



## Disease impact

Dengue, a mosquito-borne viral infection, is a major international public health concern, with nearly half of the world's population, an estimated 2.5 billion people in over 100 countries, at risk. The incidence of dengue has increased 30-fold over the last 50 years, but the true magnitude of the disease burden is not well established.

Dengue is a complex disease and a deeper understanding of the interactions between virus, host, and vector and their impact on the disease burden is needed. Dengue can affect anyone regardless of age, sex, underlying health, or socioeconomic status. The geographic distribution of the 4 dengue serotypes varies unpredictably over time, causing a continuous risk of infection in populations of endemic areas where current dengue prevention and control is costly and provides insufficient protection against disease. Epidemics and outbreaks are often only combated by reactive control measures, and they result in an increase of patients seeking medical care that can be disruptive to healthcare systems. Infection manifests in an unpredictable spectrum of disease. There are no specific treatment or prophylactic measures available. The health and economic impact of the disease is felt significantly at both the individual and societal levels. The development of a vaccine against dengue is therefore essential in order to achieve efficient control of the disease.



# Sanofi Pasteur dengue vaccine candidate

SANOFI PASTEUR 

## Key facts about vaccine R&D project

Sanofi Pasteur has been working on bringing the world the first vaccine against dengue for over 20 years. The company's goal is to make dengue a vaccine-preventable disease.

Work by Sanofi Pasteur began in the early 1990s with the development of the first candidate vaccine, a classic live attenuated (LAV) vaccine approach. Although this original vaccine was eventually abandoned, many important insights were gained. Most importantly, these lessons were carried forward to the new partnership formed in 1998 with Acambis (Cambridge, USA) where group of researchers were developing a vaccine candidate based on recombinant technology. This research helped pave the way for the development of the dengue vaccine by Sanofi Pasteur and eventually led to its initial proof of concept. Sanofi Pasteur dengue vaccine is the world's most clinically, and industrially, advanced candidate vaccine.

- **Candidate vaccine name:** Live attenuated tetravalent vaccine.
- **Current phase:** The vaccine is in phase III clinical development. Two large phase III clinical studies are ongoing in Asia (NCT01373281) and Latin America (NCT01374516) involving 31,000 adolescents and children. Results will be reported in H2 2014.
- **Countries where clinical trials are carried out:** Large scale phase III dengue vaccine clinical studies are ongoing in 33 clinical sites in Latin America (Mexico, Colombia, Honduras, Puerto Rico and Brazil) and in Asia (the Philippines, Vietnam, Malaysia, Indonesia, and Thailand).
- **Number of researchers/scientists involved:** Since 2006, more than 1200 people have reported time working on the Sanofi Pasteur dengue development program.
- **Investments in candidate vaccine to date:** Sanofi Pasteur invested €350 million for the production of its dengue vaccine, including a new dedicated vaccine manufacturing center in Neuville-sur-Saône, France. It's also 20 years of research, a global clinical program with over 40,000 children adolescents and adults in 15 countries, and today around 450 dedicated employees.
- **Forward looking:** The first regulatory approval of the vaccine could be as early as 2015 in endemic countries, pending positive results of the phase III studies and review by regulatory agencies.

- Sanofi Pasteur is partnering with institutions and leading academies to help better understand dengue disease, the corresponding virology and immunology, and support surveillance systems and laboratory capacity.

### Long-term commitment and R&D specific challenges and complexities

Starting date: 1994

The greatest scientific challenge that faced researchers developing a dengue vaccine candidate was to develop a vaccine candidate able to elicit an immune response against the four serotypes of the dengue virus. The prevalence of strains varies geographically, but co-circulation of all four serotypes is common in highly-endemic areas. The lack of an animal model also adds complexity in the development program.

In addition to the scientific commitment to develop the vaccine, Sanofi Pasteur made the decision to develop the vaccine, set up the industrial capacity with the creation of a new dedicated facility, and prepare for the market entry in parallel, rather than sequentially as most companies do. By adopting this innovative approach, the supply of the vaccine will be available to public health authorities for large public immunization program shortly after its first regulatory approval.

*“Dengue is one of the fastest growing public health concerns with no specific treatment today. The mission of Sanofi Pasteur is to develop the vaccine and also to provide the right quantity of vaccine available in the best condition of timing and quality for people who need it.”*



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Olivier Charmeil, President and CEO, Sanofi Pasteur

Moving forward, dengue prevention will require significant effort implementing effective vaccination policies, mobilizing adequate human and financial resources to execute routine and catch-up vaccination programs, giving access to people most in need and insuring an efficient disease surveillance. It is urgent that the public health community work together to start preparing for vaccination programs.

*“With half of the world’s population at risk, the availability of a dengue vaccine is an urgent global public health need. The health and economic costs of dengue are staggering. The loss of productivity and cost of dengue hospitalization and treatment amounted to an estimated \$12 billion in 2010 worldwide. Making dengue a vaccine preventable disease is a huge responsibility for Sanofi Pasteur and the entire public health community, and we are fully committed to meet this ambition.”*

Guillaume Leroy, Vice President, Dengue Vaccine head, Sanofi Pasteur.

### Why it matters

The vaccine could be supplied as early as 2015. At full capacity, the Sanofi Pasteur manufacturing facility is expected to be able to produce around 100 million doses of vaccine per year. Together with external experts, health authorities, and international organizations around the world, Sanofi Pasteur will support the setting of dengue immunization programs having a major public health impact. Preliminary mathematical models show that multiple catch-up cohorts, in addition to routine vaccination, have the potential to significantly reduce the medical and economic burden of dengue. When used in conjunction with other dengue prevention and control measures, broad vaccination programs are expected to reduce disease incidence and outbreaks and help meet WHO’s objectives to reduce dengue mortality by 50% and morbidity by 25% by 2020. Countries should start planning for the most effective vaccine introduction approach and implementation of vaccine delivery with the support of the international community.

### Learn more

For more information, please visit [www.dengue.info](http://www.dengue.info)



For more information visit [www.ifpma.org/resources/case-studies/case-study-dengue.html](http://www.ifpma.org/resources/case-studies/case-study-dengue.html)



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