COVID-19-RELATED RESEARCH AT THE FRANCIS CRICK INSTITUTE

The COVID-19 crisis requires a rapid, coordinated research effort to reduce the spread of SARS-CoV-2, the virus that causes COVID-19, and minimise the loss of life. At the Crick, our excellence in discovery research, diverse science base, focus on human biology and links with clinical hospitals and global research collaborators, such as the World Health Organization, make us well placed to drive progress in the fight against COVID-19 and SARS-CoV-2.

To support the national and global effort, we have devised a research strategy that addresses the immediate practical challenges of controlling the virus, whilst seeking to deliver more definitive therapeutic solutions in the longer term. Our comprehensive COVID-19 research programme brings together a team of approximately 110 world-leading scientists across 12 laboratories, who will focus their expertise and energy on finding solutions to some of the most pressing challenges posed by COVID-19 and SARS-CoV-2.

The establishment of an extensive biobank of COVID-19 samples housed at the Crick and available to the scientific community will support this ambitious scientific and clinical programme, advancing our understanding of the virus and guiding the development of new tests, treatments and vaccines.

The programme is underpinned by five strategic themes, each led by eminent scientists and multidisciplinary groups of researchers:

1. DETECT SARS-COV-2 RAPIDLY, ACCURATELY AND AT SCALE

The need for rapid and accurate testing to help contain the spread of the virus and keep keyworkers safe is well documented, as is the UK's lack of capacity in this area. At the Crick, we responded rapidly to the outbreak in March by working with our university hospital partners and commercial organisations to transform our laboratories into a high-throughput SARS-CoV-2 testing centre. We have the capacity to carry out more than 2,000 tests per day and at present we are supporting 10 hospitals, the London Ambulance Service and a number of care homes.

We have also made our standard operating procedures publicly available to aid other laboratories in establishing their own testing sites, thus building critical capacity across the country. To date, we have advised 40 institutions on the establishment of the diagnostic pipeline, which has led to the Crick being cited as a National Exemplar Site in the Diagnostic Testing Guidelines by the Department of Health and Social Care.

The experience of developing and operating our testing infrastructure, combined with our strengths in immunology and molecular biology, puts us in a strong position to develop, compare and evaluate new diagnostic methods to improve the speed, accuracy and cost of mass SARS-CoV-2 testing. A particular area of focus for us is the development of simple methods that can be used at the point of patient care, without the need for specialised equipment or expertise. Another priority is the development of blood tests that will be used to screen the population in order to detect exposure to the virus.

2. UNDERSTAND THE ROLE OF IMMUNITY AND THE IMMUNE SYSTEM IN COVID-19

Questions around immunity to SARS-CoV-2, how long it lasts and how we assess it remain unanswered. At the Crick, we're harnessing our clinical links and applying our expertise in areas such as immunology, virology and pathogen biology to address these problems.

Our scientists are developing a number of techniques to detect antibodies in the blood and identify whether someone has been infected with SARS-CoV-2. This work will also determine how effective these antibodies are at preventing the virus from infecting human cells and how long the antibody response to the virus lasts.

To further investigate the immune response to SARS-CoV-2, we'll use human samples from COVID-19 patients, along with samples from those who did not get the disease, to understand the causes of excessive immune response. Our experts in disease modelling will study the earliest interactions between the virus and the immune system via an array of laboratory models of infection – something that's extremely difficult to study in the clinic.

3. INVESTIGATE THE MOLECULAR BIOLOGY OF SARS-COV-2 TO REVEAL NEW TARGETS FOR TREATMENTS

Given the uncertainties around immunity to SARS-CoV-2 and how long it lasts, there is a critical need to develop effective anti-viral treatments. We're pivoting our world-class expertise in virology, structural biology and chemistry to answer fundamental questions about the molecular mechanisms that enable SARS-CoV-2 to function, multiply and spread, with the aim of uncovering new ways to treat the infection.

Our specialised facilities will enable researchers to safely isolate SARS-CoV-2 from patient samples and study it within a tightly controlled setting using genetic, chemical and computational approaches. With a wealth of expertise in cell biology and imaging, we're in a strong position to answer key questions, such as how the virus attaches to cells, how it enters cells, how it replicates and how it moves on to infect more cells.

Understanding what drives the virus lifecycle will unveil anti-viral targets and enable us to perform initial screens for inhibitory molecules, while our well-established partnerships with pharmaceutical companies will allow us to rapidly capitalise on any promising therapeutic discoveries.

4. STUDY THE PATTERNS, CAUSES AND EFFECTS OF SARS-COV-2 INFECTION IN LARGE POPULATIONS OF PEOPLE

There is a pressing need to determine the factors that contribute to the spread of SARS-CoV-2 in different settings, particularly in the healthcare sector, in order to develop effective healthcare policies and protect the public. We urgently need to understand how the quantity, source and complexity of the virus impacts the severity of SARS-Cov-2 infection.

The Crick's platforms for viral diagnosis (theme 1) and our close links to hospital partners at the centre of the current epidemic place us in an ideal position to advance our understanding of these factors and improve clinical management of the disease.

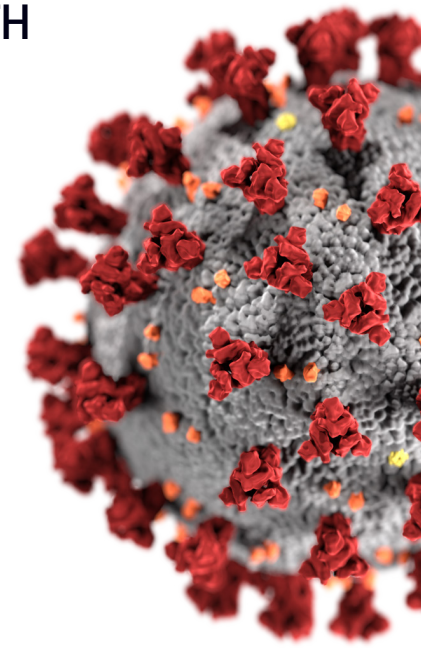
Our research aims to determine how individual patients and healthcare workers are impacted and how factors such as ethnicity, age and existing health conditions affect the risk of severe disease. This research will provide critical information to help develop systems and policies to effectively protect hospital patients, people in care homes and healthcare workers. This work will also enable better understanding of the evolution of the virus and the threat that mutation may pose.

5. EXPLORE HOW SARS-COV-2 INFECTION IMPACTS VULNERABLE INDIVIDUALS, SUCH AS PEOPLE WITH CANCER, AND HOW WE CAN BEST PROTECT THEM

SARS-CoV-2 infection is creating major challenges for clinicians delivering care to vulnerable individuals, such as those with cancer. Clinicians are forced to make changes to anti-cancer treatment which could significantly impact a patient's cancer outcomes.

The Crick's world-leading cancer, immunology and infection research expertise, together with our interface with clinical cancer care, make us ideally placed to address questions around the risks of SARS-CoV-2 infection in the context of different cancer types and the challenges it poses to cancer treatment such as radiotherapy, chemotherapy, and immunotherapy.

Through a collaboration with the Royal Marsden NHS Foundation Trust, our researchers will determine how cancer patients can obtain the anti-cancer treatments they need in the safest possible way and inform clinical guidance and policy.



Scientific and social impact are at the core of our COVID-19 research programme. Our aim is to generate key biomedical outputs that will advance the scientific field and inform health protocols, ultimately protecting the public and saving lives.

If you would like to support the Crick's work into COVID-19, please contact the philanthropy team at Philanthropy@crick.ac.uk or on 0203 796 2747.