part of Open Orphan plc

Infectious Diseases

COVID-19

The Challenge

Coronaviridae are a family of viruses that frequently cause mild illnesses, such as the common cold, in all age groups. Recently emergent strains, such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) have been associated with more severe disease, especially in vulnerable populations. In December 2019, a new betacoronavirus was identified as the cause of an atypical disease outbreak that originated in the Wuhan district of China.

This new virus, named 'Severe Acute Respiratory Syndrome CoronaVirus 2' (SARS-CoV-2), was highly transmissible, leading to an epicentre of infectious disease in Europe by early 2020. The disease caused by the virus came to be known as 'CoronaVirus Disease 2019' (COVID-19). In March 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic. The COVID-19 pandemic has led to a series of rolling lock-downs around the world and caused over 500M infections and 6M deaths.

Although a large number of COVID vaccines and treatments are currently approved for the control of COVID-19 disease, the imperative is for vaccines that prevent transmission as well as for novel, highly effective therapeutics in hospitalised patients. The relentless progression of new variants from Alpha to BA.4 has highlighted this need for new drugs and vaccines.

The COVID-19 challenge model

As the global leader in Human Challenge Trials, hVIVO performed the World's first COVID-19 human challenge trial in 2021. hVIVO has since developed and can offer Wuhan & Delta strains of SARS-CoV-2 for Human Challenge Models, allowing for estimations of efficacy for new vaccines and therapeutics against a broad diversity of COVID strains as measured by qRT-PCR, TCID50 and symptoms.

The challenge model as a solution

The COVID-19 Human Challenge Model offers drug and vaccine developers a wide range of solutions to speed up the development of their product:

- **Efficacy testing of `next generation` vaccines in a controlled setting.** The unpredictability of future COVID-19 outbreaks makes the planning and execution of an efficacy field trial challenging – COVID-19 Human Challenge Modelling is a reliable and controlled approach to obtaining efficacy data in adult populations.
- **Relative protective efficacy of SARS-CoV-2 vaccines.** Using licensed vaccines as a benchmark, new vaccines can be directly and rapidly compared for prioritization. Field studies to determine relative efficacy would be unfeasibly large and subject to unavoidable confounding factors.
- **Effect of vaccination on viral shedding from the nose (transmission blockade).** Preventing infection in the upper respiratory tract and blocking subsequent viral shedding is critical to reducing the transmission of virus. Such reductions cannot be practically assessed in field studies.
- **Comparative efficacy of vaccines with different modes of action.** Different vaccine platforms may induce distinct mechanisms of protection that are assessable only in a controlled study, with frequently incomparable immune readouts being directly translated into measurable viral and host effects.
- **Vaccine-mediated correlates of protection in immunized participants.** Vaccine-induced markers that correlate strongly with protection from challenge infection can be validated as measures for vaccine licensure of new vaccine candidates in lieu of determining efficacy in a Phase 3 trial.
- **Accelerated and augmented selection of optimal vaccine dose and dosing regimen, including heterologous combinations.** The rapid realization of data in small cohorts allows for improved comparative analyses, decreasing the risk of failure at Phase 3.
- **Vaccine Boosters – comparative efficacy against variants of concern (VOCs).** Challenge viruses made using VOCs enable estimations of protection relating to homologous and heterologous vaccine booster regimens (class, combination/s, timing, peak and longevity)

To have a look at the results of the first ever SARS-CoV-2 Human Challenge Study, please see our paper that was published in March 2022 in Nature: "Safety, tolerability and viral kinetics during SARS-CoV-2 Human Challenge in young adults".