

Dengue DNA Vaccine [UPSC Notes]

India's first and only DNA Vaccine candidate for dengue has shown promising results in its preliminary trials. This vaccine is being developed by the National Centre for Biological Sciences, Bangalore. In this article, you can learn more about the DNA vaccine against dengue developed in India for the [IAS exam](#).

About Dengue Vaccines

Dengue has 4 strains: DEN-1, DEN-2, DEN-3 and DEN-4. In India, the most common strain is DEN-2. The reason why dengue vaccines are so difficult to manufacture is that they need to be effective on all 4 strains.

As of now, only 2 dengue vaccines have been approved for usage.

1. Dengvaxia: Produced by the French company Sanofi. However, it can be used only for those people who have had Dengue previously, or those who live in an area where the majority population has been previously infected. In people who have never had the infection, this vaccine can increase the risk of severe dengue.
2. Qdenga: Produced by the Japanese company Takeda, it can be used by people who have not had an infection history.

Know more about [dengue](#) in the linked article.

NCBS Vaccine

When used on mice, the vaccine produced great results. It led to the production of both the B-cells (create antibodies) and the T-cells (protect from infection).

A challenge study was also conducted for the vaccine, where blood serum taken from the inoculated mice was given to the immunocompromised mice. This resulted in a 50% better survival rate in these immunocompromised mice compared to the unvaccinated mice.

After this success, the vaccine will need to be tested on non-human primates, where if successful, it will go for clinical trials.

What is a DNA Vaccine?

It is also known as the 3rd generation of vaccines. It relies on the in-situ production of the target antigen against which the response is sought. This is done by introducing the [DNA](#) sequence of the antigen into the cells of the person getting immunised. Once the plasmid DNA enters the nucleus of the person's cell,

it produces mRNA which travels to the cytoplasm and eventually gets copied to create the proteins responsible for generating the immune response.

The traditional or the “whole virus” vaccines, since they contain the whole virus, also include those parts of it which can produce an adverse effect on human beings. The DNA vaccines allow the researchers to pick only those parts of the virus which will help in generating the immune response. **These vaccines are thus not only safer but also cost-effective and more stable than the “whole-virus” vaccines.**

World’s first DNA Vaccine “ZyCoV-D” was developed in India by Zydus Cadilla, for Covid, and was approved in 2021 for emergency use.

Know more about [DNA vaccines](#) in the linked article.

DNA Dengue Vaccines Issues

1. They produce a weaker immune response in humans compared to mice, so more doses will be required.
2. Antibody-Dependent Enhancement: Ordinarily, vaccines prompt the body to create antibodies that halt the virus from attaching to cells if it is encountered again in the future. Nevertheless, in the case of dengue, antibodies can promote the virus to duplicate and induce serious illness. This is due to the fact that antibodies formed after either receiving a vaccine or contracting the disease itself may be insufficient in both quality and quantity, which allows them to bind to the virus, forming a complex that fastens itself to immune cells. Once inside the cells, the virus can replicate, thereby increasing the viral load.

The Antibody-Dependent Enhancement is the reason why Dengvaxia hasn’t been completely successful.