Yeast Expression of VLP-Based Universal Dengue Vaccine and Other Flavivirus

Published date: Aug. 28, 2016

Technology description

Background
Flaviviruses are significant human pathogens for which no commercially approved vaccines exist. Flaviviruses exist as small (50 nm) particles containing a single RNA molecule encoding 3 structural proteins (C, M and E) that make up the virion, and 7 nonstructural proteins required for genome replication. This virus family includes a number of mosquitoborne viruses that are pathogenic for humans, including West Nile virus (WNV), dengue virus (DENV), Japanese encephalitis virus (JEV), and yellow fever virus (YFV). Each virus is endemic in regions with a large and highly susceptible population, causing significant medical and economic burden. Recent outbreaks of DENV in India, Brazil, and the United States highlight the importance of developing new defense and treatment options for this emerging infectious disease.
Technology Description
A novel high expression, easy scale up, and low cost method for the production of various flavivirus viral-like particles (VLPs) in a yeast system has been developed. The flavivirus structural proteins comprising the C protein, the prM protein and at least one E protein are expressed in yeast and isolated using a novel lysis procedure, which does not contaminate the vaccine with solvents or detergents. The flavivirus VLPs that have been produced and validated are a universal Dengue vaccine and a universal West Nile vaccine.

Provisional patent application filed

Application area

1. VLP-based vaccine development for current and emerging Dengue and West Nile strains
2. VLP-based vaccine development for Japanese and St. Louis encephalitis (JEV) and (SLEV) and Yellow Fever Virus (YFV)
3. Vaccine development for other infectious disease pathogens

Advantages

1. Eliminates detergents and solvents required for bacterial-based production of virus thus decreasing the risk of contamination.
2. Eliminates potential reversion to infectious state that inactivated or live-attenuated virus vaccines possess.
3. Expressed VLPs contain all three structural proteins from multiple flavivirus in yeast which are required for flavivirus vaccine production.
4. High levels of expression and controlled induction of protein expression allow for easy scale-up and low cost of production.
5. Addition of C protein presents more antigenic targets as well as a more complete virion structure to allow for better response to the vaccine.
6. Mechanical lysis protocol maximizes protein expression and keeps the integrity of particles.
7. One sequence can elicit immune responses that recognize all strains of dengue or west nile. 8. Universal sequence can elicit immunity to currently circulating as well as emerging dengue and west nile strains.

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