Committee on Oversight and Government Reform, Chairman Henry A. Waxman

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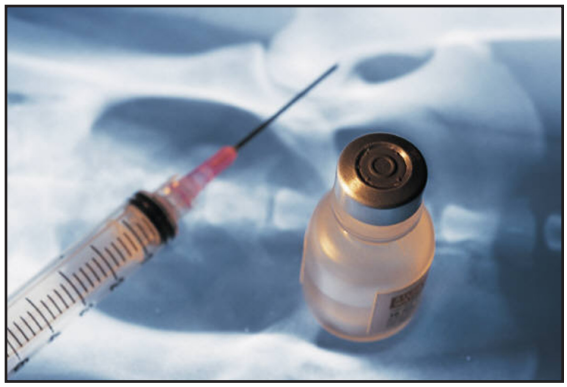
Vaccines

Vaccines have proven highly effective in controlling many infectious diseases, but to date there is no vaccine for HIV. This week's HIV/AIDS Today factsheet focuses on efforts to develop an HIV vaccine.

DEVELOPMENT GOALS AND RESEARCH METHODS

Vaccines generally work by stimulating the immune system to recognize and form an initial response to a particular pathogen. Upon encountering the pathogen later, the immune system can mount a stronger response than if it had never been exposed. A vaccine usually includes a dead or weakened form of the pathogen or a portion of the pathogen.



According to the NIH, in order to effectively control the global epidemic, an HIV vaccine would have to have several characteristics: simplicity of administration; affordability; effectiveness against all HIV subtypes; and production of long-lasting immunity.[i]

PREVENTIVE VERSUS THERAPEUTIC VACCINES

Preventive HIV vaccines would be administered to those who are not yet infected with HIV and would be designed to prevent infection

In contrast, therapeutic vaccines would either control or delay disease progression or treat those already infected with HIV or AIDS.

It is theoretically possible that one vaccine could serve both preventative and therapeutic purposes.[ii] However, just as multiple drugs are often needed to treat those already infected with HIV, multiple HIV vaccines could be necessary in preventing or controlling infection.

CHALLENGES TO HIV VACCINE DEVELOPMENT

Even though tremendous advances have been made in understanding how HIV and AIDS affect the human immune system, a successful HIV vaccine has not yet been developed.

Unlike other viral diseases in which investigators could analyze cases of complete recovery in which to guide the development of a successful vaccine, there are no documented cases of complete recovery from HIV infection. Therefore, HIV vaccine researchers have no human or animal cases of recovery from infection and protection from re-infection to use as a model for a vaccine.[iii]

In an infected person, HIV continually mutates and recombines to evolve into new strains that are different from the original infecting virus. The constant mutation of HIV poses a challenge to the design of an HIV vaccine.[iv]

An ideal HIV vaccine would produce two kinds of immune responses to fight HIV: T cells, and antibodies secreted by B cells. These immune responses would prevent the establishment and spread of the virus from the original site of infection and decrease the effects of the disease in those who do become infected. However, scientists have not yet been able to stimulate both types of responses. To date, researchers have only stimulated weak T cell responses with experimental HIV vaccines. They have had difficulty stimulating the production of antibodies that would protect against a broad range of HIV strains.[v]

TESTING HIV VACCINES

The HIV vaccines being tested in humans cannot cause an HIV infection because they do not contain HIV. However, because most vaccines induce antibodies against portions of the virus, a person that has received an HIV vaccine is likely to test positive for HIV with conventional laboratory tests, which search for these antibodies. Volunteers who engage in behaviors that expose them to HIV may still become infected with the virus.[vi]

Two vaccine clinical trials, the "STEP" and "Phambili" studies for the Merck V520 vaccine, were stopped after an interim evaluation for the STEP trial concluded that the vaccine did not prevent HIV infection or affect the course the disease. Of particular concern was the finding that a component of the vaccine may have in fact increased susceptibility to the virus. Both trials have ceased immunizations, but are continuing with scheduled follow-up visits with all volunteers.[vii]

ENDNOTES

[i] National Institutes of Health, National Institutive for Allergy and Infectious Diseases, NIAID Division of AIDS, *Challenges in Designing HIV Vaccines* (online at http://www.niaid.nih.gov/factsheets/challvacc.htm).

[ii] National Institutes of Health, National Institute for Allergy and Infectious Diseases, Division of AIDS, *HIV Vaccines Explained: Making HIV Vaccines a Reality* (Jan. 2005) (online at http://www.aidsinfo.nih.gov/ContentFiles/WhatIsAnHIVVaccine_FS_en.pdf).

[iii] *Supra* note i.

[iv] *Id*.

[v] *Id*.

[vi] *Supra* note i.

[vii] National Institutes of Health. *Statement: Immunizations Are Discontinued in Two HIV Vaccine Trials*. NIH News (Sept. 21, 2007) (online at http://www3.niaid.nih.gov/news/newsreleases/2007/step_statement.htm).