



AIDS VACCINES

WHAT IS A VACCINE?

The body's immune system normally reacts to anything it recognizes as foreign and tries to eliminate it. A vaccine is a substance that helps the immune system respond to a specific germ or virus. A vaccine can prevent an infection. However, no vaccine is 100% effective. Most vaccines being used in the US are between 70 and 95% effective.

Vaccines can help individuals by protecting them against a disease or by helping them fight the disease. For a community, vaccines can lower the overall infection rate and help stop the spread of a disease. See fact sheet 207 for more information on vaccinations that can help people with HIV prevent some common diseases.

HOW DOES A VACCINE WORK?

A healthy immune system fights anything it thinks is foreign. It produces proteins called antibodies. These proteins lock onto the invading germs or virus and prevent them from infecting cells.

These antibodies keep the germ or virus from multiplying. Once the threat of infection is over, the immune system produces special memory cells that remember how to fight the specific germ.

Most vaccines are used to prevent infections. However, others help your body fight an infection that you already have. These are called "therapeutic vaccines." See fact sheet 480 for more information on therapeutic vaccines and HIV.

Some vaccines are made up of weakened germs or viruses. These are called "live vaccines." They can give you a mild case of disease, but then your immune system kicks in to protect you against a severe case. Examples include measles, mumps and rubella. Other "killed" or "inactivated" vaccines, like for influenza or rabies, don't use a living germ. You don't get the disease, but your body can still build up its defenses.

Vaccines can have side effects. With live vaccines, you might get a mild case of the disease you are fighting. With inactivated vaccines, you could have a reaction where you got the shot. You might also briefly feel weakness, fatigue, or nausea.

WHAT'S DIFFERENT ABOUT AIDS VACCINES?

All of the proposed AIDS vaccines use copies of parts of HIV to produce an

immune reaction. They cannot cause HIV infection or AIDS. These are different from both types of vaccines mentioned above. They are not weakened live vaccines or inactivated or killed vaccines. They are "engineered" vaccines.

AIDS vaccine trial participants will likely develop antibodies to HIV. People who take part in a study of a proposed AIDS vaccine might test positive for HIV even if they are not infected. If you are in a vaccine trial, you should only have HIV tests at your trial site.

HOW ARE AIDS VACCINES TESTED?

Vaccines start with a researcher's idea about how to fight HIV. This idea is tested in the laboratory and then in animals. If it is successful in these early studies, a vaccine "candidate" can then be tested in humans. Human testing takes place in three phases: Phase 1: Is it safe? Phase 2: Does it produce an immune response, a bodily defense reaction to the invading bacteria or virus? Phase 3: Is it effective in preventing HIV infection? Does it slow disease progression?

No vaccine provides 100% protection against infection. So any vaccine is only partially effective. Although that may sound like a problem, vaccines are actually powerful tools for preventing disease. They bring enormous benefits to individuals and communities. For example, if a vaccine can be given to an entire community and reduce the infection rate by 40%, it will have a major impact on the overall number of new infections.

Vaccine testing takes many years. For example, Scientists have been working for over 126 years to find a malaria vaccine. It took over 100 years of work to develop a vaccine for typhoid. Polio vaccine took 46 years. The measles vaccine was one of the fastest; it took 9 years to develop.

HOW CLOSE ARE WE TO AN AIDS VACCINE?

There is currently no effective AIDS vaccine. Data from a large trial in Thailand were released in late 2009. The study looked at using standard prevention techniques with or without the vaccine. Participants who got the vaccine regimen were about 30 percent less likely to become infected than those who received the placebo. Researchers are trying to understand this result and to use it to develop a more effective vaccine.

In 2007 and 2013, large trials of a candidate AIDS vaccine were stopped for failure to show benefit. Other very early stage studies are underway to explore new approaches for vaccine development.

Developing an AIDS vaccine is extremely difficult. Even with the modest effect in the Thai trial, we don't yet know how to measure immune protection against HIV. New ways have to be found to measure the immune response to HIV, and to produce it. There are still many vaccine candidates being developed in the lab, and in human clinical trials.

WHAT ABOUT PEOPLE WHO ARE ALREADY INFECTED?

Most vaccines are designed to prevent infection. However, some vaccines might also help people who are already HIV-positive. These are called **therapeutic vaccines**. A good therapeutic vaccine would strengthen the body's immune response against HIV. We still have to identify ways to measure the immune response against HIV. Dermavir is a therapeutic vaccine that is currently being studied in humans. See fact sheet 480 for information on other immune boosters.

WHAT ELSE IS BEING STUDIED?

Taking anti-HIV medications might prevent HIV infection. This approach is called **Pre-exposure prophylaxis, or PrEP**. Prophylaxis means prevention. Studies showed dramatic success among men, women and people who inject drugs. However, there are major questions about availability of PrEP medications, and funding.

Microbicides might be another way to prevent HIV infection. These are substances that could be applied as a cream or gel by women and men to prevent HIV infection during vaginal or anal sex. Several microbicides are currently being tested.

NEXT STEPS

Experts agree that a safe and effective AIDS vaccine would be a vital way to help deal with the global epidemic. It would work along with effective antiretroviral drugs that treat existing HIV infection.

Reviewed November 30, 2014