



India's First DNA Vaccine for Dengue

Why in News?

Researchers at [India's National Centre for Biological Sciences](#), in collaboration with nine other institutions in India, Africa, and the US, have developed **India's first and only DNA vaccine candidate for dengue fever.**

- In preliminary trials on mice, the **candidate generated a robust immune response** and improved survival rates after exposure to the disease.

What is DNA Vaccine?

- A **DNA vaccine is a type of vaccine that uses a small piece of DNA** that codes for a specific antigen (**a molecule that triggers an immune response**) from a pathogen, such as a virus or bacterium, to stimulate an immune response.
- The **DNA is injected directly into the body's cells**, where it instructs the cells to produce the antigen.
 - The **immune system then recognizes the antigen as foreign** and **mounts an immune response against it**, which helps to develop immunity to the pathogen.
- DNA vaccines are **third-generation vaccines.**
- The **ZyCoV-D** is the **world's first and India's indigenously developed DNA based vaccine for COVID-19.**

What is Dengue?

- **About:**
 - Dengue is a **mosquito-borne tropical disease** caused by the dengue virus (**Genus Flavivirus**), transmitted by several species of mosquito within the genus **Aedes**, **principally Aedes aegypti.**
 - This mosquito also transmits [chikungunya](#) and [Zika infection.](#)
- **Serotypes of Dengue:**
 - There are 4 distinct, but closely related, serotypes (separate groups within a species of microorganisms that all share a similar characteristic) of the virus that cause dengue (**DEN-1, DEN-2, DEN-3 and DEN-4**).
- **Symptoms:**
 - Sudden high fever, severe headaches, pain behind the eyes, severe bone, joint, and muscle pain, etc.
- **Dengue Vaccine:**
 - The **dengue vaccine CYD-TDV or Dengvaxia** was approved by the US Food & Drug Administration in 2019, the **first dengue vaccine to get the regulatory nod in the US.**
 - **Dengvaxia** is basically **a live, attenuated dengue virus** which has to be administered in people of ages **9 to 16** who have laboratory-confirmed previous dengue infection and who live in endemic areas.
- **Challenges in Vaccine Development:**

- Developing an **effective vaccine against dengue is tricky** because it is caused by four closely related virus serotypes.
 - **Each one interacts differently with antibodies in human blood.** A person infected with DEN-1 is then protected against it for life, but not against the other three serotypes.
 - **An ideal vaccine must target all serotypes.**
- Also, vaccines trigger **production of antibodies** that prevent the virus from binding to cells at later exposure. But with dengue, **antibodies help the virus replicate** and cause severe disease.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. In the context of vaccines manufactured to prevent COVID-19 pandemic, consider the following statements: (2022)

1. The Serum Institute of India produced COVID-19 vaccine named Covishield using mRNA platform.
2. Sputnik V vaccine is manufactured using vector-based platform.
3. COVAXIN is an inactivated pathogen-based vaccine.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (b)

Mains

Q. What is the basic principle behind vaccine development? How do vaccines work? What approaches were adopted by the Indian vaccine manufacturers to produce COVID-19 vaccines? (2022)

Source: DTE

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