



GSK Vaccines

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Could your science and technology accelerate vaccine research?

Combine your knowledge with GSK's to help develop innovative vaccines together.

The rapid advances in fields as diverse as human genetics and data analytics are creating opportunities to dramatically improve human health. GSK, recognizing that no single company can master all these fields, is collaborating with organizations inside and outside life sciences to achieve breakthroughs in the discovery and development of innovative vaccines.

In pursuing its goal of helping people to feel better and live longer, GSK has become a science-led company with three global businesses that discover, develop and manufacture medicines, vaccines and consumer healthcare products.

GSK invested £673 million in core vaccines research and development (R&D) in 2018. This strong engagement is enabling GSK to leverage breakthroughs in its knowledge of the immune system, human genetics and advanced technologies to discover and develop differentiated vaccines.

Improved understanding of biology is fueling the development of novel, targeted vaccines. In parallel, the rise of digital technologies and data analytics is creating new opportunities to understand the effect of interventions on diseases. GSK is building on these advances by using reverse vaccinology, innovative trial designs and other techniques to accelerate vaccine discovery and development. Effectively harnessed, GSK believes these advances will help improve health outcomes.

Accessing expertise and new ideas

As proactive or preventive interventions, GSK believes vaccines play an important role in improving the health of billions of people throughout their lives and will continue to do so in the coming decades. GSK, the world's leading vaccine company, delivers more than 2 million doses a day across 158 countries to protect people from infectious diseases and is developing next-generation vaccines.

Working out of three global R&D centres in Belgium, Italy and the US, GSK's 2,500 vaccine scientists have built a pipeline of 16 candidate vaccines across all R&D phases. Over the past five years, these teams have introduced key innovations in vaccine development.

None of this would have been possible without external collaborations. GSK knows that some of the people and technologies needed to make vaccine breakthroughs and speed them to market are found outside its walls. This has led GSK to form approximately 150 external scientific vaccine collaborations to develop its pipeline.

These collaborations, which range from early research to late-stage development, are united by their focus on advancing the frontiers of disease prevention. The collaborations feature pharma and biotech companies, consortia, charities, foundations,

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

Immunology and vaccinology

- Understanding host-pathogen interactions and immune responses to infectious diseases and vaccines
- Microbiome function and impact on immune responses

New vaccine targets

- Discovering targets and developing new protective antigens to prevent or treat the following
 - Infectious diseases (bacterial and viral diseases and diseases prevalent in the developing world)
 - Noncommunicable diseases, e.g. cancer

New technology platforms

- Developing new approaches to modulate the immune system, including adjuvants, adenoviral vectors, self-amplifying mRNA (SAM)
- New immunization strategies and technologies

Vaccine delivery and antigen design

- Developing mucosal, oral, sublingual, nasal and intradermal delivery methods and devices
- Developing nanoparticles and virus-like particles and investigating antigen stability
- Structural vaccinology
- Monoclonal antibodies

New production process technologies

- Technologies to accelerate development and manufacturing of new target antigens
- Process monitoring, process efficiency, simpler and faster antigen production
- Alternative expression systems
- Thermostability
- Biosensors
- Microfluidics

New technologies and tools to accelerate R&D

- Miniaturizing clinical assays, making them faster and more robust and developing quality control and assurance assays
- New clinical trial designs
- Biomarkers and the application of systems biology to (new) readouts
- Assays on a chip

Artificial intelligence and digital data analytics

- Novel applications of systems biology and data analysis
- Modelling
- Bioinformatics

government researchers, academic groups and businesses in industries outside of life sciences. GSK also supports graduate and postdoctoral research programs and provides courses for PhD students.

The breadth of collaborators is testament to GSK's awareness of the scientific and technological gaps that impede vaccine R&D and its recognition that parts of the solutions come from multiple sources.

Forming effective collaborations

GSK starts each potential collaboration with a scientific evaluation of the opportunity conducted by its vaccine R&D experts. The next stage is to understand how the perspectives, needs and priorities of the potential collaborator may match or complement the perspectives, needs and priorities of GSK. This enables GSK and the partner to craft collaborations together that yield the best results, for all parties.

Once a collaboration is active, GSK entrusts its scientists to manage the relationship, facilitating close communication. Throughout each collaboration, GSK collects and acts on feedback from its partners to drive continuous improvement.

This approach has led to some notable successes. For example, as part of the EU funded project DiViNe, GSK together with the consortium partners, is applying innovative nanotechnologies to establish an affinity chromatography platform for efficient and sustainable vaccine purification. GSK is working with postdoctoral researchers and PhD students at the University of Southampton to glean insights from the findings of a pivotal epidemiological study into chronic obstructive pulmonary disease (COPD). By 2030, COPD is predicted

to become the world's third-leading cause of death¹. GSK's COPD candidate vaccine marks a move away from disease prevention toward the development of a disease-modifying vaccine that could reduce the frequency of COPD exacerbations.

At the European level, GSK has joined academia, patient groups, other pharma companies, regulatory agencies and others as part of the Innovative Medicines Initiative RESCEU project (REspiratory Syncytial virus Consortium in EUrope) to share knowledge of the respiratory syncytial virus. GSK has also partnered with the International AIDS Vaccine Initiative to develop a new prophylactic vaccine to help prevent tuberculosis infection.

GSK's success demonstrates the effectiveness of its collaborative approach to vaccine R&D, but the company is not resting on its laurels. In its ongoing effort to accelerate vaccine R&D and improve human health, GSK is building a new culture and increasingly seeking partners in other industries.

Through these efforts, GSK stands to continue forming the multitalented teams needed to address major public health challenges.

1. World Health Organization. World health statistics 2008. WHO <http://www.who.int/whosis/whostat/2008/en/index.html> (2008).

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