Progress Toward an HIV VACCINE

Development of a **safe and effective preventive HIV vaccine** remains key to realizing a durable **end to the HIV/AIDS pandemic**. NIAID and its global partners are pursuing numerous research strategies to develop next-generation vaccine candidates.

Developing an HIV vaccine is challenging

HIV **mutates rapidly** and has unique ways of evading the immune system.

MOST VACCINES

....mimic the immune responses of recovered patients. There are no documented cases of an HIV-infected person developing an immune response that cleared the infection. Researchers are working to define and understand the responses that may protect against HIV.

....are inactivated or weakened viruses. Inactivated HIV was not effective at eliciting immune responses in clinical trials. A live form of HIV is too dangerous to use.

....are effective against pathogens that are rarely encountered. People in high-risk groups might be exposed to HIV daily.

But we've made progress

Results from the landmark **RV144** clinical trial in Thailand, reported in 2009, provided the first signal of HIV vaccine efficacy: a 31 percent reduction in HIV infection among vaccinees. RV144 evaluated the safety and efficacy of a **prime-boost** combination of two vaccine components given in sequence: one using a harmless virus as a **vector**—or carrier—to deliver HIV genes and a second containing a protein found on the HIV surface.

Broadly neutralizing antibodies, or **bNAbs**, can stop many HIV strains from infecting human cells in the laboratory. A minority of HIV-infected people naturally produce bNAbs, but usually too late after infection to overcome the virus. Researchers have isolated bNAbs from the blood of HIV-infected people and are studying them in detail in an effort to design novel vaccine candidates.

And we're working to do more

To build on this progress, NIAID is pursuing two general approaches, each of which has many components. Numerous investigational vaccines are at different stages of development.

Basic & preclinical research → Manufacture of vaccines for human testing → Clinical trials to test for safety & efficacy in humans

Scientists are developing novel **prime-boost regimens** that elicit strong, long-lasting protective immune responses.

The Pox-Protein Public-Private Partnership, or **P5,** comprises organizations including NIAID working to build on the modest success of RV144 and increase understanding of the immune responses linked to protection against HIV infection. In 2016, the P5 announced a decision to move forward with HVTN 702, a vaccine efficacy trial in South Africa aiming to build on the RV144 results.

Scientists are developing improved **vectors** that effectively deliver HIV genes to host cells, resulting in production of HIV proteins, and trigger anti-HIV immune responses.

Researchers are working to determine how **adjuvants**—vaccine components that enhance antigen-specific immune responses—affect the potency, durability and other aspects of vaccine-induced immunity.

Scientists are working to harness the potential of **bNAbs** to protect uninfected people from acquiring HIV.

Scientists are studying the **design and delivery of antigens**—vaccine components that stimulate specific immune responses—to develop vaccine candidates that may induce uninfected people's immune systems to make bNAbs.

Passive immunization involves giving injections or intravenous infusions of bNAbs as an HIV prevention strategy. In 2016, NIAID launched the Antibody-Mediated Prevention (AMP) Studies, which aim to determine whether giving uninfected people bNAb infusions is safe, tolerable and effective at preventing HIV infection.

Researchers also are investigating **vectored immunoprophylaxis**. By injecting a vector containing bNAb genes, antibodies that may prevent HIV infection are produced.

For more on the latest advances in HIV vaccine research, visit:

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