HIV Vaccines

An Introductory Factsheet

May 2017

This fact sheet provides basic information on preventive AIDS vaccines. For more basic fact sheets in this series on emerging HIV prevention strategies visit www.avac.org/intro.

What is an AIDS vaccine?

A **preventive** HIV vaccine would teach the immune system to create responses that prevent the virus from establishing infection in the body. No licensed preventive HIV vaccine exists at present.

A **therapeutic** HIV vaccine would improve the body's immune response to HIV in people living with HIV and thereby reduce their risk of getting sick and, ideally, also reduce their reliance on antiretroviral treatment. Therapeutic vaccine research may provide important clues to the ongoing search for a cure for HIV. No proven therapeutic HIV vaccine exists at present.

This factsheet focuses on research into preventive vaccines for use by HIV-negative people.

Resources and links

AVAC (www.avac.org/vaccines)

Global HIV Vaccine Enterprise (www.vaccineenterprise.org)

HIV Vaccine Trials Network (www.hvtn.org)

International AIDS Vaccine Initiative (www.iavi.org)

US MHRP (www.hivresearch.org)

What is the current status of HIV vaccine research?

2017 could mark the first year in over a decade that two HIV vaccine efficacy trials are running at the same time. An efficacy trial involves thousands of people, and tests if a vaccine regimen is safe and reduces the risk of HIV infection. At the end of 2016, an HIV vaccine efficacy trial started in South Africa. Known as HVTN 702, or *Uhambo*, it's testing a vaccine candidate designed for the clade (subtype) of HIV most common in Southern Africa, clade C. Later in 2017, another efficacy trial, HPX2008/HVTN 705, is expected to start in countries throughout sub-Saharan Africa. This vaccine candidate includes so-called mosaic immunogens, meaning it is designed to induce immunity to multiple HIV clades.

Two additional efficacy trials are ongoing now that are testing the effectiveness of infusions of an antibody for HIV prevention; see below for more information.

What are the important advances in HIV vaccine research?

Before 2009, five HIV vaccine efficacy trials had failed to show any impact on preventing infection. That year a trial in Thailand, known as RV144, released results showing modest success. Those who received the candidate vaccine combination were 31 percent less likely overall to acquire HIV than those who received placebo. This result provided the first proof-of-concept that a preventive HIV vaccine was possible. It was a major milestone for the field.

The RV144 vaccine regimen used a "prime-boost" strategy. Prime-boost involves an initial dose (or doses) to "prime" the immune system, followed by a later dose (or doses) to "boost" the immune response. The prime part of the vaccine combined synthetic fragments of HIV with a harmless form of a bird virus, canary pox, that served as a vector to carry these fragments into the body. That candidate was called ALVAC-HIV. The boost part of the vaccine was a synthetic version of a protein found on the outer surface of HIV, called gp120. This candidate was called AIDSVAX B/E. Since that trial, the field has worked to understand why the strategy worked, how to improve it and how to adapt it for use in other parts of the world. This work led to HVTN 702, the efficacy trial currently underway in South Africa (described above).

What are some of the key challenges to developing an HIV vaccine?

The virus mutates rapidly, allowing it to evade the body's natural defenses. Furthermore, HIV primarily attacks the very cells needed to mount an effective immune response. Most vaccines in use today have been developed by learning from the immune response of a person who has successfully eliminated an invading pathogen. Since no human to date has ever eliminated HIV naturally, with their own immune system, vaccine scientists find themselves in uncharted territory.

Vaccine trials are being conducted as new HIV prevention options, including oral pre-exposure prophylaxis (PrEP), are rolling out. The design of efficacy trials, which include access to the full range of prevention methods, has become increasingly complex as they incorporate these additional interventions.

How is antibody research informing HIV vaccine research?

Broadly neutralizing antibodies (bNAbs) are Y-shaped proteins produced by B cells (immune cells) that bind to a specific part of HIV's surface and block HIV from infecting cells. "Broadly neutralizing" means that bNAbs recognize and can bind to a variety of strains of HIV from around the world.

After infection, it typically takes B cells many years to produce bNAbs, and many people never produce them. However, scientists have isolated numerous bNAbs from a subset of people living with HIV. So far, these bNAbs have not kept pace with HIV's mutations in most individuals living with HIV. By the time they develop, HIV has mutated into something they can't recognize. Scientists hope to develop a vaccine that would elicit such protective antibodies at the time of exposure, thus helping the body better combat the virus right away.

bNAbs are also being studied for "passive immunization". This strategy is different from traditional, "active immunization" in which a vaccine teaches the body to make antibodies itself. With passive immunization bNAbs are introduced into the body through intravenous drips (direct infusions) and they do not self-replicate. Two large clinical trials in the Americas, Europe, and across sub-Saharan Africa, known collectively as the Antibody Mediated Prevention (AMP) Studies, are testing the safety and effectiveness of the passive immunization of a bNAb known as VRC01 for HIV prevention. The study's results are expected over the next five years.

In addition to VRC01, a growing number of antibodies are moving through pre-clinical and clinical trial stages for testing as passive immunization. Researchers hope to test especially potent antibodies and antibodies with longer half-lives as well as combinations of antibodies in future efficacy trials. For an ongoing list of bNAbs as they are discovered, visit *www.bnaber.org*.

A note on progress in HIV vaccine science

While a licensed vaccine is still years away, the vaccine research pipeline is rich, with diverse designs and multiple strategies. Finding an effective vaccine requires a global effort and commitment across a range of groups: public–private, international, regional, and national collaborations. The HIV vaccine research field has established a number of collaboratives across disciplines to accelerate scientific progress.

For additional information on HIV vaccine research, visit *www.avac.org/vaccines*.

About AVAC | AVAC is a non-profit organization that uses education, policy analysis, advocacy and a network of global collaborations to accelerate the ethical development and global delivery of new HIV prevention options as part of a comprehensive response to the pandemic. This fact sheet is part of the Women's HIV Prevention series, created to address HIV prevention strategies and the advocacy needed to bring them to reality.