RT, Avalos CR, Graham S, Parrilla DR, Ferreira EA, Queen SE, Shirk EN, Bullock BT, Li M, Metcalf Pate KA, Beck SE, Mangus LM, Mankowski JL, Mac Gabhann F, O'Connor SL, Gama L, Clements JE. Myeloid and CD4 T cells comprise the latent reservoir in antiretroviral therapy-suppressed SIVmac251-infected macaques. *MBio*. 2019; 10(4): e01659-19.
- Logsdon EA, Finley SD, Popel AS, Mac Gabhann F. A systems biology view of blood vessel growth and remodeling. *Journal of cellular and molecular medicine*. 2014; 18(8): 1491-1508.

## Awards & Honors

- 2019 JHU Career Champion Award
- 2016 William H. Huggins Excellence in Teaching Award
- 2015 JHU Catalyst Award for research on virtual pre-clinical and clinical trials in HIV
- 2012 American Physiological Society Arthur C. Guyton Award for Excellence in Integrative Physiology
- 2012 Sloan Research Fellowship
- 2010 Microcirculatory Society August Krogh Young Investigator Award
- 2008 NIH Pathway to Independence Award