The Benefits of AIDS Research

Better Health for All

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AIDS RESEARCH

Since the beginning of the epidemic, AIDS research has been a testing ground for new concepts and technologies in drug development, diagnostics, and disease prevention. Drugs developed to combat HIV and to treat AIDS have helped improve and prolong the lives of countless people worldwide.

But discoveries made in one area of research often benefit the study and treatment of a wide variety of human diseases. The fact is that many new treatments for diseases, such as ***cancer, heart disease, hepatitis, osteoporosis****, and* ***SARS,*** *have arisen from research aimed at preventing, diagnosing, and treating AIDS.*

How does AIDS research help people with cancer?

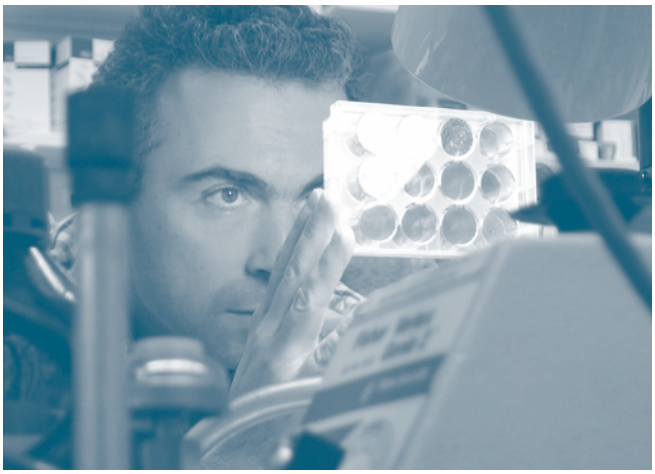
Treatments for several types of cancer have grown directly out of AIDS research. One promising experimental therapy for advanced cancer is high-dose chemotherapy followed by a bone-marrow transplant. But the profound immune suppression necessary for a successful transplant often leads to devastating, even fatal, infections, such as **cytomegalovirus (CMV)** and **pneumocystis pneumonia**, which also affect people with AIDS. New drugs to treat and prevent these infections have come directly from AIDS-targeted research.

Treatments for other cancers are also emerging from AIDS research. Several natural body hormones called growth factors promote the activity of HIV. Many of these hormones also accelerate the growth and spread of cancer cells. Blocking the activity of these hormones is a strategy first used experimentally to treat **Kaposi's sarcoma**, a cancer found in patients with HIV/AIDS. Now it is also being tested in **bladder**, **vulvar**, and **breast cancers** and has shown some exciting recent success in treating **colon cancer**. In addition, small proteins and drugs that can block the growth of new blood vessels (which is critical to the survival of tumor cells) were originally developed to treat Kaposi's sarcoma, but are now being tested in many other cancers as well.

Are other treatments for major diseases likely to emerge from AIDS research any time soon?

Absolutely. AIDS research is helping to improve treatments for Alzheimer's disease and heart disease.

Alzheimer's disease is a progressive, global dementia whose cause is unknown. Profound dementia is commonly seen in the late stages of AIDS as well, so drugs that are successful in lessening nerve damage and dementia in AIDS, for example, may benefit patients with



Alzheimer's. The characteristic plaques that fill the brain cells of an Alzheimer's patient are formed partly by enzymes called proteases, so scientists are now investigating the use of protease inhibitors to treat this debilitating dementia.

Many HIV-positive children and adults also suffer **heart attacks** and **strokes** because HIV appears to affect small blood vessels in the heart and the brain, which makes them vulnerable to spasm, blood clots, and early atherosclerosis. The small arteries of a two-year-old child with AIDS often resemble those of a 50-year-old man. In HIV infection, a process of programmed cell death injures the cells that line the small blood vessels of the heart. Similar damage occurs in HIV-negative people with atherosclerosis. Discovering a way to block this process may benefit not only those with AIDS, but a much broader population as well.

How does the study of HIV/AIDS help in the treatment of other diseases?

HIV/AIDS therapies may be critical in the treatment of other diseases. For example, lamivudine and adefovir can help patients with **hepatitis B** who have no other options. In addition, protease inhibitors are being developed to combat infections, such as **hepatitis C, influenza,** and, most recently, **SARS,** as well as medical conditions such as **osteoporosis** and the heart muscle damage that results from a heart attack.

Another experimental treatment for SARS is based on a concept similar to that of an anti-HIV entry inhibitor called enfuvirtide, or Fuzeon, which was approved for use in 2003. A modified version of another AIDS drug called cidofovir, used to treat CMV eye infections in AIDS, is now being developed to treat and possibly prevent **smallpox** infection. AIDS drugs have even been used to eliminate diseases in plants. Two of them, adefovir and tenofovir, can eradicate the **banana streak virus,** which infects a substantial proportion of the world's banana harvest.

Since HIV is a virus that attacks the immune system, what does AIDS research teach us about autoimmune disorders or immune-based therapies for other diseases?

HIV-positive people often develop autoimmune problems, such as **psoriasis** or blood abnormalities associated with **lupus.** For these autoimmune diseases, treatments developed for AIDS should also apply when the same conditions occur spontaneously.

Certain hormones that modify the function of immune cells are now being tested as treatments for AIDS. Some of the most recent include IL-12 and TNF (tumor necrosis factor)-alpha inhibitors, which may also boost the immune systems of cancer patients. In those patients,

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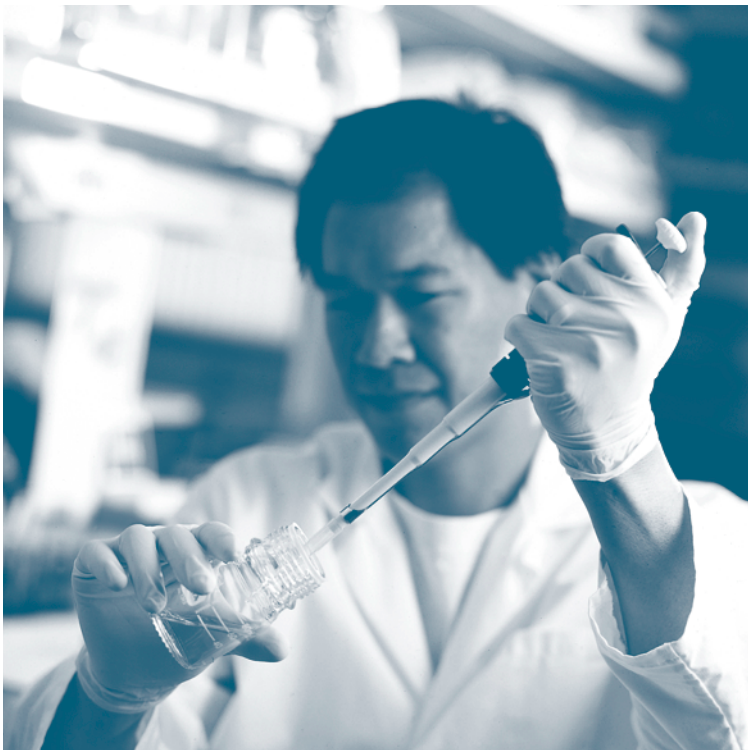
"HIV/AIDS research has blazed trails empirically, politically, and even philosophically. Since this disease took hold . . . new insights and understanding in immunology, antiviral research, vaccine development, and gene therapy have emerged from HIV/AIDS research laboratories and crossed over to cancer research."

From "Cancer and AIDS" by A.J.S. Rayl, published in *The Scientist (XIII, 2, 1999)*.



the hormones help destroy the residue of cancer after surgery, radiation, or chemotherapy. The TNF-alpha inhibitors may also be useful in combating the **body wasting** that accompanies AIDS, severe **tuberculosis**, and some forms of cancer.

Tests for HIV and other infections associated with AIDS have become very sophisticated. Can these procedures help improve the diagnosis of other diseases?

One particle of HIV genetic material can be located among millions of other particles by using extraordinarily sensitive techniques known as PCR (polymerase chain reaction) and RT-PCR (reverse transcription PCR). These techniques have also made it possible to measure otherwise undetectable levels of cancer cells in people who appear to have been cured. This detection allows doctors to initiate new therapy or to continue ongoing treatments that might otherwise have been discontinued.

Similar techniques are being applied to the rapid diagnosis of tuberculosis. In addition, the discovery of **HHV-8,** a herpes virus linked to Kaposi's sarcoma, was made possible by a new application of PCR. This technique is now being used worldwide to seek possible infectious causes for diseases of unknown origins.

We hear a lot about AIDS activism. Has it helped anyone besides AIDS patients?

Yes. AIDS advocates have focused national attention on the high cost of new drugs and on the slow and cumbersome way in which drug development is traditionally regulated by federal agencies. The Food and Drug Administration has responded constructively to the urgings of AIDS advocates and has instituted fast-track procedures to review new treatments for all life-threatening conditions. Fast tracking has already been applied in the approval of drugs for treating Alzheimer's, AIDS, and other diseases, including cancer.

"The discoveries made in HIV/AIDS are now reaching out and touching the lives of thousands of Americans with other diseases....The cross fertilization of ideas and discoveries brings broad benefits to all individuals."

Dr. Allan Rosenfield, Dean
Mailman School of Public Health
Columbia University

In summary, AIDS research is providing insight into a range of diseases, their causes, and their treatments. Better diagnostic methods, therapies to restore the immune system, newer preventive antibiotics and drugs, and new treatments for infectious diseases and cancer—all developed in the course of AIDS research—are having a major impact on countless lives every day.

amfAR is one of the world's leading nonprofit organizations dedicated to the support of AIDS research, HIV prevention, treatment education, and the advocacy of sound AIDS-related public policies. Since 1985, amfAR has invested more than $233 million in its programs and has awarded grants to more than 2,000 research teams worldwide.

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