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Short Communication

Advancement of HIV Vaccines and its Unique Challenges

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DESCRIPTION

Based on a conversation with Robert Gallo, the co-discoverer of the HIV virus, U.S. Health and Human Services Secretary Margaret Heckler expressed optimism about an HIV vaccine in April 1984. She said in a press conference that "We hope to have a vaccine ready for testing in about two years." Given that it typically takes between 10 and 20 years to create a vaccine, this prognosis was undoubtedly unduly optimistic. However, 30 years later, there is still no approved HIV vaccine [1].

In short, reasons generally given are;

- Lack of innate HIV immunity
- The diversity of HIV subtypes
- Absence of correlates of immune protection
- Absence of an animal model that can accurately predict human vaccination effectiveness

First and foremost, HIV defies the conventional immunization strategies because, unlike illnesses like measles and chickenpox, no one recovers naturally from HIV infection. If a person contracts the measles and survives, their immune system will typically be able to guard against contracting the disease again in the future. This naturally occurring immunity can be used by researchers to determine the level of protection that a successful vaccination should offer [2].

It is far more challenging to design an HIV vaccine without a model for natural immunity since researchers are unable to pinpoint an immune response that would be effective against HIV. Some people have the innate ability to manage the illness and stop it from developing into AIDS. Another potential route for the development of a vaccine is to investigate how these so-called "elite controllers" manage the infection [3].

HIV frequently mutates, which presents a second obstacle to vaccine development. The virus is a challenging moving target for a vaccination because of its constant alterations. Additionally, there are other genetically different subtypes of HIV, and it's expected that more may develop in the future. This presents even another difficulty because a vaccine that defends against one subtype might not defend against others [4].

The fact that researchers have not been able to identify what is known as the correlate of protective immunity to HIV infection poses a third problem (related to the first). "A specific immune response that is closely associated to protection against infection, illness, or other defined end points," is the definition of a correlate of protective immunity. We do not understand what HIV protection would look like in an individual because no one is known to have been infected with HIV and then spontaneously eradicated the virus. Designing and verifying a vaccine will be challenging until researchers have determined what the correlates of protective immunity to HIV infection [5].

Animal models are a crucial tool in understanding the fundamental mechanisms of infection and immune response in the majority of diseases as well as in the development of vaccines. However, there isn't a trustworthy non-human animal model for the immune system's reaction to HIV infection. The effectiveness of the HIV vaccine in humans has not yet been accurately predicted by animal experiments. In an effort to use similar strategies to treat HIV, researchers are still conducting studies investigating vaccinations against genetically modified SIV and HIV hybrids as well as the monkey virus Simian Immunodeficiency Virus (SIV).

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