VACCINES HELP PREVENT INFLUENZA AND REDUCE THE RISKS OF ITS SEVERE CONSEQUENCES

INFLUENZA IS A SERIOUS INFECTION THAT CAN HAVE UNEXPECTED, SEVERE CONSEQUENCES.

Anyone can catch influenza and spread it within their community.

Each year, 3 to 5 million cases of severe influenza are reported worldwide[1].

Everyone is at risk of influenza, as the disease spreads easily through coughing, sneezing or talking[2].

There are four main types of flu viruses with multiple sub-types that can infect people.

Different sub-types of viruses circulate across the Northern Hemisphere between the fall and following spring, which we call “flu season”. Each season it’s difficult to predict exactly which sub-types of the viruses will dominate, their severity, and the full impact on public health.

Influenza can lead to severe complications such as heart attacks and strokes.[3]

Some of the most severe complications from influenza infection are somewhat unexpected. Following an influenza infection, the risk of heart attack is elevated six times[4]. And up to two months after influenza infection, older adults are at higher risk of having a stroke[5].

Furthermore, influenza increases the risk of pneumonia by 100-fold [6,7].

Because influenza often aggravates underlying conditions, people living with asthma, chronic obstructive pulmonary disease (COPD), heart disease and diabetes are at higher risk of severe influenza-related complications[8,9,10].

People living with diabetes are 3-6 times more likely to be hospitalized due to influenza[11,12] and the risk of death from influenza complications is 6 times higher in this group[13].

Because age increases susceptibility to infection, older adults are the most at risk for influenza infection and serious outcomes[14,15].

Influenza infection can contribute to functional decline, or a senior’s inability to recover back to full prior functional capacity once the infection has passed[16].

Adults aged 65+ represent 9 in 10 influenza-related deaths[17] and 63% of influenza-related hospitalizations[18].

Influenza creates added pressure and economic burden on healthcare systems, societies and individuals.

The total economic burden of influenza, including direct and indirect costs, is significant but preventable.

In industrialized countries, the total economic burden of an influenza epidemic is estimated to be €57 million per million people, so €57 per person[19].

Compared to high income countries, the economic burden of seasonal influenza in low and middle income countries represents a higher percentage of national GDPs and ranges for seasonal influenza from 2–5% for Brazil and Russia, and 6% for Thailand, as compared to 0.13% for the US and comparable figures for European countries[20].

Annual influenza vaccination is considered the most effective way to prevent influenza infection and its complications.

The WHO advises annual influenza vaccination for people aged 65 and more, people with pre-existing health conditions (such as diabetes, asthma, chronic heart or lung diseases), children aged 6 months to 5 years, pregnant women and healthcare workers[21]. The WHO considers that "among healthy adults, influenza vaccine provides protection, even when circulating viruses may not exactly match the vaccine viruses." (WHO, 2018)

As importantly, a recent study has shown that influenza vaccination can help reduce the risk of heart attack by 15-45%. These are similar levels of risk reduction as those that are seen with other, more routine heart attack prevention measures such as smoking cessation (32-43%), high cholesterol (19-30%) and high blood pressure medication (17-25%)[22].

Annual influenza vaccination contributes to sustainable healthcare systems by preventing physician consultations, hospitalizations, absenteeism and lost productivity to societies and employers[23,24].

In fact, in the European Union (EU 27), influenza vaccination may save up to 37,200 lives and €332,000 million every season with observed coverage rates and observed vaccine effectiveness[25].

In its 2019-2030 Global Influenza Strategy, the WHO recognizes the value of influenza prevention in the fight against other global health threats, including preparing health systems for potential future influenza pandemics, antimicrobial resistance and even management and control of non-communicable diseases [26].

SANOFI PASTEUR MAKES AND DELIVERS INFLUENZA VACCINES

We offer vaccines to help protect people from the risk of serious illness caused by influenza.

The efficacy of our five influenza vaccines has been demonstrated through randomized clinical trials, the gold standard of medical evidence, and real-world experience.

Our standard quadrivalent (QIV) influenza vaccines include the 4 main influenza viruses that circulate each season.

Sanofi Pasteur's seasonal influenza vaccines are licensed and distributed in more than 150 countries[27]. And more than 3.5 billion doses of Sanofi Pasteur seasonal influenza vaccines have been distributed worldwide over the past 70 years[28].

We are developing the next generation of influenza vaccines.

We are actively exploring several strategies to develop a broadly-protective influenza vaccine, with the ambition to provide long-lasting protection against influenza and its related complications.

In 2017, we launched our own internal start-up called FluNxt, our biotech unit dedicated to accelerating the development of a broadly-protective influenza vaccine.

Also part of this approach, we have taken several steps to advance our research.

We are emphasizing a strong commitment to R&D partnerships with major universities, research institutes, public authorities and biotechnology companies.

Our collaborations cover all aspects of influenza vaccine development. We are investing in recombinant and cell-culture vaccine technologies to help improve both medical and manufacturing performance of our vaccines in the future.

This work includes a current collaboration with SK Chemicals.

Building upon a long-standing research collaboration with University of Ghent (Xavier Salens), we are investigating the application of neuraminidase enzymes to new influenza vaccines to potentially help boost the efficacy of current and future vaccines.

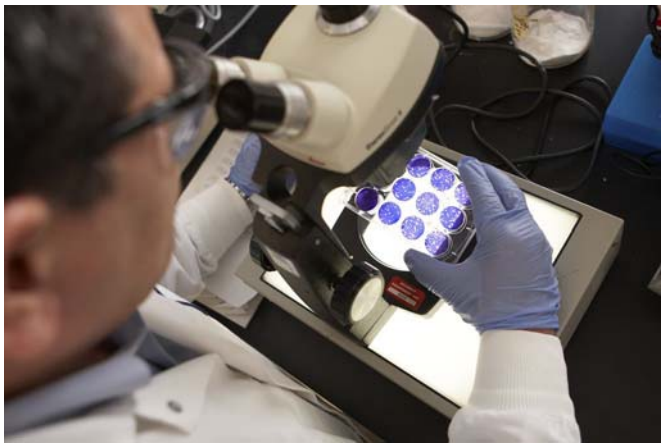
We are creating a multi-year collaboration with Ragon Institute at Harvard (Galit Alter) using systems serology to better understand the immune response to influenza and influenza vaccines.

And we have begun a Phase I study with the National Institutes of Health to investigate the impact of adjuvants on currently licensed influenza vaccines.

We bring science and support to our partners in influenza awareness and vaccination programs.

We are proud to collaborate with the Global Influenza Hospital Surveillance Network (GIHSN), an international platform of 60 hospitals coordinated by public health institutions from 18 countries. To support national health authorities in decision-making on influenza surveillance and related vaccination programs, GIHSN generates and shares evidence on the burden of severe influenza and on the public health benefits of influenza vaccines[29].

In collaboration with Google, Evidation Health and Doctor Evidence, we lead research on the impact of influenza on diabetes outcomes and on the reasons for current influenza vaccination coverage rates among patients living with diabetes in the US[30].



We manufacture our influenza vaccines with a quality mindset.

We are the world's largest manufacturer of influenza vaccines, and we have an enduring commitment to global public health. We provide sustainable supplies of influenza vaccines for people around the world who choose to get vaccinated each season.

We produce over 200 million doses of influenza vaccines each year for both the Northern and Southern hemisphere flu seasons[31]. This corresponds to 40% of the influenza vaccines distributed worldwide. We work on five manufacturing sites around the world: Swiftwater (Pennsylvania, United States), Pearl River (New York, United States), Val-de-Reuil (France), Ocoyoacac (Mexico) and Shenzhen (China).

All Sanofi Pasteur influenza vaccines are manufactured in accordance with current Good Manufacturing Practices (GMP), and comply with the company's specifications, and with the specifications approved by the Food and Drug Administration of the United States of America for vaccines manufactured in the USA and by the Agence Nationale de Sécurité du Médicament et des Produits de Santé (ANSM) for vaccines manufactured in France as well as the Mexican and

Chinese regulatory authorities for vaccines produced in those countries, respectively.

Over 70% of Sanofi Pasteur’s production cycle is dedicated to quality control. Further, our teams all work with a shared quality mindset that drives our everyday activities and ensures we’re delivering on our commitments to protecting health.

References

1. World Health Organization (WHO). (2018). Influenza (Seasonal). Retrieved from: https://www.who.int/en/news-room/fact-sheets/detail/influenza-(seasonal)

2. Centers for Disease Control and Prevention (CDC). (2018). How flu spreads. Retrieved from: https://www.cdc.gov/flu/about/disease/spread.htm

3. Center for Disease Control and Prevention (CDC). (2019). Flu and heart disease & stroke. Retrieved from: https://www.cdc.gov/flu/highrisk/heartdisease.htm?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fflu%2Fheartdisease%2Findex.htm

4. Kwong, J. et. al. (2018). Acute myocardial infarction after laboratory-confirmed influenza infection. The New England Journal of Medicine, 78(4), p.349. Retrieved from: https://www.nejm.org/doi/full/10.1056/NEJMoa1702090

5. Warren-Gash C., Blackburn R., Whitaker H., McMenamin J., Hayward A.C. (2018). Laboratory-confirmed respiratory infections as triggers for acute myocardial infarction and stroke: a self-controlled case series analysis of national linked datasets from Scotland. European Respiratory Journal, 51(3), 1701794. Retrieved from: https://erj.ersjournals.com/content/51/3/1701794

6. Metersky M.L., Masterton R.G., Lode H., File T.M. Jr., Babinchak T. (2012). Epidemiology, microbiology, and treatment considerations for bacterial pneumonia complicating influenza. Int J Infect Dis. 2012;16:e321–331. Retrieved from: https://www.sciencedirect.com/science/article/pii/S1201971212000367?via%3Dihub

7. Shrestha S., Foxman B., Berus J., Van Panhuis W.G., Steiner C., Viboud C. & Rohani P. (2015). The role of influenza in the epidemiology of pneumonia. Sci Rep. 2015;5:15324. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/26486591

8. Centers for Disease Control and Prevention (CDC). (2018). Who is at High Risk for Flu Complications. Retrieved from: https://www.cdc.gov/flu/highrisk/index.htm?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fflu%2Fabout%2Fdisease%2Fhigh_risk.htm

9. Centers for Disease Control and Prevention (CDC). (2019). Flu and people with diabetes. Retrieved from: https://www.cdc.gov/flu/highrisk/diabetes.htm?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fflu%2Fdiabetes%2Findex.htm

10. Wesseling G. (2007). Occasional review: influenza in COPD: pathogenesis, prevention and treatment. International Journal of Chronic Obstructive Pulmonary Disease, 2(1):5-10. Retrieved from: https://europepmc.org/abstract/med/18044060.

11. Allard R., Leclerc P., Tremblay C., & Tannenbaum T. (2010). Diabetes and the Severity of Pandemic Influenza A (H1N1) Infection. Diabetes Care, 33(7), 1491-1493. Retrieved from: http://care.diabetesjournals.org/content/33/7/1491

12. Bouter K. P., Diepersloot R. J., Romunde L. K., Uitslager R., Masurel N., Hoekstra J. B., & Erkelens D. W. (1991). Effect of epidemic influenza on ketoacidosis, pneumonia and death in diabetes mellitus: A hospital register survey of 1976–1979 in The Netherlands. Diabetes Research and Clinical Practice, 12(1), 61-68. Retrieved from: https://www.sciencedirect.com/science/article/pii/016882279190131V

13. Public Health England (PHE). (2019). Influenza: The green book, chapter 19. Retrieved from https://www.gov.uk/government/publications/influenza-the-green-book-chapter-19

14. Centers for Disease Control and Prevention (CDC). (2019). People 65 years and older & influenza. Retrieved from: https://www.cdc.gov/flu/about/disease/65over.htm

15. Gavazzi G. & Krause K. (2002). Ageing and infection. The Lancet Infectious Diseases, 2(11), 659-666. Retrieved from: https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(02)00437-1/

16. Gozalo P.L., Pop-Vicas A., Feng Z., Gravenstein S., Mor V. (2012). The effect of influenza on functional decline. J Amer Geriatr Soc. 2012 Jul;60(7):1260-7. Epub 2012 Jun 21. PMID: 22724499. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/22724499 ref

17. Centers for Disease Control and Prevention (CDC). (2019). People 65 years and older & influenza. Retrieved from: https://www.cdc.gov/flu/about/disease/65over.htm

18. Thompson, W.W., Shay, D.K., Weintraub E., et al. (2004). Influenza-associated hospitalizations in the United States. JAMA. 2004;292(11):1333-1340. Retrieved from: https://jamanetwork.com/journals/jama/fullarticle/199440

19. Commission of the European Communities (CoEC). (2009). Proposal for a Council recommendation on seasonal influenza vaccination. July 13: Retrieved from: https://ec.europa.eu/health/ph_threats/com/Influenza/docs/seasonflu_rec2009_en.pdf

20. De Francisco N., Donadel M., Jit M., et al. (2015). A systematic review of the social and economic burden of influenza in low- and middle-income countries. Vaccine; 33: 6537–6544. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0264410X15014954?via%3Dihub

21 World Health Organization (WHO). (2012). Weekly epidemiological record. Vaccines against influenza WHO position paper, 87, No. 47 p 461–476. Retrieved from: http://www.who.int/wer/2012/wer8747.pdf

22. MacIntyre C. R., Mahimbo A., Moa A. M., & Barnes M. (2016). Influenza vaccine as a coronary intervention for prevention of myocardial infarction. Heart, 102(24), 1953-1956. Retrieved from: https://heart.bmj.com/content/heartjnl/102/24/1953.full.pdf

23. Waure C., Veneziano M., Cadeddu C., Capizzi S., Specchia M., Capri S. & Ricciardi W. (2012). Economic value of influenza vaccination. Human vaccines & immunotherapeutics. 8. 119-29. 10.4161/hv.8.1.18420.Retrieved from: https://www.researchgate.net/publication/221753993_Economic_value_of_influenza_vaccination

24. Szucs, T. (1999). The socio-economic burden of influenza. Journal of Antimicrobial Chemotheraphy, 44, pp.11-15. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/10877457

25. Preaud E., Durand L., Macabeo B., Farkas N., Sloesen B., Palache A., Shupo F., Samson S.I., & Vaccines Europe influenza working group. (2014). Annual public health and economic benefits of seasonal influenza vaccination: a European estimate. BMC public health, 14, 813. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4141103/

26. World Health Organization (WHO). (2019). Global influenza strategy 2019-2030. Retrieved from: https://apps.who.int/iris/bitstream/handle/10665/311184/9789241515320-eng.pdf?sequence=1&isAllowed=yhttps://apps.who.int/iris/handle/10665/311184

27. Sanofi Pasteur (2016). Sanofi Pasteur, Seasonal Influenza Leader Factsheet. Retrieved from: http://www.news.sanofi.us/download/COM+11590+Influenza+Leader+Fact+Sheet+16March2016.pdf

28. Sanofi Pasteur (2017). Sanofi invests €170 in new vaccine production facility in France. Retrieved from: https://www.sanofipasteur.com/-/media/Project/One-Sanofi-Web/Websites/Global/Sanofi-Pasteur-COM/Home/en/media-room/docs/PR_20171012_SanofiInvestsE170Million_EN.pdf

29. Global Influenza Hospital Surveillance Network (GIHSN). (2018). Presentation of the Global Influenza Hospital Surveillance Network. Retrieved from : https://www.gihsn.org/images/gihsn/GIHSN-Presentation_Apr_2018.pdf ref 25

30. Sanofi Pasteur. (2017). Sanofi advances its digital strategy through reinforced ties with health behavior leader. Retrieved from: https://www.sanofi.com/en/science-and-innovation/evidation-health

31. Sanofi Pasteur (2019). Focus on Influenza. Retrieved from: https://www.sanofipasteur.com/en/media-room/focus-on-diseases/influenza

SANOFI PASTEUR

www.sanofipasteur.com
14 Espace Henry Vallée
69007 Lyon - France

SAGLB.IFLU.19.08.1186
Updated in October 2019