



## A tale of two pandemics: COVID-19 and its impact on HIV

**F**ounded with a mandate including persistent monitoring of viral diseases, the BC Centre for Excellence in HIV/AIDS (BC-CfE) has developed world-leading expertise in this increasingly crucial area of public health. As the SARS-CoV-2 virus swept around the planet in March of 2020, the BC-CfE's Molecular Epidemiology and Evolutionary Genetics Group, led by Senior Scientist, Dr. Jeffrey Joy, expanded focus from HIV and viral hepatitis to include COVID-19, exploring its global, national, and regional spread and the impact it had on both HIV treatment and populations at risk of acquiring HIV.

Using viral genome sequences and associated clinical characteristics integrated with evolutionary theory and methods, the Molecular Epidemiology and Evolutionary Genetics Group study how viruses evolve and adapt, monitor their transmission at multiple epidemic scales, and evaluate effectiveness of public health interventions in curbing their spread.

In a pair of complementary studies (performed with assistance of funding by CIHR, Genome Canada and Genome BC) released in summer 2022, they aimed at understanding Canadian SARS-CoV-2 transmission and the impact of COVID lockdown on HIV transmission in at-risk populations.

### COVID-19 Transmission in Canada

Using SARS-CoV-2 phylogenies (family trees of the virus causing COVID-19 based on virus genome sequences) they carefully analyzed COVID-19 variant transmission into and across Canada and evaluated the impact that international travel restrictions had in curbing new introductions of the virus. This study was the subject of an article published in the journal *eLife* entitled: *Genomic epidemiology of the first two waves of SARS-CoV-2 in Canada*.

"Large-scale SARS-CoV-2 genomic epidemiology analyses in Canada have so far been limited to a study on the early epidemic within Quebec," says lead author Angela McLaughlin, Research Assistant at the BC-CfE and PhD candidate in Bioinformatics at the University of British Columbia (UBC), Canada. "We wanted to elaborate on this research with a national-scale analysis for the first and second COVID-19

waves. Specifically, we evaluated the impact of international travel restrictions in March 2020 on international importations of the virus into Canada and on viral persistence into 2021."

Their analysis tested the hypothesis that international travel restrictions enacted in March 2020 reduced importations of SARS-CoV-2 into Canada, yet ongoing introductions contributed to COVID-19 persistence into early 2021, exacerbated by highly transmissible B.1.1.7 and other variants of concern (VOC) sublineages. Within 4 weeks of implementation of travel restrictions, rates of sublineage importation dropped 10.3 fold. Restrictions drastically reduced, but did not eliminate transmission events attributable to international sources across all provinces.

Restricting travel to and from locations with high relative COVID-19 prevalence, particularly attributable to emerging VOC, can be an effective tool to protect the healthcare system from being overwhelmed, but must be weighed against economic, social, and other impacts. Genomic surveillance in Canada and abroad to characterize viral transmission and genetic variants are critical to inform evidence-based public policy on COVID-19 interventions.

### Impacts of COVID on HIV Transmission in British Columbia

Collaborating with colleagues at the British Columbia Centre for Disease Control and Vancouver Coastal Health, the BC-CfE's Molecular Epidemiology and Evolutionary Genetics Group led a second study focusing on the impact the early pandemic lockdown period had on HIV transmission in BC.

The article: *"Impact of SARS-CoV-2 lockdown on expansion of HIV transmission clusters among key populations: a retrospective phylogenetic analysis"* examined HIV transmission patterns prior to, during, and after lockdown. Looking at the interaction between the pandemics, this article revealed impacts of COVID-19 lockdown restrictions on individuals living with or at-risk of HIV infection and how the measures responding to one pandemic had consequences on another.

A positive side effect of restrictions was that increases in amount of time spent at home likely led to a dramatic

reduction in contact rates and a corresponding reduction in risk of HIV transmission in some populations at risk of acquiring HIV. Conversely, populations characterized by non-sexual transmission routes such as needle sharing may have experienced an increased risk of HIV transmission due to limited access to health services such as harm reduction sites and clinics that were shut or offered reduced hours and/or capacity during the lockdown.

Findings of the study indicate that populations of men who have sex with men experienced a decline in detected HIV transmission based on cluster growth, to a level rarely seen in the previous 3 years, supporting the idea that reduced social contacts and increased time at home favour reduced transmission. However, amongst people who inject drugs, the analysis revealed a contrasting pattern with a peak of HIV transmission higher than observed in the same time periods in the previous 3 years.

Notably, clusters associated with populations of people who inject drugs continued to experience elevated growth beyond the initial period of instability in health service availability, indicating that the effects of such gaps can be long-term and difficult to counterbalance. Longer-term downstream effects of these disruptions to engagement with HIV care services are yet to be seen, but studies estimate the negative impacts to be substantial.

Lead author, Rachel Miller, Research Assistant at the BC-CfE and recent MSc graduate in Bioinformatics from UBC noted, "The difference in transmission revealed between at-risk populations highlights the need for persistence and increased vigilance in caring for our vulnerable populations during crises or times of public health emergency. Providing services to this group should be more like the treatment and care of those with diabetes or other chronic conditions because the consequences of interruption can be long-term and severe."

Increasing vigilance and using innovative, targeted solutions are necessary to offset potential negative impacts on HIV treatment and prevention stemming from current and future pandemics or other major public health events.

» "Together these two studies performed at different but complementary levels of epidemic hierarchies highlight the value of molecular epidemiology and evolutionary genetics in providing critical, unique, and practically actionable insights into viral epidemics."

— BC-CfE Research Scientist, Dr. Jeffrey Joy



## Montreal hosts the 24th International AIDS Conference



Copyright: Marcus Rose/photo courtesy of IAS

For the first time since BC-CfE Executive Director & Physician-in-Chief Dr. Julio Montaner welcomed the world to Vancouver in 2015, the International AIDS Society returned to Canada July 29th, bringing the 24th International AIDS Conference to Montreal (AIDS 2022). The world's foremost meeting on HIV research, advocacy and policy-making, the biannual conference is the largest global gathering on any health issue in the world.

Hosting the conference in Montreal, offered the Canadian government an opportunity to highlight their support of HIV/AIDS at home and abroad. Notably, the federal Minister of Health Hon. Jean-Yves Duclos began the week formally endorsing the Global Declaration on Undetectable=Untransmittable (U=U). The campaign of U=U was a central theme throughout the conference and is built on the science of **Treatment as Prevention**<sup>®</sup>, empowering people living with HIV with the knowledge that they can't transmit HIV when they are on effective treatment with an undetectable viral load.

Canada announced an \$18 million investment in HIV testing accessibility (particularly in northern, remote and isolated communities) and a \$15 million commitment to the UNAIDS for the global response through 2025. Ahead of the conference, Attorney General of Canada David Lametti met with community partners and announced the launch of consultations to modernize the criminal justice system's response to HIV non-disclosure which will begin in October 2022.

While these commitments were well-received on a national level, they were sadly overshadowed among the global delegates, as many international attendees were unable to secure visas to enter Canada despite months of urgent calls to expedite them. As the HIV community strives to bridge the disparity in treatment and care between developed and developing nations, the absence of voices from predominantly developing nations due to delayed or denied visas was felt throughout the conference; culminating in a panel discussion in which all six chairs sat empty due to the panellists being denied entry.

The conference opened with a stirring presentation from Indigenous leaders including BC-CfE Indigenous Peer Research Associate Claudette Cardinal who attended the conference to share her experiences as a representative at the Canada Pavilion. What followed was five full days of activist-led calls to action, policy discussion and research presentations, in which the BC-CfE was well-represented among the accepted abstracts.

Poster presentations from the Epidemiology and Population Health program explored antiretroviral (ARV) treatment safety and quality of life factors experienced by people living with HIV (PLWH). Research Assistant Olivia Hunt's work on adverse drug reactions associated with generic-equivalent ARVs found low incidence of adverse drug reactions attributed to generic product substitution. Presenting SHAPE (STOP HIV/AIDS<sup>®</sup> Program Evaluation) Study data, Study Coordinator Clara Tam provided a look at factors associated with ARV treatment interruption. Revealing socio-structural marginalization including incarceration, violence and homelessness increased treatment interruption, the findings illustrate the need for re-engagement programs to address structural factors impacting treatment.

Acknowledging the increased prevalence of violence experienced by PLWH, Research Assistant Kalysha Closson presented COAST (Comparative Outcomes And Service Utilization Trends) Study data looked at healthcare utilization and mortality related to experiences of violence. Findings revealed higher violence/abuse-related healthcare utilization among PLWH compared to people not living with HIV, and illustrated the need to integrate violence prevention and support services within HIV care. Also presenting COAST Study data, PhD Student Ni Gusti Aye Nanditha, used disability-adjusted life years (DALY) to describe the burden of comorbidities among PLWH. The analysis found PLWH experienced a twofold higher DALYs associated with chronic comorbidities (predominantly cancers and cardiovascular disease).

Turning to pre-exposure prophylaxis (PrEP), Drs. Jordan Sang and Viviane Lima delivered updates from BC's PrEP program. Dr. Sang presented on the secondary impacts of COVID-19 on PrEP use among gay, bisexual and men who have sex with men (gbMSM) in Vancouver, finding increased PrEP interruptions and trends of depressive symptoms during the pandemic. These findings as part of the Engage Study encouragingly discovered decreasing trends of polysubstance use, interpersonal violence and binge drinking, but on the whole, illustrated the need for additional mental health services and targeted follow-up for those on PrEP. Dr. Lima evaluated the impact of increased syphilis testing through the HIV-PrEP program, finding a significant decline in syphilis incidence among gbMSM as a result.

The BC-CfE Laboratory assumed additional COVID-19 research and testing over the past two years and looking at how COVID-19 impacts PLWH, presenting on this research to AIDS 2022 also. Research Assistant Aniqah Shahid's study on HIV genetic diversity between blood and lung tissue while on ART, examined whether there would be marked differences between the two. Findings indicated a strong correlation between the two suggesting that blood is likely a strong indicator of genetic diversity elsewhere in the body. Laboratory Research Coordinator, Hope Lapointe was awarded a full scholarship to attend the conference and presented his poster on COVID-19 vaccine-induced immunity among people living with HIV in Montreal. As has been reported earlier, this work illustrated that PLWH on suppressive ARV treatment (ART) mount strong humoral responses after two and three-dose COVID-19 vaccination.

Laboratory Director, Dr. Zabrina Brumme attended in person to deliver a highly informative oral presentation on HIV reservoir dynamics and its implications on HIV cure research. Presenting a technical and in-depth look at reservoir establishment and persistence, Dr. Brumme demonstrated how we can infer pre-ART reservoir dynamics and decay rates of proviruses from the ages of the existing proviruses sampled shortly after ART-mediated suppression. While providing novel insights into the current state of HIV cure research, this work also reinforces how critical early ART is to limit reservoir size and genetic diversity.

Finally, Data Analyst, Jason Chia was the recipient of the Bonnie Devlin Memorial Bursary and attended the conference virtually. Established in 2017, the bursary honours former Research Coordinator Bonnie Devlin, who worked with the BC-CfE for 15 years before passing away in 2008 after a courageous battle with cancer. The bursary supports a member from the Epidemiology and Population Health department to attend the conference to broaden their knowledge and skills.

Reflecting on the conference, Jason was particularly struck by the emerging science on long-acting ARVs and topics surrounding global policy development for equity of access to HIV treatment and healthcare. "I would like to express my gratitude for the opportunity to attend AIDS 2022. I learned a lot from speakers worldwide, including PLWH, researchers, and many others."

Vancouver Pride Grand Marshals support BC-CfE



After a two-year hiatus, the Vancouver Pride Parade returned as an in-person event, and the Grand Marshalls from the Dogwood Monarchist Society (DMS) selected the BC-CfE as one of the organizations to support. Victor Bearpark, from SPH's mailroom (aka His most Imperial Sovereign Majesty Emperor 50 of Vancouver) and Tee Kow of PHC Medical Affairs (aka Her Most Imperial Sovereign Majesty, Empress 50 of Vancouver, Fancy Pants) are reigning monarchs and co-chairs of DMS and were selected as two of the four grand marshals.

DMS is a non-profit organization, established in 1972 with a mandate to raise money for local organizations, selected by the reigning monarchs, one of which must be dedicated to the support of people living with HIV. The BC-CfE is grateful and honoured to be selected as one of the beneficiaries of DMS and work of reigning monarchs.

The parade was attended by thousands, lining the parade route for the parade, aptly themed: "Together Again."

### BC Centre for Excellence in HIV/AIDS

- > Improve the health of British Columbians with HIV through comprehensive research and treatment programs;
- > Develop cost-effective research and therapeutic protocols;
- > Provide educational support programs to health-care professionals;
- > Monitor the impact of HIV/AIDS on BC and conduct analyses of the effectiveness of HIV-related programs.

Physician Drug Hotline  
1.800.665.7677

St. Paul's Hospital Pharmacy Hotline  
1.888.511.6222

Website  
www.bccfe.ca  
E-mail  
info@bccfe.ca

Funding for the BC Centre for Excellence in HIV/AIDS is provided by the BC Ministry of Health.

