

With 2000 scientists in Belgium and a total of 9.000 employees, 19 candidate vaccines in the pipeline and 1.5 billion € of R&D expenditure in 2023, GSK is the largest pharma company in Belgium. GSK's Wavre site is also the largest vaccines manufacturing center in the world with a total of 550,000m², which is more than 70 football (soccer) fields combined. This key player relies upon global vaccine R&D centers in Europe (Rixensart in Belgium and Siena in Italy) and in the United States (Boston). An interview with Phd Jamila Louahed, Vice President, Head of Therapeutic Vaccines R&D and the Rixensart R&D center at GSK.

What are your R&D priorities?

Our R&D focus is to deliver new vaccines and medicines, using the science of the immune system, human genetics and advanced technologies. Our vaccines innovation strategy focuses on 3 priorities.

First, we apply our platform technologies to focus on developing new vaccines and medicines with high impact to prevent or treat infectious diseases. Having an industry-leading broad portfolio of platform technologies, including recombinant protein subunits, mRNA, adjuvants, live attenuated viruses, toxoids, generalized modules for membrane antigens (GMMA), monoclonal antibody, and structural antigen design, is at the heart of our strategy to deliver against this ambition. We apply these technologies – sometimes in combination – based on scientific insights on pathogens and diseases to create tailored solutions.



Mrs Jamila Louahed, VP Head of Therapeutic Vaccines R&D and the Rixensart R&D center

at GSK. © GSK

Second, we want to broaden the impact of our existing vaccines to protect more people through lifecycle management and innovation based on our leadership in meningitis, shingles, RSV and pediatric immunisation (e.g., label expansion, new formulations, development of “next generation assets”).

Finally, we connect experts across a wide range of science and technology areas to push the boundaries of innovation. To deliver new and improved vaccines, we leverage our expertise in multiple disciplines (e.g., immunology, virology, bacteriology, structural biology, vaccinology) and breakthroughs in life sciences, artificial intelligence, machine learning, and data analysis.

We are fortunate to access huge capabilities and resources within the global GSK R&D organization (encompassing vaccines and medicines), and we complement it with external collaborations and acquisitions that help us deliver the vaccines and medicines of tomorrow. We currently have more than 150 external scientific collaborations globally (20 with Belgian academia and research centers), and our 2022 acquisition of the Boston-based biotechnology company Affinivax is a good example of this approach.

Could you tell us about the vaccine candidates in development?

We have promising vaccine and anti-infectious candidates in various stages of development for diseases with high unmet medical need. Our candidates for bacterial infections such as pneumonia could help reduce the use of antibiotics and play a role in the global response to anti-microbial resistance (AMR), which is a growing public health problem and contributes to approximately 700,000 deaths annually around the world.

Additionally, we have several vaccine candidates for viral infections with high disease burden.



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Could you tell us about your research in the field of mRNA vaccines?

Advanced platform technologies are central to creating innovative, effective, and best-in-class vaccines, which is core to GSK's R&D strategy. The COVID-19 pandemic delivered a proof of concept for mRNA vaccine technology, ushering in a new era of vaccines R&D across industry. We are leveraging GSK's long history in mRNA research and significant capabilities in mRNA to make the platform technology suitable for infectious diseases with existing unmet medical need, such as influenza and COVID-19. Using different modalities and technology advances compared to the current standard of care, we aim to improve the efficacy and reactogenicity profiles of mRNA vaccines and continue developing our in-house mRNA and synthetic biology capabilities.

What is the contribution of digitalisation, artificial intelligence and machine learning to the design of vaccine antigens?

Advances in artificial intelligence (AI) and machine learning are playing a significant role in accelerating or simplifying vaccine development. As an example, we have partnered with other companies to pilot a Digital Twin, a complete and real-time simulation of the entire vaccine manufacturing process of one of our adjuvant's components. The benefits of this technology are numerous, including speed (it can run simulations in hours instead of having to build a test plant), sustainability (it reduces the amount of materials and energy required for real experimentation activities), safety (assurance of quality manufacturing agility (automation makes process robust and transfer between sites simpler), and education (off-line version of the Digital Twin can be used as a simulator for training).

The potential is huge: GSK next plans to expand and replicate this model for the production of all future new vaccines and in some of its discovery activities. Ultimately, the goal is to deliver more vaccines and medicines faster to people who need them.

What do you see as the main challenges and opportunities in vaccine research?

There are still many diseases and conditions for which we do not have vaccines and where the scientific challenge remains. However, the acceleration of scientific discoveries and applications of new technologies present many opportunities to make progress and deliver for patients.

For example, the lead times and investments required to develop new vaccines is challenging. By applying innovative approaches to help validate our targets at an early stage, we can focus on developing our most promising assets and mitigate risks. In addition, combination vaccines for respiratory diseases hold great potential to improve

protection, increase coverage, and reduce the burden of diseases like COVID-19 and the flu in older adults.



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Another challenge in vaccines R&D involves the use of biological components which can be quite complex to produce at large scale. We have developed strategic collaborations to help optimize our production processes, like the Digital Twin pilot or nanotechnology to automate and improve control processes in biomanufacturing of our vaccines, including those in development phase. This continuous improvement contributes to consolidate Belgium's strategic role in vaccine R&D and make Belgium the Health and Biotech valley of tomorrow.



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