REASONS FOR HOPE

The quest for a vaccine

Although debate continues about whether an HIV/AIDS vaccine is possible, several candidates are already embarked on the trials process

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by The Boston AIDS Writers Group

A few months ago President Clinton promised to make the development of a vaccine to prevent HIV/AIDS a major commitment of the government's scientific institutions. While most activists were disappointed that the promise didn't include ample funding, the announcement does point out some positive changes. The success of combination therapies has meant that activists have less fear that the successful development of a vaccine to prevent HIV/AIDS would mean decreased efforts in research aimed at treating and curing HIV disease. In addition, the announcement is a signal that many leading researchers and immunologists now believe that a preventive vaccine can be developed.

HIV/AIDS

An ever-growing number of people are at risk for being infected with HIV and developing AIDS. While protease inhibitors have brought renewed hope to people in the developed world, these drugs are not affordable to the majority of people around the globe. Given this reality and the success of international efforts in using vaccines to practically wipe out smallpox, a preventive vaccine may be the world's best hope of controlling this epidemic.

The Idea Behind Vaccines

Vaccination is based upon an old observation: Some people who recover from an illness don't get it again. For example, no one gets the measles twice. Vaccines have a long history, going back thousands of years to when the Chinese gave dried-out smallpox to uninfected people to lessen the chances of getting the disease itself later. Modern vaccines go back to Dr. Edward Jenner and his introduction of cowpox as a smallpox vaccine in 1798.

All of our immune systems have a built-in capacity to fight some germs (including a number of viruses) and the diseases they cause. In addition, the body's immune system has the ability to learn to recognize an unfamiliar germ as an enemy. However, it takes time for the body to learn to fight an illness it has never seen. The time it takes to recognize a new illness and learn how to fight it can be the crucial few days or weeks that makes the difference between a disease easily defeated and one that causes serious damage or even death. Teaching the body to recognize a germ as an enemy is what a vaccine does, so that when the body is exposed to the real germ, it already knows how to recognize and destroy it.

A preventive vaccine is simply a matter of injecting a person with some weak form of the germ or pieces of it, or dead ones, or things that look a lot like it, to get the body to be on guard against the actual germ. The germ may still attack the body, but the response is so quick and effective that the germ doesn't cause illness. In the case of HIV, the virus makes tens of billions of copies of itself in the first few days and weeks after infection. Therefore, the virus ends up infecting many parts of the body quickly. The hope is that a vaccine would get the immune system to attack so fast that the virus would not have a chance to reproduce and spread, and thereby HIV infection would be prevented.

Can a Vaccine Prevent HIV?

Over the years scientists have developed vaccines to fight many illnesses. The most famous was the successful effort funded by the March of Dimes to find a vaccine to prevent polio. But polio is only one of many vaccines that are routinely given to infants and children to immunize them for life against certain diseases.

It seems obvious that such an attempt would be made to find a vaccine that fights HIV. However, some researchers believe that since the purpose of a vaccine is to get the immune system to fight an invader, it might not be possible to develop an effective vaccine for HIV because it, unlike other viruses, attacks the immune system itself. In addition, they fear that because there are so many varieties of HIV around the world, and because the virus is able to mutate so quickly, a vaccine that recognized one strain of HIV might not recognize another.

Others argue that a vaccine is possible. Among the reasons many believe this is so is the possibility that some small number of people are naturally immune to infection by HIV. In several African cities there are sex workers who regularly practiced unsafe sex in areas where large numbers of their clients were infected. After many years of exposure to the virus, their immune systems have some responses to HIV, but they don't have active virus in the body. It is presumed that somehow they became infected but successfully fought off the virus. Researchers hope that if they can find out how these people's systems accomplished this, it might be possible to get other people's immune systems to do the same.

How an Effective Vaccine Might Work

For most diseases, the key to developing a vaccine is to look at people who have acquired a natural immunity to the disease, or people who have recovered from the disease. Researchers then look at the responses of those people's immune systems, and attempt to find something that will create that response in others. As our knowledge of HIV disease increases, researchers are gradually learning what types of immune response won't work, and what types may work to prevent HIV infection.

Creating a response is not difficult. After all, the body responds to the virus. The difficulty is creating the right response without infecting people. The safest vaccine is usually the weakest: For instance, one made up of small pieces of HIV could involve almost no risk of infection, but it might have the least chance of being effective. Vaccines more likely to work involve giving people an attenuated (or weakened) live virus. Some individuals have somehow been infected with such a weakened virus, and they have remained healthy for at least 12 years. Nevertheless, the safety of such a live-attenuated vaccine is not clear. The oral polio vaccine is a live-attenuated vaccine, and in the United States about eight to 10 people per year get polio from it. A small number of infections is a price society is willing to pay to avoid thousands of cases if the vaccine were not used. However, until more is known about the safety of such a live-attenuated HIV vaccine, the decision to use it will be difficult.

Over the past 10 years scientists have developed a number of HIV vaccines, and it appears that many of them are safe. Some of them have been shown to protect chimps and other primates for at least one year. So scientists are hopeful. Unfortunately, these vaccines have not been tested on enough people to know if they work.

The Time for Trials

Clearly, more than with any other illness for which a vaccine has been developed, getting an HIV/AIDS vaccine will mean a lot of trial and error. More time, more money and more experiments with testing potential vaccines in humans are the only way to determine if we are successful. The bad news is that the research is not moving fast enough. Most of those vaccines which have moved beyond animal testing to human testing are in or have completed only the first phase of testing. These tests involve a very small number of people to ensure safety, without any results regarding effectiveness.

The good news is that one vaccine is ready to begin a later phase of testing, which will include people who were at high risk of getting infected with HIV. Therefore the test will look not only at whether the vaccine is safe, but also whether it is effective at preventing infection. The individuals involved are from HIV NET, which recruits high-risk people, tries to teach safer behavior and also enrolls people into preventive trials. The vaccine is called ALVAC (from the fact it was designed in Albany, N.Y., i.e., the "ALbany VACcine"). It will be tested in 14 sites across the country, involving 420 people. One-third of the participants will receive a placebo, one-third will get the ALVAC, and one-third will get the ALVAC plus another vaccine known as GP-120 (which uses the nonactive outer coating of the virus.) Because infection rates are not that high in this country, the trial will take three years to complete, and it still isn't large enough to determine whether the vaccine works. If the results of this trial look promising, then a much larger and perhaps longer trial will be needed. Meanwhile, there are numerous other vaccines that have not had even the early safety tests, and many more which have had that first phase but have not been approved for further testing.

A number of activists are frustrated at the slow response. To move the development of some HIV treatments, the tests after the initial safety tests are often rolled into one. Some activists believe something similar should be done for preventive HIV/AIDS vaccine trials. Individuals wishing to promote the development of a preventive vaccine may want to attend the National AIDS Vaccine Advocacy Forum to be held in San Diego this November. For information call the AIDS Vaccine Advocacy Coalition at (415) 248-1330.

A Critical Concern

While there is optimism about the possibility of developing a vaccine, there are concerns. It will be years before any vaccine could be available, and it might be much less than 100 percent effective. One of the questions that experts are struggling with is what the impact would be if there was a vaccine that lowered one's chances of getting the disease by 70 percent or 90 percent but didn't completely protect an individual. Given that possibility, a vaccine would be an added layer of protection, not an alternative to current HIV-prevention methods.

While there is ongoing testing of potential vaccines, no vaccine to date has been built that would stop the illness. It needs to be understood that practicing prevention through abstinence or safer sex, and rules like never sharing needles, should continue to be viewed as absolutely necessary. Even HIV-positive individuals need to protect themselves as well as their partners. HIV is not the only disease that is transmitted sexually, and people with weaker immune systems face higher risks. In addition, there is the chance that one may contract a strain of the virus that is resistant to some antiviral drugs. Also, having a viral load which is below detectable levels does *not* mean that the virus cannot be transmitted. Vaccine or no vaccine—safer practices and protection are essential!

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"Reasons for Hope" and Search for a Cure are now on-line (www.sfac.org).