

Dengue Vaccines EDIII-HBsAg TV and DENV-2 ENV based VLPs

Dengue virus (DENV) is a leading arthropod borne viral infection which infects more than 300 million people worldwide and leads to about 50000 deaths annually. The DENV is transmitted primarily by *Aedes aegypti*, and *A. albopictus* is also thought to be implicated in spreading the infection. The DENV is considered more dangerous than other arbovirus infections which cause viremia in humans leading to propagation of virus.



A well known fact is that viruses cause huge number of fatal infections among infants, and children. Vaccine development for viral infections is of paramount importance, and is the most cost-effective medical intervention for preventing mortality and morbidity caused by viral infections. Many of vaccine developed in India are of significant medical importance, and are at par with international standards.

The DENV infections can be prevented by vaccination of susceptible human populations, and globally efforts have been made over three decades, although not too much success has been achieved in this direction. Dengue is an emerging viral disease caused by any of dengue virus 1–4 serotypes, and there is no specific antiviral therapy available against the dengue. Dengvaxia, the only licensed dengue vaccine is incapable of conferring balanced protection against all four serotypes, therefore, the efforts are being made to develop safe, efficacious and inexpensive tetravalent dengue vaccine candidate at the International Center for Genetic Engineering and Bio-technology (ICGEB), New Delhi.

The institute has used an adenovirus vectored approach to develop a tetravalent DENV vaccine candidate. The genes encoding the domain III of the envelope (E) protein (EDIII) of the respective DENV strains have been stitched together to create the tetravalent gene (EDIII-T)

cassette that was inserted into a replication-defective *Ad5* vector. The vaccine candidate was evaluated in animal model mice, wherein cell mediated immune responses and virus neutralizing antibodies were generated. But, the vaccine construct suffered from the limitations of Ad5 vectors. At ICGEB, New Delhi *Pichia pastoris* expression system has been explored.

Two promising vaccine candidates, EDIII-HBsAg TV and DENV-2 ENV based VLPs have been under development at the International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi. Besides, a provisional patent application was filled with an Indian patent application no: 1820/DEL/2010.

According to annual report 2018 of ICGEB, research group involved in dengue vaccine research are currently interested in developing in yeast an experimental, tetravalent subunit vaccine against DENV infection. At ICGEB, New Delhi, the Recombinant Gene Products Group has made great progress in generating a novel dengue virus vaccine based on a tetravalent virus-like particle. Another significant development is that the vaccine showed efficient protection in pre-clinical models, thereby, opening the way for the start of clinical trials. The research work has been published in some of the high impact research journals with high impact factor^{1,2}.

At ICGEB, New Delhi, Dengue vaccine technology licensed to *Sun Pharmaceuticals Ltd.*, is progressing very fast with lab scale technology transferred to a German CMO for further development. Additionally, under agreement signed in 2016 with the same company for the co-development of world's first botanical drug for the treatment of Dengue infection, in 2018. The *Sun Pharmaceuticals Ltd.*, team filed an additional patent application. A randomized, double-blind, placebo-controlled trial to evaluate the efficacy and safety of the botanical drug in adult patients with dengue fever was planned for 2019.

References:

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Dr. Bilqeesa Bhat
Project Scientist,
bhat.bilqeesa3000@gmail.com