THE FIRST VACCINE AGAINST DENGUE
A GLOBAL PUBLIC HEALTH CHALLENGE

• Dengue fever, a mosquito-borne disease caused by four serotypes of dengue virus, is a threat for about half of the world’s population(1).
• Dengue is a pressing public health priority in many countries in Asia and Latin America where epidemics occur(2).
• Dengue fever occurs mostly in tropical and subtropical regions and is spreading to new parts of the globe each year(2).
• Many factors contribute to the spread of dengue fever, including urbanization and increased international travel which facilitate the dissemination and the transmission of this disease.
• While half the world’s population lives at risk of the disease, there is still no specific treatment available.
• The WHO has set the target to reduce dengue mortality by 50% and morbidity by 25% by 2020(3).

KEY FIGURES

ESTIMATED BURDEN OF DENGUE DISEASE, GLOBALLY:

3.9 BILLION PEOPLE
at risk in over 128 countries(1)

390 MILLION INFECTIONS
per year(4), of which
96 MILLION PEOPLE
show clinical symptoms(5)

500,000 PEOPLE,
including children, develop dengue hemorrhagic fever, a severe form of the disease(6)

UP TO $9 BILLION USD
each year in direct medical costs and indirect costs (lost productivity, absenteeism)(6)

EARLY SCIENTIFIC DISCOVERIES FORMED THE FOUNDATION FOR VACCINE DEVELOPMENT

1944:
Isolation and identification of the 1st serotype (in Hawaii, DEN1) and 2nd serotype (in N.Guinea, DEN2) by Sabin and Schelsinger(5).

1944-45:
First monovalent dengue vaccine, a live attenuated vaccine (LAV) DEN1, developed by Sabin and Schelsinger(5).

1956:
Isolation and identification of the 3rd serotype (DEN3) and 4th serotype (DEN4) by W. Hammon(6).

1970-1980:
Development of a tetravalent LAV DEN1, DEN2, DEN3, DEN4, by Pr Natth Bhamarapravati at the Mahidol University (Bangkok - Thailand). Data from clinical investigations conducted in Thailand showed hope for a tetravalent dengue vaccine(7).

DENGUE:
COUNTRIES OR AREAS AT RISK


Dengue virus under electronic microscope

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DENGUE:
COUNTRIES OR AREAS AT RISK


20 YEARS OF RESEARCH AND DEVELOPMENT FROM SANOFI PASTEUR

1994
Collaboration begins on agreement signed in 1993 between Sanofi Pasteur and the Vaccine Development Centre, University of Mahidol (Bangkok, Thailand).

2001
Proof of concept of a tetravalent live attenuated dengue vaccine candidate in two doses and a booster. Start of the development of a second generation vaccine obtained by recombinant technology.

2004
Sanofi Pasteur decides to pursue only the second generation, recombinant live attenuated vaccine.

2006
Collaboration with PDVI (Pediatric Dengue Vaccine Initiative), a consortium working to accelerate the introduction of a dengue vaccine candidate for children in endemic countries (supported by Sanofi Pasteur and the Bill and Melinda Gates Foundation).

2007
Positive results in phase II clinical studies; proof of concept for Sanofi Pasteur’s dengue vaccine candidate.

2009
Sanofi Pasteur dengue vaccine candidate enters a pediatric clinical efficacy study in Thailand.

JUNE 2010
The U.S. FDA grants fast track status to Sanofi Pasteur dengue vaccine candidate.

OCTOBER 2010
Sanofi Pasteur dengue vaccine candidate enters phase III clinical study.

FEBRUARY 2011
Collaboration with the International Vaccine Institute to support the DVI (Dengue Vaccine Initiative), a non-profit advocacy group focused on raising awareness of dengue fever and supporting the introduction of dengue vaccination, funded by the Bill & Melinda Gates Foundation and supported by Sanofi Pasteur.

JULY 2012
Results from Sanofi Pasteur’s phase IIb clinical trial in Thailand demonstrate that a vaccine is possible.

JULY 2014
World’s first phase III dengue vaccine candidate safety and efficacy study including 10,275 participants in Asia demonstrated protection against dengue and dengue hemorrhagic fever. Results published in The Lancet.

NOVEMBER 2014
Final phase III clinical safety and efficacy study in more than 20,869 participants in Latin America successfully completed. The study met its primary endpoint and showed efficacy against each of the four dengue serotypes. Results published in the New England Journal of Medicine.

JULY 2015
New England Journal of Medicine publishes new analyses confirming that Sanofi Pasteur’s vaccine candidate safely protects people 9-16 years old with similar safety protection expected in adults.

DECEMBER 2015
Sanofi Pasteur’s dengue vaccine receives its first market approvals in Mexico, the Philippines, and Brazil.

FEBRUARY 2016
First vaccinations begin in the Philippines.

APRIL 2016
Strategic Advisory Group of Experts on Immunization convened by the World Health Organization recommends use of Sanofi Pasteur’s dengue vaccine in dengue-endemic regions.

JULY 2016
World Health Organization position recommends countries with high dengue disease burdens consider vaccine introduction.

AUGUST 2016
First vaccinations begin in Brazil and El Salvador.

* Pooled efficacy analysis in 9-16 year olds over a 25-month period, following the first dose of the vaccine. Efficacy is extrapolated to individuals over 16 based on similar immune responses.

CLINICAL STUDIES:
A GLOBAL PROGRAM

• 15 countries included in the Sanofi Pasteur global clinical study program (phase I, phase II and phase III).
• First vaccine to successfully complete phase III clinical efficacy and safety studies in dengue endemic countries.
• Globally, about 40,000 volunteers participated in the clinical study program.
• 25 clinical studies (phase I, phase II, and phase III) in adults, adolescents, and children in the United States, Australia, Asia and Latin America.

*SANOFI PASTEUR IS COMMITTED TO BRINGING THE VACCINE TO COUNTRIES WHERE DENGUE IS A MAJOR PUBLIC HEALTH PRIORITY. BY VACCINATING THE POPULATION AND PREVENTING DENGUE IN MANY PEOPLE, GOVERNMENTS CAN EXPECT A SIGNIFICANT IMPACT ON THE GROWING HUMAN AND ECONOMIC BURDEN OF DISEASE. IT’S A UNIQUE CONTRIBUTION TO PUBLIC HEALTH AND A CONTINUATION OF OUR COMPANY’S HERITAGE: MORE THAN A CENTURY OF DEVELOPING AND DELIVERING INNOVATIVE VACCINES FOR PEOPLE AROUND THE WORLD.*

David Loew, Executive Vice President, Sanofi and General Manager, Sanofi Pasteur.
AN INDUSTRIAL PIONEER FOR GLOBAL HEALTH

In response to the global need for a dengue vaccine, Sanofi Pasteur built a new dedicated vaccine manufacturing facility in Neuville-sur-Saône, France in order to reduce the time necessary to provide access to the vaccine upon licensure.

- 2009: start of construction
- 2014: production site operational
- 2016 onward: production capacity of 100 million vaccine doses per year

THE NEXT STEP: ACCESS TO DENGUE VACCINATION

- Dengue vaccination programs that dengue endemic countries may implement can face important challenges such as creation of vaccination policies for the first dengue vaccine and access and financing mechanisms for people most in need.
- Preparation of vaccination programs requires collaboration across the public health community.
- Sanofi Pasteur is joining efforts with international organizations to raise awareness and support sustainable preventative measures against the disease.