

RISING TO THE CHALLENGE – THE CRICK AND CORONAVIRUS



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The Francis Crick Institute was set up to carry out blue-skies biomedical research – to understand the biology underlying human health and disease. It’s the kind of research that expands our horizons and broadens our understanding of human diseases, but also the kind of work that can be years away from benefiting patients.

But when the world is in the grip of a pandemic that is taking hundreds of thousands of lives, it can’t afford to wait years. In the face of a new and unknown virus, the science community was being looked to in an unprecedented way to help us understand and tackle it. And the answers were needed quickly.

It was a galvanising moment for Crick researchers who saw that their work and their expertise could help shed light on the SARS-Cov-2 virus. And the Crick had other unique strengths to contribute to both the national and global responses to the pandemic.

For some research groups it meant pausing their current research to respond, pivoting onto new projects to help build the world’s understanding of the infection. We have seen researchers from multiple disciplines approaching complex questions in different ways and sharing their results; their exchanges sparking new ideas and new theories.

PARTNERSHIP

Though the Crick only opened 4 years ago, one of our strengths lies in our history. The institute was born of the merger of two venerable research institutes; the Medical Research Council’s National Institute for Medical Research and Cancer Research UK’s London Research Institute. They, together with Wellcome, UCL, Imperial College London and King’s College London make up our founding partners, giving us a strong network of relationships to draw upon.

Scientific, academic, business and clinical collaborations are woven into our fabric. Those partnerships have made it easier for us to down tools, respond where we are needed and adapt fast. As part of our COVID response we have partnered across disciplines, sectors and countries.

THE CRICK COVID CONSORTIUM

Early in the pandemic, when the need for rapid and accurate testing was becoming increasingly apparent, the Crick looked at the national challenges in developing large scale testing, and saw that we could play a part. We had the right equipment, expertise, adaptability and partnerships to contribute to the national need. Working with University College London Hospitals (UCLH) NHS Foundation Trust and its diagnostic partner Health Services Laboratories (HSL), we transformed our laboratories into a high-throughput testing centre in just 11 days, with the help of hundreds of volunteer staff and students.

We have just carried out our 50,000th test, helping 10 hospitals, the London Ambulance Service, and a number of care homes to test staff and patients.

We have made our procedures publicly available, to help other laboratories set up their own testing sites. So far, we have advised 40 institutions on training and protocols.

MULTI-DISCIPLINARY

With lead researchers from the physical, biological and clinical sciences, the Crick encourages collaboration between disciplines, while supporting people at every career stage to work together. So it was natural for researchers to work across groups in collaboration with our cutting-edge science and technology platforms to answer some of the fundamental questions about the virus and how it behaves.

Crick scientists benefit from specialised facilities including high level containment labs which enable the study of the pathogen within a tightly controlled setting. We’re applying expertise in virology, immunology, structural biology, and chemistry to understand the lifecycle of the virus –

how SARS-CoV-2 attaches to cell surfaces, how it enters cells, and how it replicates inside cells. By knowing more about how the virus functions, one of the things we hope to learn is how potential drugs interfere with stages of the virus lifecycle.

By drawing on years of expertise studying viruses like HIV and influenza, we are using a combination of techniques including high-resolution imaging and reverse genetics to build up a picture of how SARS-CoV-2 infects cells.

We already have long-standing partnerships with pharmaceutical companies like AstraZeneca, GSK and MSD, and industry scientists work closely alongside Crick researchers to speed up the discovery and development of new treatments. Teams across the Crick are collaborating to create methods for systematically testing many approaches, including drugs and antibodies, that might block the virus from entering cells, or limit its ability to replicate once inside the cell.

BIOMARKERS TO PREDICT DISEASE PROGRESSION

People infected with SARS-CoV-2 respond differently. Some do not develop any symptoms, some need to be hospitalised and, for some, the disease is fatal.

In a study by Crick research group leader, Markus Ralser, researchers found 27 potential biomarkers that are present in different levels in patients with COVID-19, depending on the severity of their symptoms.

The researchers refined an analysis method called mass spectrometry to rapidly test for the presence and quantity of various proteins in the blood plasma. This platform was developed at the Francis Crick Institute and applied to analyse serum of 31 COVID-19 patients at the Berlin University hospital Charité. Their results were further validated in 17 patients with COVID-19 at the same hospital and in 15 healthy people.

The researchers hope their findings will lead to the development of simple routine tests to check for the levels for one or some of these proteins in patients with COVID-19. The results of such tests could be used to support doctors in deciding what treatment to give.

THE CRICK'S UNIQUE MODEL

At the heart of the Crick's model is our focus on talent. We create a supportive environment to enable our researchers to develop their scientific and leadership skills, and then help them move on to the wider UK biomedical research community. Our ambition is that they will ultimately become world-class science leaders, acting as a pipeline for UK research.



Like the rest of the country, Crick researchers have had to start working in new ways. Many have been able to carry on with some of their research while working remotely. Others have been able to change their focus and work on COVID-19, like Nikhil Faulkner and Kevin Ng, who are PhD students in the Crick's Retroviral Immunology Laboratory, studying how our bodies respond to viruses. They have refocused on finding out what happens when our immune system is exposed to SARS-CoV-2. They've developed a highly sensitive test to detect antibodies that attach to the SARS-CoV-2 spike protein, which could be useful for diagnostics and research.

Enzo Poirier and Mike Buck are postdocs who, before COVID, worked on the immune system's response to cancer, but are now developing a new testing method to detect SARS-CoV-2. Their colour-change test gives a result within 25 minutes, and has just been clinically validated. They have already shared their approach with the research community so that it can be used widely.

The challenges of COVID-19 have forced the whole scientific community to think differently about how we work. At the Crick we are hoping this can help catalyse long-term improvements in research culture.

IMPACT OF COVID-19

In the last few months, the global science and research landscape has been radically transformed, but major and long-term research projects have been delayed, sometimes for years, with inevitable consequences for patients waiting for new treatments.

The large national Tracer X trial, a 10-year programme tracking lung cancer and how tumours change over time, has been paused, setting it back by as much as five years.

The pandemic has also had an immediate and profound impact on medical research funding, because of the loss of charity fundraising income. The economic impact of COVID-19 poses a real threat to the viability of charity-funded research, both now and in the future.

THE R&D ROADMAP

The COVID-19 pandemic has brought the importance of science into sharp focus and the Government has recognised, in its R&D Roadmap, the critical role that research and innovation will play in the UK's economic and social recovery from the virus' impacts.

The roadmap sets out an ambitious vision for UK science and recognises the importance of long-term investment in fundamental research and bridging the gap between discovery and application.

Scientific collaboration across countries and disciplines is critical as we look to tackle the biggest problems facing society. Maintaining the UK's position as a destination of choice for international talent will be essential, and the Government's renewed statement of ambition to participate in EU research programmes has given the sector hope. In a 2018 survey, 97% of Crick Group Leaders said they would prefer to participate in EU Framework programmes than to develop alternatives.

The Crick was set up to be agile, multi-disciplinary, collaborative. In the face of the COVID-19 pandemic, the benefits of that approach have become evident. The COVID-19 pandemic demonstrates what can be achieved through partnership and collaboration and we look forward to working with the Government to ensure that science is able to play its crucial role in the future of the UK. □