



<b>Project title</b>	Virtual Patient Cohorts to Illuminate Immunologic Drivers of Influenza Severity		
<b>Study level(s)</b>	<input type="checkbox"/> MSc	<input type="checkbox"/> PhD	<input checked="" type="checkbox"/> Postdoctorat
<b>Principal investigator(s)</b>	Morgan CRAIG		
<b>Project duration</b>	4 years		
<b>Start date</b>	June 1, 2023 or ASAP thereafter		

Date of posting: 2022-08-05

### Research laboratory presentation

The [Quantitative and Translational Medicine Laboratory](#) led by Dr. Morgan Craig focuses on the application and implementation of quantitative approaches, particularly computational biology, to study how heterogeneity impacts on disease and treatment outcomes. The lab's research focuses on the development of predictive, mechanistic models of the immune system to identify pathophysiological mechanisms and tailor therapeutic regimens according to patient-specific characteristics. Recent focuses include developing mechanistic models and virtual patient cohorts to understand heterogeneous outcomes in COVID-19, and antiviral and vaccination models to better schedule anti-COVID-19 treatments and vaccines. Dr. Craig is an expert in computational immunology, particularly in cancer immunotherapies and the within-host response to viruses.

### Research project description

Influenza is a highly heterogeneous disease with varying outcomes ranging from asymptomatic to deadly. A variety of viral and host factors in addition to complications from other pathogens and underlying diseases contribute to the high degree of variability in outcomes. New approaches that account for heterogeneity are required to define and understand individualized immune trajectories. Systemic mathematical models therefore offer the possibility to accurately predict immune dynamics that drive influenza progression.

In collaboration with Drs. Amber Smith and Klaus Schughart at the University of Tennessee Health Science Center, this project will develop systemic immune models and virtual patient cohorts (VPCs) of influenza infections with the goal of representing the immune response to influenza infection and predicting and simulating disease heterogeneity. These mechanistic models will combine cell and cytokine processes with viral dynamics and tissue processes (inflammation), along with disease outcomes. Expanding upon our previously developed virtual patient cohort for SARS-CoV-2 (<https://doi.org/10.1371/journal.ppat.1009753>) to influenza, we will predict patterns of disease progression and directly compare them with clinical cohort data from various sources.

### Required training and profile

The ideal candidate will have strong academic and publication records in systemic, mechanistic mathematical/computational modelling, a high degree of autonomy, and excellent communication skills. They will also work well with their peers and collaborators, be detailed-



oriented and well-organized. The candidate will participate in lab activities, help with the supervision of students and/or interns, and collaborate on grant applications.

Training: PhD in applied mathematics, computational biology, or a related discipline.

Specific expertise: Demonstrated mathematical modelling skills using data-driven quantitative analyses, differential equations, and/or quantitative systems pharmacology; programming skills; prior knowledge of immunology is an asset.

### Conditions

One year contract with possibility of renewal.

The candidate must register at the Université de Montréal as a postdoctoral fellow and must meet the eligibility requirements of the program. Postdoctoral fellows at the CHUSJ are Scholarship recipient postdoctoral fellows (stagiaires postdoctoraux boursiers (SPB)). They are considered as researchers in training and are not employees of the CHUSJ. They are paid in the form of a scholarship (stipend), not a salary. For this reason, CR-CHUSJ postdoctoral fellows are not eligible for employment insurance, parental insurance, pension plans and other benefits exclusive to employees. Taxes will be deducted at the source.

The CHU Sainte-Justine has a minimum remuneration policy for all its students and postdoctoral fellows. Remuneration may come from the researcher's funds or from an external nominal award. The candidate will have to apply for external scholarships to obtain a nominative award.

The duration of the research project is conditional to:

- The availability of research funds;
- The progress of the project;
- The candidate's eligibility to maintain a postdoctoral fellowship status at the university.

### Submit your application

Candidates must send the required documents before **12/2022** to **Morgan Craig** at [morgan.craig@umontreal.ca](mailto:morgan.craig@umontreal.ca).

Please provide:

- ✓ *Curriculum vitae*
- ✓ Most recent transcripts
- ✓ Cover letter
- ✓ References

Morgan Craig  
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Canada

**Equity, diversity and inclusion**

The masculine gender is used without discrimination and for the sole purpose to facilitate reading. The CHU Sainte-Justine subscribes to the principle of equal access to opportunities and invites women, members of visible and ethnic minorities, persons with disabilities and Indigenous people to apply. We would appreciate it if you could inform us of any disabilities that would require technical and physical accommodation adapted to your situation during the selection process. Please be assured that we will treat this information as confidential.

**Studies at the CHU Sainte-Justine Research Center**

Pursue your [graduate or postdoctoral studies](#) at the **CHU Sainte-Justine Research Center**, and be one of the 500 students, fellows and interns involved in accelerating the development of knowledge in the field of maternal, child and adolescent health, whether in basic or clinical research. Under the supervision of prominent scientists, especially in leukemia, rare pediatric diseases, genetics, perinatology, obesity, neuropsychology and cognition, scoliosis and rehabilitation, you will have the opportunity to work with multidisciplinary scientific teams and collaborators from all over the world.

**About the CHU Sainte-Justine Research Center**

**CHU Sainte-Justine Research Center** is a leading mother-child research institution affiliated with Université de Montréal. It brings together more than 200 research investigators, including over 90 clinician-scientists, as well as 500 graduate and postgraduate students focused on finding innovative prevention means, faster and less invasive treatments, as well as personalized approaches to medicine. The Center is part of CHU Sainte-Justine, which is the largest mother-child center in Canada and the second most important pediatric center in North America. More on [research.chusj.org](http://research.chusj.org)

