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# Accelerating vaccines R&D in collaboration with GSK: partnerships that open new frontiers

COVID-19 reinforced the value of infectious disease vaccines and medicines. GSK works to realise that value by putting research and development at the heart of innovation, harnessing immune science, human genetics, and advanced technologies to deliver new and specialty products.

In 2021, GSK invested £5.3 billion in research and development (R&D), further growing a budget that has built a pipeline of 43 medicines and 21 vaccines, almost half of which address infectious diseases. As GSK's eight consecutive years at the top of the Access to Medicine Index (ATMI) show, diseases affecting the developing world are a particular focus. For instance, the GSK Vaccines Institute for Global Health is focused on addressing infectious diseases in developing countries.

## Uniting science, talent and technologies

Through a unified R&D organization bringing vaccine and medicines science together, GSK's R&D teams advance opportunities to connect treatment and disease prevention. As such, GSK's pipeline includes programs in which different technologies and expertise are combined to get ahead of disease for all age groups, including populations with specific needs. This pipeline includes vaccines and monoclonal antibodies (mAbs) in development to protect against COVID-19 and influenza, as well as antisense oligonucleotide and therapeutic vaccine approaches to chronic hepatitis B virus infection, following decades of success for the prophylactic vaccines.

## Life-long protection from pathogens

GSK's science-led and collaborative approach to vaccine R&D, pairing 2,000 in-house scientists with external expertise, supported more than 250 manuscripts in 2021, and a pipeline of candidates that are predominantly developed through collaborations.

Working out of 12 manufacturing sites, the company distributed 767 million vaccine doses across more than 160 countries in 2021. More than ten million people received one of GSK's meningococcal vaccines, and GSK is building on its leadership in invasive meningococcal disease protection with a five-in-one vaccine candidate currently in phase 3 development.

The meningococcal vaccines are part of a portfolio of licensed vaccines, considered the broadest in the industry. After a product is on the market, GSK keeps looking for ways to further help patients and broaden protection.

In the case of GSK's recombinant herpes zoster vaccine, a proprietary Adjuvant System plays a key role in its high efficacy, by helping to boost the immune response. This adjuvant is part of an industry-leading portfolio of technologies that includes, amongst others, small-molecule immune potentiators, and a pandemic adjuvant technology used as part of GSK's

### VACCINE TARGETS AND ANTIGENS

- Tools for discovery and identification of vaccine targets (infectious and chronic diseases)
- Associations between infectious agents and chronic diseases
- Structural vaccinology and antigen design
- New carrier proteins, nanoparticles, virus-like particles, ...

### IMMUNOLOGY AND VACCINOLOGY

- Characterization of host-pathogen interactions and immune responses
- Immunotherapy of chronic diseases
- Epigenetic research of innate immune cells (trained immunity)

### TECHNOLOGIES TO ACCELERATE R&D

- Assays on a chip for clinical read-outs, quality control and assurance
- Novel clinical trial designs (incl. human challenge models)
- Biomarkers research and application of systems biology to new readouts
- Development of in vitro models such as organoids or organ-on-chip systems



### TECHNOLOGY PLATFORMS

- Immunomodulation technologies and adjuvants (incl. tolerogenic adjuvants)
- mRNA vaccine technologies (sequence optimization, backbone, ...)
- Microbiome impact on immune response
- Discovery, identification, engineering of human monoclonal antibodies

### COMPUTATIONAL R&D

- Novel applications of systems biology, data modelling/analysis and artificial intelligence
- Data science

### VACCINE DELIVERY

- Formulations of protein/mRNA based vaccine (Tissue targeting, thermostability, encapsulation, single-dose vaccine)
- Delivery methods/devices/vectors enabling alternative routes of administration (oral, mucosal, intradermal, ...)

### PRODUCTION PROCESS TECHNOLOGIES

- Technologies to characterize or improve biomanufacturing (PAT, biosensors, microfluidics, continuous manufacturing, ...)

## Areas of interest for potential partnerships with GSK Vaccines R&D.

bio-preparedness response, including the ongoing response to the COVID-19 pandemic.

A candidate RSV vaccine for older adults includes the adjuvant used in the recombinant herpes zoster vaccine, to help address the effects of immunosenescence in the target population. GSK's expertise in immunosenescence is embedded in its focus on vaccine-enabled healthy ageing, exemplified by the company's active role in the VITAL consortium under the EU-funded Innovative Medicine Initiative (IMI).

## Responding to health crises with partners

GSK is committed to contributing to the global response to COVID-19, as evidenced by collaborating with Vir Biotechnology on the then-preclinical therapeutic mAb sotrovimab. The treatment came to market only 13 months after the collaboration's initiation, highlighting the value of collaborations in fast-tracking product delivery. GSK has also advanced vaccine collaborations, including adjuvanted protein-based candidate vaccines with Sanofi and SK bioscience, the adjuvanted plant-based vaccine with Medicago, and next-generation mRNA vaccines with CureVac.

The COVID-19 pandemic showed the global community that better ways are needed to manage pathogenic threats such as the rise of antimicrobial resistance (AMR)—one of the top 10 global health threats according to the World Health Organization.

GSK contributes to the response to AMR with several bacterial vaccine programs in early clinical development—using platform technologies such as generalized modules for membrane antigens, adjuvants, bioconjugation or mRNA—and through the IMI consortium PRIMAVERA. The company's AMR expertise and engagement was recognized by the global non-profit CARB-X, which is funding some of GSK's research work, and by the ATMI, which has repeatedly ranked GSK industry leader of its AMR Benchmark.

Science-driven partnerships between medicine and vaccine developers, other businesses, consortia, non-governmental organizations, and academia showed their value during the COVID-19 pandemic. GSK, with more than 150 scientific collaborations in 2021, welcomes partners on projects spanning discovery to late-phase development, to accelerate vaccine development and strengthen supply performance. Ultimately, uniting forces will help deliver greater impact for patients around the world.

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