



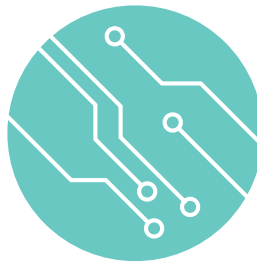
## The Value of Investing in HIV Research



Did you know an entirely new avenue of cancer treatment has emerged as a result of HIV research? The cure may just come from a place few would have guessed 10 years ago.

The HIV epidemic has had an immense impact on the communities and the people it has touched. The research effort to treat, prevent and ultimately cure HIV has been broad and ambitious. HIV was a little known virus when it first emerged, so the research community has approached treatment from multiple angles; focusing on all aspects of the disease, from exploring its basic foundation of the disease, understanding the intersection of aging and complications of HIV/AIDS, improving care and treatment, to developing interventions to reduce the risks and rates of complications.

Technologies, treatments, medications, and social services have been developed, honed and put to the test during the HIV epidemic and their effects extend beyond their original intended purpose. Investing in HIV research has had, and will continue to have, a broad impact on other disciplines. Where the results will take us in the future is only limited by our imagination.



**These discoveries, technologies and new avenues of treatment came about thanks to investments in HIV research. These investments are returned many fold; not only do they improve the lives of those living with or affected by HIV, but the crossover benefits impact a variety of areas of public health. CAHR, CANFAR, CIHR and CTN are proud to celebrate the significant achievements made in Canadian HIV/AIDS research over the past 30 years and look forward to the discoveries to come.**



# The Value of Investing in HIV Research



## Cancer Prevention, Detection and Treatments

Cancer treatments have entered an entirely new realm as researchers now focus on enhancing the immune system and allowing the body to combat cancer itself. This was a concept developed through HIV research. HIV patients have a predisposition to certain types of cancer including Kaposi's sarcoma, a type of skin lesion and lymphomas (blood and lymph node cancer). Women and men co-infected with human papilloma virus (HPV) and HIV have an increased risk of anal cancer, and women have an increased risk of cervical cancer. The overall risk of HIV associated cancer is directly correlated to how well HIV is controlled through immune

suppression. This has given researchers a big hint that the immune system is critical in preventing cancer. Currently, CCR5 inhibitors — a group of medications that prevent the HIV virus from entering immune cells — are being explored because of their apparent ability to prevent aggressive cancer cells from spreading to other parts of the body.

### The Nervous System

Scientists have learned a great deal about the nervous system through research into how HIV-related inflammatory processes can impact the brain, nerves and muscles in a person infected with HIV. The knowledge gained has implications for patients with other neuro-cognitive disorders including Alzheimer's, dementia, and multiple sclerosis. People living with HIV for long periods of time are prone to HIV-associated neuro-cognitive disorders (HAND). HAND is a complex suite of symptoms; it can manifest as memory loss, lack of concentration, behavioural changes, motor dysfunction, and numerous other issues. Research is now looking into the causes of HAND and how to prevent it, shedding light on the inner workings of the central nervous system.

## Aging

Compared to a healthy population, people living with HIV experience age-related illnesses like cancers, diabetes, cardiovascular and bone disease sooner and at a much higher rate. Canadian researchers are working to determine what causes the body to age and why it happens faster in people with HIV. While it's possible that anti-retroviral therapies cause accelerated ageing, it might also be due to co-infections or co-factors such as tobacco or drug use. Results from this type of research will help to improve the quality of life not only for those with HIV, but of the aging population as a whole.



## Viruses and Vaccines

Extensive research into the host cells targeted by HIV and how the virus enters host cells and replicates has opened the door to new avenues of treating other viruses. Canadian clinical researchers have had a critical role in the development of anti-retroviral therapies which are now being applied to influenza, hepatitis C and B, HPV, and smallpox. Lamivudine, developed by Canadian researchers in the late 1980s, continues to be a critical component of HIV treatment and it has found new life as a valuable medication for treating hepatitis B at low dosages, and is being considered as a treatment for hepatitis C as well.

## Emerging Diseases and Epidemiology

The global HIV epidemic provided great insight into how viruses emerge and spread through human populations. The jump of diseases from animals to humans, including the appearance of SARS, demonstrates that we will continue to be challenged by disease, particularly with increasing urban populations and ease of global travel. The international collaborations established during the HIV epidemic will serve us well as we continue to combat other human diseases. Testing protocols, clinical practice guidelines, monitoring strategies and mathematical models constructed for the HIV epidemic — all of which were supported by investments in HIV research — can be used to prevent the spread of other human borne diseases in the future.

## The Human Immune System

In HIV-infected individuals, there is a constant battle between host defenses and the HIV virus. The virus changes its appearance and hijacks the immune system, while the immune system tries to keep up. Ultimately, if untreated, the immune system malfunctions and HIV develops into AIDS, an autoimmune disease. There are other diseases in which the immune system malfunctions including allergies, lupus, multiple sclerosis and psoriasis. Research into AIDS has led to major advances in our understanding of immune dysfunction, which may lead to more affected treatments for other immune disorders.

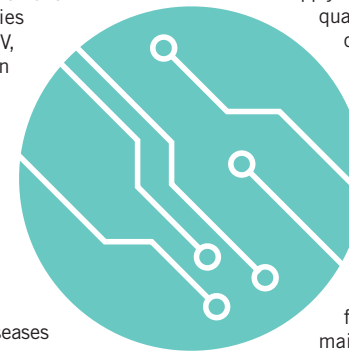
## Opportunistic Infections

Treatment strategies, including prophylaxis, developed for HIV patients are now used for immune compromised individuals. This is a strategy which has prevented serious disease and saved lives. With a compromised immune system, people with HIV are vulnerable to bacteria, viruses and parasites that would cause little difficulty for a healthy person. Transplant patients, who are on immunosuppressant drugs to prevent organ rejection, and those with compromised immune systems, are subject to many of these same infections.

## Testing and Technology

In the initial stages of the epidemic, the technology used to rapidly screen for HIV allowed early identification of infection and access to treatment. Rapid screening was also critical for testing the blood supply to prevent further infections. Thanks to investments in HIV research, technologies were quickly developed and improved including PCR (polymerase chain

reactions) and RT-PCR (reverse transcription PCR) which allowed for rapid testing and high volume throughput. These same technologies now test for other diseases including hepatitis C, B and Lyme disease, expediting the diagnosis (and treatment) and protecting global blood supply. In turn, technology continues to improve the quality of current research in all fields. Scientists can now model the structure of HIV and other viruses, rapidly assess HIV genes to determine targets for a vaccine and model the patterns of disease epidemics using advanced computer technology.

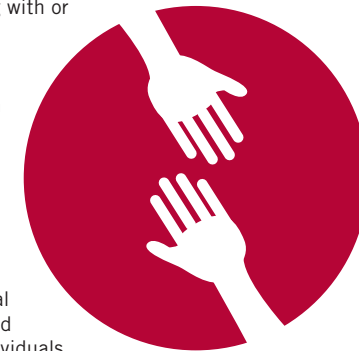


## Social Science

It has become apparent as the HIV epidemic progresses that a complex web of social interactions, behaviours and cultural factors contribute to its spread and maintenance in the population. Canadian NGOs, researchers, health staff and public health programs have contributed greatly to the understanding of these factors. Stigma associated with HIV status, gender non-conformity, urban life and childhood abuse, among others, have all been shown to contribute to HIV risk. We also know these factors play a role in many other areas of public health. Our understanding of these factors and ability to act to improve overall health has increased significantly due to investments in HIV research.

## Community-based Research

HIV research is unique in that it often involves the communities and people whom research results will ultimately affect. Methodologies developed to ethically involve Aboriginal communities, and people living with or affected by HIV have been developed and applied to HIV research since the mid 1990s. Community-based HIV research is founded on the 'Greater Involvement of People with AIDS' and similar principles that ultimately ensure both ethical methods and truly relevant results. Researchers are applying these kinds of methodologies to cancer clinical trials, urban health research and research with marginalized individuals. Investments in community-based HIV research have helped to refine research processes and enhance the relevancy and effectiveness of research results.



## Social Services

Many programs and facilities that provide services to persons living with HIV simultaneously address other social and health issues. Experience has shown that harm reduction efforts can prevent the spread of other blood borne diseases such as hepatitis C.