



FUNDING LEADING-EDGE RESEARCH:

Canada's HIV/AIDS epidemic, the global HIV/AIDS crisis and CANFAR

By Stanley E. Read, Robert S. Remis and James K. Stewart

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“Acquired immunodeficiency syndrome (AIDS) is the leading infectious cause of adult death in the world. Untreated disease by the human immunodeficiency virus (HIV) has a case fatality rate that approaches 100%. Not since the bubonic plague of the 14th century has a single pathogen wreaked such havoc.”

*World Health Organization*¹

“At St. Paul’s Hospital in downtown Vancouver, there are more people dying of AIDS on the ward today than ever. It is a convergence of two disparate groups: long-time sufferers who have exhausted all treatment options and patients coming in from the streets with advanced forms of the disease who have not been treated adequately.”

*Andre Picard, The Globe and Mail*²

“Only a vaccine will end this pandemic.”

*Stephen Lewis, UN Special Envoy for HIV/AIDS in Africa*³

“Our continued research in the pursuit of treatments and a cure for HIV/AIDS is in large part thanks to the tireless efforts of organizations like CANFAR. The benefits to the Canadian public and humanity in general from such vital research is enormous”

*Andre Desormeaux, Infectious Diseases Research Centre, Laval University*⁴

* CANFAR is the Canadian Foundation for AIDS Research.

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The year 2003 marked the potential crossroads in the worldwide battle against HIV/AIDS⁵. The truly global nature of this modern plague was demonstrated by HIV/AIDS deadly spread across the world. HIV infections and AIDS reached staggering levels in Africa, while its terrible toll became increasingly evident in its surge through China, India and the former Soviet Union. The gap between the treatment provided for, and the need for therapy of, millions living with HIV/AIDS in the developing world and as the marginalized members of wealthy societies such as Canada has never been clearer.

Yet, global and domestic political commitments, policy support, and private and public funding all entered a promising new phase in 2003. The lack of access to HIV/AIDS treatment for millions of people, most notably in Africa, led the World Health Organization (WHO) to declare a global health emergency. The WHO announced a multi-faceted effort to ensure that 3 million people who are not receiving much-needed HIV/AIDS treatment are provided with this drug therapy by 2005⁶. Much-increased funding commitments from the U.S. government, European countries and major foundations were promised. Recalcitrant governments in China and South Africa announced long overdue domestic policy initiatives to improve HIV/AIDS diagnosis and treatment. The World Trade Organization members agreed to allow poor countries that cannot manufacture the necessary HIV/AIDS drugs to import these products provided that there is a compelling public health need. In 2004, the Government of Canada pledged again to champion this generic HIV/AIDS drugs initiative among the G-7 countries.

Despite these promising policy and political announcements in 2003, Canadians' stake in HIV/AIDS prevention, treatment and vaccines has never been greater or more pressing. Increasing trends of unsafe sex practices among existing and new high-risk groups in Canada show that complacency and lack of awareness about the HIV infection and AIDS disease characterize the view of too many Canadians. The deadly global momentum and disturbing domestic rates of HIV infection have significantly increased the importance of research into new vaccines, therapies and a better understanding of how HIV/AIDS is spreading. It is not just that the huge costs and lengthy time periods to develop vaccines and treatments for HIV/AIDS bear emphasis. New research is crucial to combat the continuing changes in the HIV virus and to help overcome the problems with adverse effects from, and increasing resistance of many patients to, prolonged use of existing treatments.

The Canadian Foundation for AIDS Research (CANFAR) is a non-profit organization dedicated to funding all aspects of HIV/AIDS research. CANFAR supports a broad range of fundamental and applied research, including research into new vaccines and therapies, and epidemiological studies of how HIV/AIDS is spreading. CANFAR fulfills a vital role in stimulating much-needed research in a low-cost, effective manner. It provides an essential complement to government and private sector efforts given the funding gaps and coordination challenges in HIV/AIDS research between the public and for-profit sectors.



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Overview

This report addresses the domestic and global HIV/AIDS challenges in four sections.

- Part I reviews the tragic impact of HIV/AIDS in Canada and the growing threat of increased HIV infections among new high-risk groups. It also briefly explores the treatment challenges and multi-billion dollar costs of HIV/AIDS in Canada.
- Part II outlines the catastrophic scope and scale of the global HIV/AIDS crisis, together with the much-improved worldwide response. The terrible toll of HIV/AIDS in sub-Saharan Africa and the daunting outlook for this region are underscored, as is its surging wave in China, India and the former Soviet Union. Promising funding, policy and political initiatives are also described.
- Part III provides a general summary of the research challenges in developing new therapies and vaccines. There is a tremendous need for research success into better prevention methods, improved treatments and new vaccines. Major advances are vital to achieve inexpensive and simpler therapies as well as vaccines for the various high-risk groups with HIV/AIDS in Canada and worldwide.
- Part IV highlights the role of CANFAR in funding all aspects of HIV/AIDS research. CANFAR's activities provide a crucial complement to government funding, especially in supporting early-stage research. This final part summarizes CANFAR's success to date and its commitment to greater, more effective funding of all aspects of HIV/AIDS research.

I. Canada's Challenge – Complacency and Lack of Awareness

"AIDS has fallen off the front pages of the newspapers. It used to be big news through North America that this was a terrible disease. And yet in the public mind, HIV has been dealt with. Adults have the attitude that we have successfully dealt with this problem. If adults feel that way, why the heck shouldn't their children feel that way?"

Mark Wainberg, Director, McGill University AIDS Centre ⁷

By 2002, 56,000 Canadians were estimated to be living with HIV/AIDS⁸ and more than 15,000 Canadians had died from AIDS⁹. Trends in new HIV infections (incidence) and the number of people living with HIV/AIDS (prevalence) are equally disturbing. There has been a 40% increase in the number of Canadians living with HIV/AIDS since 1996¹⁰. About one-third of Canadians estimated to have HIV are unaware that they have this infection, significantly increasing the risk of the further spread of HIV/AIDS.

MSM and New Groups at Risk

Men having sex with men (MSM) still account for the largest number of people living with HIV/AIDS in Canada and remain a crucial focus for prevention and treatment¹¹. Estimates through 2002 placed the total number of Canadians infected by HIV through MSM at 32,500, 58% of Canada's total. Statistical analysis shows that MSM's share of new HIV infections accounted for 40% of the estimated number of Canadians contracting the infection during 1999-2002. Yet, despite the large increase in the number of HIV infections among MSM, Health Canada's and other research also highlights that Canada's policy challenges for HIV/AIDS have broadened significantly, and now include MSM plus other major sub-groups at serious risk.



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Young Adults

From modest levels during the first 15 years of the HIV/AIDS wave in Canada, heterosexual transmission has become the fastest growing category of HIV incidence. Health Canada and other estimates show that while MSM remains the population group with the highest number of HIV infections, heterosexual contact is a rapidly increasing cause of HIV prevalence. The number of heterosexual HIV infections is up sharply since 1996, and rose by 25% from 1999 to 2002¹².

Too little knowledge and increasing complacency among teenagers and young adults have led to a growing number of young Canadians failing to take precautions to protect themselves during sex. In recent years, this sharp rise in unsafe sex has caused significant increases in sexually transmitted infections (STIs) such as gonorrhoea and syphilis. For example, incidence rates of gonorrhoea have jumped by 52% over the 1997-2002 period, with the highest rates of increase occurring in women aged 15-19 and men aged 20-24¹³. In turn, the rising incidence of these STIs likely indicates a disturbing trend of much-increased future HIV infections. (There is a strong linkage between the unsafe practices that spur STIs and the future incidence of HIV.)

Also of great concern is the deterioration in attitudes regarding HIV infections and the AIDS disease among elementary and secondary school students. The 2002 Canadian Youth, Sexual Health and HIV/AIDS Study found that “Some students had the misconception that there is a vaccine available to prevent HIV/AIDS and approximately 66% of Grade 7 students and 50% of Grade 9 students did not know that there is no cure for HIV/AIDS. It is distressing that students who participated in this [2002] study have generally lower levels of knowledge than do those who took part in the 1989 study¹⁴.”

Disadvantaged Groups

HIV/AIDS is increasingly affecting disadvantaged groups in Canada. Aboriginal people, intravenous drug users, prisoners, prostitutes, street youth, and women living in poverty constitute an expanding proportion of new HIV infections. Intravenous drug use (IDU) alone was the cause of an estimated 11,000 Canadians living with HIV/AIDS in 2002¹⁵. Aboriginal people continue to be over-represented in Canada’s HIV epidemic¹⁶, with an estimated share of roughly 6.5% of all HIV infections, or approximately twice their percentage of Canada’s population. IDU dominates the sources of aboriginal HIV infections – at 63%, this is double that of Canada’s IDU-related HIV incidence¹⁷.

Immigrants from Countries with High HIV/AIDS Prevalence

Canada receives a substantial number of immigrants from various countries that have been particularly hard hit by the HIV/AIDS pandemic. In these countries, the main source of HIV infection is heterosexual transmission, and HIV prevalence among young adults varies from 2-3% to as high as 20% or more. These countries are deemed to have a “generalized” HIV epidemic by the Joint United Nations Programme on HIV/AIDS (UNAIDS). Health Canada estimates that there are 4,700 HIV-infected persons living in Canada from these countries, or 8% of Canada’s prevalence¹⁸.

The failure to access diagnostic and treatment services of many people with HIV/AIDS who have immigrated to Canada from countries with a “generalized” HIV epidemic is a significant challenge. An estimated 60% of people



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living with HIV in the African and Caribbean communities in Canada do not know that they have the infection¹⁹. The issue is sensitive as “many do not even want to acknowledge that HIV is a serious problem in these communities, let alone discuss cultural aversions to practising safe sex, and testing for HIV²⁰”. Organizations working in these communities note that the “fear of racism and the disgrace of HIV can make people reluctant to seek medical attention or be tested²¹”.

Older Canadians

Widespread use of anti-impotence drugs has created a potential new population group at risk, given the deterioration in safe sex practices that has accompanied this trend²². Leading Canadian medical experts have highlighted the lack of precautions taken by people over 50 years of age in sexual activity when using these drugs. One recent U.S. study found that anti-impotence drug users had a large increase in both the number of sexual partners and in the incidence of STIs.

Problems with Long-term Treatments

For Canadians living with HIV/AIDS, the problems with existing treatments are serious, despite the significant success with high activity anti-retroviral therapies (HAART) – the so-called “AIDS cocktail”. HAART’s introduction in 1996 has resulted in reduced levels of HIV in the bloodstream, the stabilization and some recovery of the body’s immune system, a slowing of the progression through the stages of HIV/AIDS and decreased mortality. Evidence from people with HIV/AIDS and their families and friends also indicates an improved quality of life as a result of the HAART treatment. HAART’s use was the dominant factor that caused the huge drop in AIDS-related mortality in Canada since its reported peak at 1,497 deaths in 1995²³.

However, there are problems with HAART. The treatment regimen is difficult and expensive. A significant number of HAART recipients are unable to comply with the treatment regimen because of the complexity and adverse side effects. The growing challenge of increasing resistance of HIV in many patients to the medications bears emphasis. Most important, the HAART treatment only controls, but does not eliminate HIV, thereby requiring lifelong treatment.

Economic Burden

Words cannot adequately describe the tragedy for people living with HIV/AIDS or the effect on their families and friends. But, the direct economic costs and huge indirect socio-economic burdens for all Canadians from HIV/AIDS can be estimated and highlighted. One study in the late 1990s assessed the direct costs of treatment and other health care outlays throughout the lifetime of a person with HIV/AIDS at just over \$150,000²⁴.

The indirect economic losses are several times higher than the direct health care costs of HIV/AIDS because of the young age of those affected and the increasingly chronic nature of the disease. Canadians pay a very heavy price for the loss of income and many other benefits from the much-reduced number of productive years of people with HIV/AIDS. The study noted above estimated the economic loss per person with HIV/AIDS in the late 1990s at \$600,000 per case or four times the direct health care costs for each person living with HIV/AIDS²⁵. It concluded that, by 1998, the cumulative burden of Canada’s HIV/AIDS epidemic was already \$36 billion, or \$1,200 per Canadian²⁶.



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II. The Global HIV/AIDS Crisis – Deadly Trends Gather Momentum, But Better Funding and Improved Policies Emerge

No region in the world is now safe from HIV/AIDS. The crisis in sub-Saharan Africa has very disturbing company as HIV/AIDS has spread rapidly in China, India and the former Soviet Union. Accordingly, Canada's huge stake in supporting global humanitarian assistance to people with HIV/AIDS has become even more urgent. The spread of HIV/AIDS in Africa, Asia, the Caribbean and Europe will affect Canada extensively given our diverse communities, international trade and travel contacts. Global diseases like AIDS do not respect Canada's or other countries' borders as last century's influenza epidemics, and the outbreaks of severe acute respiratory syndrome (SARS) and West Nile virus in recent years tellingly demonstrated.

Globally, the massive scale and widening scope of the HIV/AIDS crisis across the world have reached staggering proportions. The improved HIV/AIDS data measurement and interpretation by UNAIDS and WHO make sobering reading²⁷:

- By 2003, an estimated 40 million people across the globe were living with HIV/AIDS²⁸, or more than Canada's entire population have this disease;
- HIV/AIDS is now the leading cause of death among adults aged 15-59 in the world²⁹;
- HIV/AIDS is now the single most important factor in the burden of disease among adults aged 15-59 globally³⁰;
- During 2003 alone, at least 5 million new HIV infections occurred and more than 3 million people died from AIDS³¹; and
- HIV/AIDS incidence among women has now surpassed the incidence among men – 2002 marked the first time that more women were newly infected than men³². In Africa, women are now 20% more likely to be infected with HIV than men³³.

Unless the new global and key country initiatives announced in 2003 are successful, the prospects are very disturbing. In 2002, UNAIDS and WHO experts projected that unacceptably high rates of infection during 2000-2002 would accelerate without much-expanded efforts³⁴. HIV/AIDS worldwide spread has also led to other "epidemics of global concern – most notably tuberculosis" which has become a leading cause of death among people living with HIV and their family members and contacts that do not have HIV³⁵.

Africa's Crisis

"Governments everywhere should look at Africa and tremble. In some countries more than half the population will still die of AIDS. All of Africa's famines are now AIDS-related: hungry people lack the strength to fight off sickness, sick people lack the strength to grow food, and dead parents cannot teach their children how to farm. Other regions can avoid this, but they must act now."

The Economist, November 29, 2003 ³⁶

The human toll of HIV/AIDS in Africa reached appalling new levels last year. At least 15 million Africans had died from AIDS by 2003, and 27 million Africans were living with the disease³⁷. Approximately 3.2 million new infections occurred in 2003 while the epidemic claimed an estimated 2.3 million African lives during the year. The estimated infection rate of HIV now exceeds 20% in several of these countries, reaching an astounding 39% in Botswana and Swaziland. As of 2002, there were an estimated 5.3 million South Africans living with HIV.



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Just as problematic is the reality that the apparent “levelling off” in the numbers of Africans living with HIV/AIDS does not indicate a decline in this region’s crisis³⁸. The appearance of stabilization masks the high (and in some countries) rising number of people dying from AIDS and the continuing high rate of new HIV infections. The combination of these two factors means that in the absence of prevention and treatment success, the HIV/AIDS epidemic “will continue to wreak havoc in these countries”³⁹.

The UN Food and Agricultural Organization has estimated that more than 5 million agricultural workers in Africa have already died from AIDS and projected at least 15 million more deaths of farm workers by 2020 unless massive and effective prevention and treatment programs are implemented⁴⁰. Farm workers’ deaths from AIDS cripple the capacity of many households and communities to produce or afford food⁴¹. Studies in Kenya and Zimbabwe found that the death of a household head leads to a severe reduction in the value of that family’s farm production. Shrinking farm incomes compel women and children to seek jobs that not only pay meagre wages, but too often are in short supply. HIV/AIDS affected families are also forced to dispose of crucial household and other assets during poor harvests to fund medical, funeral and other expenses. Research in Tanzania has shown that wives whose husbands have died from AIDS may lose access to credit, agricultural inputs and distribution networks – they may even forfeit their rights to the land, house and livestock that are so crucial to their livelihood.

The linkage between HIV/AIDS and severe declines in food production occurs in both directions⁴². This connection has been key to southern Africa having the worst HIV/AIDS epidemic in the world since drought swept through this sub-region in 1992. The food crisis has spurred survival strategies such as migration to cities where good jobs are scarce, and educational and medical facilities are inadequate. Women and children barter sex for work, food and other essentials. HIV/AIDS has thrived amid this breakdown of the agricultural economy, rural communities and social networks.

International efforts have struggled to relieve the severe food problems affecting 14 million people in six southern African countries. “Famine has a new ally. If it were not for AIDS, southern Africans might be able to cope with the food shortages afflicting the region. But the epidemic is making millions too weak to grow enough food, and too weak to survive with empty stomachs⁴³.”

The prospects for sub-Saharan African youth are particularly daunting. It is estimated that more than 10 million children in this region have lost at least one parent to AIDS, a figure that is 11 times that of 1990⁴⁴. One UN agency forecasts that there could be as many as 20 million AIDS orphans by 2010 if present trends continue⁴⁵. The costs are and will be enormous. “As parents fall ill and die, family burdens shift to the children. For many, neither money nor time is available for normal schooling to continue ... in the long term, it entrenches the household’s poverty and puts the children at greater risk of being infected with HIV. The result is a vicious circle linking poverty, food insecurity and HIV/AIDS⁴⁶.” In recent years, crowds of African orphans “congregate at traffic lights in Nairobi, Lusaka and Johannesburg, begging, sniffing glue and pilfering. Many are traumatised, having watched their parents slowly waste away and die. Most are shunned because of the stigma surrounding death by AIDS and the assumption that they carry the virus too⁴⁷.”



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The Winds of Change: Favourable Developments Amid a Growing Crisis

As staggering as the HIV/AIDS challenges are in sub-Saharan Africa, 2003 was marked by numerous favourable changes in funding, policy and political commitments. This potential turning point in the response to HIV/AIDS bears highlighting given the evidence that coordinated, well-funded programs can have a decisive impact. For example, Uganda, one of the countries hit very hard by the first wave of HIV/AIDS, has had solid success in reducing HIV infections, especially among young people. International experts have confirmed the sustained decline in Uganda's HIV prevalence⁴⁸.

South Africa's government, which has long resisted the necessary funding and programs for the prevention and treatment of HIV/AIDS, announced a dramatic turnaround in its policy in August 2003⁴⁹. South Africa promised US\$680 million by 2007 to buy drugs, create clinics and train thousands of health workers⁵⁰. While concerns remain about the actual spending with this initiative⁵¹, the "U-turn" in South African policy is potentially very promising given this country's superior medical infrastructure relative to other countries in this region, and its capacity to lead treatment programs elsewhere in Africa⁵².

Decisive global initiatives announced in 2003 bear emphasis. The first is the WHO's commitment to treat 3 million people living with HIV/AIDS by 2005 ("3 by 5"). The WHO has established a detailed strategic framework that will involve not only the multiple stakeholders within countries' health systems, but also major new investment in these countries' health infrastructure⁵³. With only a tiny fraction of Africans living with HIV/AIDS receiving anti-retroviral drug treatment, the scope for achieving a huge increase in the provision of therapy under the WHO program is enormous. More than 4 million Africans who currently need drug treatment are not receiving it as drug company reports indicate that, as of mid-2003, only roughly 76,000 Africans take generic anti-AIDS drugs⁵⁴.

The announcement of the World Trade Organization (WTO) agreement in the summer of 2003 also merits emphasis for Africa's HIV/AIDS prospects. Under this deal, countries that do not have their own drug manufacturing capacity can import cheap life-saving medicines if there is a compelling public health need⁵⁵. This landmark agreement has already led to proposals such as those by the WHO for a procurement agency to purchase drug treatments in bulk quantities for poor countries and to provide quality assurance. One estimate by Doctors Without Borders projects that the combination of the deal and procurement agencies could lead to a decline in the annual cost to US\$100 per patient versus the current lowest price available of approximately US\$300⁵⁶. Canada's renewed pledge in 2004 to lead the G-7's efforts for sales of less expensive generic drugs is also very significant, provided effective legislation is passed quickly and generic drug firms respond fully.

Despite these promising changes, no one should be deceived that the challenge does not remain enormous in Africa. Huge treatment gaps remain as, even with the WTO agreement, major structural barriers still exist. The inadequate health networks as well as insufficient numbers of trained personnel in many African countries must be overcome. Success with the WHO "3 by 5" program is essential. Experts warn that many of the countries with the greatest need lack sufficient basic health facilities for large numbers of residents and have too few skilled medical people to ensure that the drugs are administered properly and side effects monitored⁵⁷. Implementation and other questions



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remain about Canada's generic drugs initiative. They include how quickly Canadian drug legislation can be enacted, the estimated 18-24 months for drug companies to receive approvals and begin production⁵⁸, and the costs of Canadian-based production versus those of other countries such as Brazil and India.

Asia and Eastern Europe -- The New Wave

Compounding the global HIV/AIDS crisis is the phenomenal growth of the disease in Asia and the former Soviet Union. These regions missed the first wave of HIV/AIDS, and were spared for many years from its devastating effects. Now, however, the growth of HIV/AIDS is exploding in these regions. Without effective vaccines, or much better prevention programs, the prospects are grim for restraining the growth of HIV/AIDS in Eurasia. The rapid escalation in the number of HIV infections in China, India and Russia also poses potentially serious economic and security challenges⁵⁹.

By 2003, 7.4 million people were living with HIV in Asia and the Pacific, with 500,000 estimated to have died of AIDS last year⁶⁰. India's epidemic has skyrocketed with at least 4 million people living with HIV by 2003⁶¹. Not only is India's total the second highest in the world after South Africa, but more than 300,000 people were newly infected with HIV last year. Problems with high state taxes on generic AIDS drugs and cultural differences in dealing with same gender sex as a source of HIV infections are two of the serious constraints upon India's efforts to contain and treat its HIV/AIDS crisis⁶².

China's HIV prevalence has also soared. There are 1 million-to-1.5 million people living with HIV/AIDS according to official government estimates, but other assessments project this figure to be at least 2 million⁶³. Fundamental causes of this surge included local officials' cover-up of information, their harassment of people with HIV/AIDS, and infected blood supplies. Encouragingly, China announced in late 2003 that it would provide anti-retroviral drugs to all its citizens who require them. However, analysts note that despite progress in changing government policy to deal with China's AIDS problem, challenges in terms of business and public awareness of AIDS together with serious weaknesses in the public health system remain to be overcome⁶⁴.

In terms of HIV/AIDS incidence, the fastest growing epidemic in the world is in Eastern Europe and Central Asia, especially in the countries that comprised the former Soviet Union⁶⁵. The Russian Federation alone experienced an eighteen-fold increase in HIV diagnoses from 1998 to 2002. UNAIDS estimates that around 1 million people aged 15-49 are living with HIV in the Russian Federation as of 2003⁶⁶. Serious concerns surround official Russian estimates as these are considered by some to be too low. For example, some projections place the total number of Russians living with HIV at up to 2 million⁶⁷.

The potential for a looming catastrophe from HIV/AIDS in China, Asia and the former Soviet Union bears emphasis now that the combined number of people infected by HIV in these regions is at least 6-7 million⁶⁸. The very rapid growth of HIV/AIDS in Eurasia and the multiple population segments at high risk within these countries make accurate forecasting very difficult. However, it took less than a decade for the number of HIV-infected people in Africa to surge from 7 million to 25 million. A 2002 study by the United States' National Intelligence Council projected much higher growth rates for HIV infections in Eurasia, concluding that these countries' combined HIV/AIDS cases will exceed those of central and southern Africa by 2010⁶⁹. The policy changes in China and the



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efforts of the WHO, the WTO and global funds to help these countries offer hope for improvement in this bleak forecast. But, even without approaching the infection rates of Africa, the human toll in terms of HIV infections and AIDS deaths will be staggering.

Caribbean and Latin America

HIV/AIDS is solidly entrenched in the Caribbean and Latin America⁷⁰. More than 2 million people in this region are now living with HIV, an increase of 200,000 during the past year alone. At least 100,000 people died of AIDS in 2003. The national HIV prevalence is at least 1% in twelve Caribbean countries. While external resources for Caribbean countries' HIV/AIDS response have grown notably, UNAIDS notes that the responses of many countries in this region suffer significantly from inadequate programs focused upon prevention and treatment for people who became infected with HIV from male-to-male sex or intravenous drug use. "Stigma and discrimination remain a major obstacle" to much-needed policy changes and increased funding according to UNAIDS⁷¹.

III. The Research Solution – Canadian's domestic and global stake in success

Vaccines

As with any infectious disease, the best solution is prevention through vaccines. Research demonstrates that a safe and effective vaccine is the only reliable way to prevent any infection by HIV. A successful vaccine does not require major changes in individual behaviour apart from ensuring that potential victims, especially those at high risk, take the vaccine. The best example is the eradication of smallpox by vaccination, and the same is forecast to occur in the near future with polio and measles.

However, the unique problems from HIV's attack on the immune system itself make developing new vaccines very complex. HIV has also shown a disturbing ability to adapt as it has mutated into multiple strains, especially in Africa. The nature of HIV/AIDS means that it is likely to require a number of vaccines to successfully contain and ultimately reduce the spread of the disease. There is a clear need to better understand the virus and the complex interaction between the virus and the human immune system.

As the research efforts continue, finding successful vaccines remains challenging. There have been noteworthy successes in the early and middle stages of research. But, the resources required for this scientific research, the costs of disseminating a successful vaccine within Africa and Eurasia, and the organizational challenges to overcome within Canada and worldwide merit emphasis.

Notably, prospects for microbicides to prevent HIV and other sexually transmitted diseases have improved markedly given research underway in Canada and abroad⁷². Microbicides offer the potential for affordable, female-controlled HIV prevention methods. These gels and creams can be used to prevent unwanted pregnancies and kill viruses potentially transmitted during sexual intercourse. Notably, the International Partnership for Microbicides has received significant funding from the Bill and Melinda Gates Foundation for grants to laboratory researchers. However, microbicides are not expected to be available to the public at competitive prices prior to 2007.



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Treatments

As noted in Part I, the introduction of the so-called AIDS cocktail, HAART, resulted in the suppression of viral activity in many individuals and at least partial recovery of the immune system. HAART slowed the progress of the disease and led to a decline in mortality for patients. However, the treatments are difficult. Despite the decreased pill burden and the less complex regimens, there is a requirement for rigid adherence to taking the medications.

For people who find it difficult to follow the strict schedules or who have experienced severe side effects with one or two drug combinations in the past, initial success is often followed by failure, as the virus becomes resistant to the medication combination. There are also significant side effects to the medications that for some people make it impossible to continue this treatment.

Earlier, it was hoped that if HIV was fully suppressed for several years using HAART, even the cells harbouring the latent form of the virus would die off and the person would be cured. However, this was not the case. Numerous studies are underway examining combined approaches, using drugs, vaccines and other ways to boost the immune system.

Accordingly, as the number of Canadians and people worldwide living with HIV/AIDS grows, so too does the need for more effective treatments. For those who have access to the therapies and sufficient income to procure adequate housing and nutrition, new treatments would mean an improved quality of life. New treatments would also reduce the number of AIDS cases and AIDS-related mortality. However, new therapies are not just complex and difficult, to most people in Africa and Eurasia, they are simply unaffordable without broad-ranging, well-funded global efforts.

In response, international initiatives include the promising commitments of the WHO's "3 by 5" program and the WTO generic drugs agreement plus the increased external resources from the U.S. government, European countries and major global funds to fight AIDS. They will significantly reduce this huge gap in treatment. But, there are too few health care providers available in developing countries to meet the intensity of care required, making it essential to have new health care approaches. Newer and, in many cases, less expensive therapies are also needed to improve the quality of life for millions of people in these countries and to help stem the spread of the disease.

Prevention

Although there have been important advances in the treatment of HIV/AIDS, there is still no prospect of a cure. Moreover, while a safe and effective vaccine is the ideal prevention tool, the development of such vaccines is challenging, costly and time consuming. Research into better prevention methods through education and behavioural changes are desperately needed. New methods and approaches required. They need to be designed and targeted to specific ethno-cultural groups. Improved education and financing greater awareness programs are also vital to effectively assist front-line care and community service providers in their efforts to help people with HIV/AIDS.



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Epidemiology

The changing nature of HIV/AIDS evolution in Canada and abroad, together with its rapid escalation, also make epidemiology – the study of the distribution and determinants of disease in human populations – crucial in the control, prevention and treatment of HIV/AIDS. Surveillance, research, interpretation and evaluation through epidemiology generate critical information to guide control and prevention efforts. Funding epidemiologic research and effectively implementing its findings are thus essential to anticipating the disease's evolution domestically and internationally.

Increasing Canadian and Global Research Need

Research success has become even more crucial because of the adaptability of HIV/AIDS, and, paradoxically, because of the impact of the much greater political commitment to and funding of the global AIDS response. There are 3 strains of the main HIV infection, and 15-20 sub-types of these strains, that have been identified already. There is also the growing threat of individual groups coming together as recombinant infections⁷³. Success in much wider distribution of existing anti-retroviral drugs will inevitably result in increasing resistance over time, making new treatments imperative. The welcome progress in promoting and distributing generic versions of patented HIV/AIDS drugs has also, unfortunately, reduced the profit incentives for private companies to invent new AIDS medicines⁷⁴.

IV. CANFAR's Role – Bridging the Research Funding Gaps

The Canadian Foundation for AIDS Research (CANFAR) is dedicated to funding all aspects of HIV/AIDS research. CANFAR is the only organization operating in Canada for the sole purpose of privately funding research on all aspects of HIV infection and AIDS. Its financing efforts support research into new vaccines and therapies, and epidemiologic studies to better understand the spread of HIV/AIDS in Canada and abroad.

CANFAR selects and funds a broad range of scientific projects that undertake significant new research when measured against other investigative projects in Canada and abroad. In particular, CANFAR undertakes the vital function of selecting and financing small and medium-size research projects of scientists who do not have the resources or the profile to compete successfully for large-scale research awards. CANFAR provides “seed funding” for start-up or smaller scale projects, enabling these researchers to supply better evidence of their projects' merits to national and international agencies for increased future support.

CANFAR selects research projects to be financed based on a rigorous peer review led by its distinguished Scientific Advisory Committee. This volunteer committee is comprised of HIV/AIDS scientists who evaluate proposals based upon the following criteria:

- The relevance of the research to reducing the spread of HIV/AIDS, or to benefiting patients with AIDS or AIDS-like conditions;
 - The uniqueness of the project within the Canadian and the global context;
 - The quality, experience and productivity of the investigator(s); and
 - The facilities available to undertake the research.
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CANFAR's funding is a crucial complement to the financing provided by governments and by global and other foundations. Even with the promising new international funding initiatives, serious doubts remain from past experience regarding the potential gaps between pledges and monies provided, as well as administrative challenges. The U.S. government's multi-billion 5-year plan to combat AIDS in Africa and the Caribbean is largely bilateral and is subject to substantial uncertainty about the actual size and pace of spending. There are also significant conditions regarding eligible countries and recipients. The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) has already committed US\$2 billion to projects in more than 120 countries, but requires another US\$4 billion by 2005 just to meet and extend these commitments⁷⁵. UNAIDS estimates that at least US\$10 billion will be required annually by 2005 to keep the progress of AIDS in check worldwide⁷⁶.

CANFAR's role is also a vital complement to Canada's notable support for the global AIDS battle. Canada's generic drugs initiative pledge was reiterated in the 2004 Throne Speech⁷⁷. Canada is one of the significant country donors to the Global Fund. The Canadian International Development Agency (CIDA) also provides substantial funding for research. Various public programs⁷⁸ are dedicated to preventing and treating HIV/AIDS in Canada.

However, significant policy challenges remain. The Canadian Strategy on HIV/AIDS (CSHA) spending has been frozen at \$42.2 million annually since 1994⁷⁹. One study in 2003 estimated that the impacts of inflation and much greater HIV/AIDS prevalence would require CSHA outlays of \$85 million just to match its 1990 levels⁸⁰. Federal funding sources are also diffused across a range of agencies, while CIDA's financing often goes to U.S. and offshore research rather than to Canadian-based efforts.

As a result, CANFAR's efforts continue to make a major difference in increasing Canada's HIV/AIDS research. Since its inception in 1987, CANFAR has invested nearly \$9.5 million in 279 research projects across Canada. CANFAR's expertise and rigorous selection process have helped to achieve numerous breakthroughs across Canada through its choice of, and funding for, small and medium-size research projects.

Canadian investigative successes funded primarily or significantly by CANFAR include:

- The research by the team of Canadian scientists which co-developed the drug Efavirenz (Zidovudine or ZDV), a component of the so-called "AIDS cocktail";
 - Montreal-based Dr. Mark Wainberg's research which was the first in Canada to isolate HIV in patients, and to conduct direct research on the virus;
 - Winnipeg-based Francis Plummer who has identified and is conducting research regarding 35 prostitutes in Kenya who appear to be immune to HIV;
 - Hamilton-based Ken Rosenthal's immunology research that discovered that HIV tricks the body's immune system into attacking itself;
 - Quebec City-based Benoit Barbeau's research studying infectious agents that increase the rate of the HIV-1 viral reproduction;
 - Toronto-based Tak Mak's work on molecular mechanisms to inactivate HIV and stop the virus from multiplying;
 - Calgary-based Christopher Power's research on how HIV damages the brain and, with Toronto-based Sean Rourke, how this affects learning, memory and behaviour;
 - Toronto-based Eudice Goldberg's studies of how to effectively disseminate HIV prevention information to youth;
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- Quebec-based Michel Bergeron who is developing an “invisible condom” birth-control gel that has the prospect of preventing STI transmission; and
- Toronto-based Kelly MacDonald’s vaccine research with Human Leucocyte Antigens.

However, this success in research is only part of what could be achieved with greater financing. CANFAR receives its funding from individual Canadians, corporations, foundations and groups across the country. It spends just 10% on fundraising and administrative costs. CANFAR awarded \$1.5 million in research grants to 27 projects across Canada during its fiscal year ended June 2003. However, the need for increased financing for CANFAR is compelling and urgent as CANFAR was unable to fund 15 other research projects totalling \$1.1 million that merited support. Increased donor support for CANFAR is essential to finance this much-needed additional research and other future investigative projects regarding prevention, therapies and vaccines.



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Endnotes

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