New partnership to sequence human genomes in fight against coronavirus

- Genetic susceptibility to coronavirus to be tested in ground-breaking nationwide study
- Genomes of thousands of patients with coronavirus will be sequenced to understand how a person's genetic makeup could influence how they react to the virus
- Genomics England partners with University of Edinburgh to lead research drive to support the search for new treatments

A major new human whole genome sequencing study will take place across the NHS, involving up to 20,000 people currently or previously in an intensive care unit with coronavirus, as well as 15,000 individuals who have mild or moderate symptoms.

Genomics England, is partnering with the GenOMICC consortium, Illumina and the NHS to launch the research drive, which will reach patients in 170 intensive care units throughout the UK.

The project is backed by £28 million from Genomics England, UK Research and Innovation, the Department of Health and Social Care and the National Institute for Health Research. Illumina will sequence all 35,000 genomes and share some of the cost via an in-kind contribution.

The study, facilitated by the University of Edinburgh and multiple NHS hospitals, will explore the varied effects coronavirus has on patients, supporting the search for treatments by identifying those most at risk and helping to fast-track new therapies into clinical trials.

Secretary of State for Health and Social Care Matt Hancock said:

> As each day passes we are learning more about this virus, and understanding how genetic makeup may influence how people react to it is a critical piece of the jigsaw.
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> This is a ground-breaking and far-reaching study which will harness the UK's world-leading genomics science to improve treatments and ultimately save lives across the world.

Since genetic discoveries need very large numbers of patients, the GenOMICC study ultimately aims to recruit every single COVID-19 patient who is admitted to intensive care in the UK.

Patients will only be enrolled in the study if they, or their next of kin, have given their consent.

As part of this study so far, DNA samples have been collected from almost

2,000 patients.

Chris Wigley, CEO of Genomics England, said:

> At Genomics England, we are extremely proud to be working with the NHS and other partners in the fight against COVID-19, to understand why people respond differently to this infection.
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> Our goal with this study is to help the national response to this terrible pandemic, using the experience we have gained through the 100,000 Genomes Project, and leveraging our ongoing work in genomic research and healthcare.
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> As with all groundbreaking science, we don't know what the answer is yet – but we are convening the finest minds in academia and industry to try to find out.

Genomics England will read the data from entire genomes – or genetic blueprints – of thousands of people who have been most severely affected by coronavirus and compare them to those who experience only mild symptoms.

Dr Kenneth Baillie, Chief Investigator at the University of Edinburgh, leading this study, said:

> Our genes play a role in determining who becomes desperately sick with infections like COVID-19. Understanding these genes will help us to choose treatments for clinical trials.
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> The GenOMICC study was launched before this outbreak and it is recruiting in more than 160 ICUs across the country with tremendous support from the critical care community. We are excited to work with Genomics England to tackle this new and complex disease.

By combining the genome with rich clinical characteristics and comparing those who become severely ill with those that experience a much milder illness, the consortium hopes to gain new insights into how the virus affects us.

This ground-breaking research may help explain why some patients with coronavirus experience a mild infection, others require intensive care and why some patients die from the disease.

By discovering why some people are predisposed to developing life-threatening symptoms, the consortium will be able to identify treatments which have the best chance of success in clinical trials, and potentially identify people at extreme risk if they develop COVID-19.

This work – sequencing human genomes – complements the UK COVID-19 Viral Sequencing Programme (COG-UK) announced in March and its work already

underway to sequence the genome of the virus itself, led by Public Health England and the Sanger Institute.

Professor Sir Mark Caulfield, Chief Scientist at Genomics England, said:

> For the first time in a generation we face a global viral pandemic that is life threatening for some people, yet others have a mild infection. By reading the whole genome we may be able to identify variation that affects response to COVID-19 and discover new therapies that could reduce harm, save lives and even prevent future outbreaks.

Whole genome sequencing will be carried out by Illumina at its laboratories in Cambridge, UK, where they successfully delivered the 100,000 Genomes Project together with Genomics England and the NHS.

Paula Dowdy, General Manager and SVP Illumina, EMEA, said:

> We have a long-standing partnership with Genomics England and are proud to support this new genomics initiative from our Cambridge-based lab. The results will establish a unique platform for researchers to understand the human response to coronavirus infection, leading towards new treatments and ways to control infection spread.

Today’s announcement demonstrates how different parts of the UK’s world-leading genomics community are working together to get a full picture of both the spread and impact of the virus.

Data from the person’s own genome can be linked to the virus genome data provided via the previously announced viral sequencing programme by the COVID-19 Genomics UK Consortium (COG-UK), a partnership of NHS organisations, UK public health agencies, the Sanger Institute and UK academic centres.

Professor Sharon Peacock CBE, Director of COG-UK, said:

> This study is a fantastic example of how different parts of the UK genomics community are working together to get a full genomic picture of the spread and impact of the virus.
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> In COG-UK we have already sequenced over 10,000 virus genomes from patients with COVID-19. Linking this data to the patient’s own genome data in the Genomics England-GenOMICC study may provide unique insights into how the patient and virus genomes act together to influence the patient’s response to the infection and will help inform and improve our response to future outbreaks.

Professor Sir Mark Walport, Chief Executive of UK Research and Innovation

(UKRI), who have given £3 million in funding to the project, said:

> The UK is a global leader in the genetic analysis of disease. By applying this expertise to examine the role of genetic factors in COVID-19, including in young severely impacted patients without known underlying health issues, this study could identify important risk factors and disease mechanisms, which may lead to new diagnostic and therapeutic approaches.

Part of the overall genomic study will also focus on children and young adults severely affected by COVID-19.

The NIHR BioResource is partnering with GenOMICC and Genomics England to provide infrastructure, expertise and £1 million funding to investigate this by collecting samples from these young patients and their parents.

Professor John Bradley CBE, Chief Investigator of the NIHR BioResource, said:

> The NIHR BioResource is delighted to build on our established partnership with Genomics England and work with GenOMICC to understand in particular why some children and young adults are so severely affected by COVID19.

These initiatives will enable novel insights into the virus, as well as possible human factors that influence the effects of the disease, and whether a combination of both shape outcomes for NHS patients.

Professor Dame Sue Hill, Chief Scientific Officer and SRO for Genomics at NHS England and NHS Improvement said:

> This study has the potential to dramatically improve our understanding of COVID-19 – it could help us to identify whether underlying genomic differences play a part in how people react to the virus and why some people have few or no symptoms whilst others can get very ill.
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> I am very grateful to all the staff, patients and families who are working on and participating in this study, at what is a very challenging time.

The data that is collected during the study will also inform global strategic planning for possible later waves of the pandemic, and for new pandemics in the future.

For now, the prospect of this study’s findings should not detract from the fact that we must all continue to follow the government’s guidance, which at the moment involves staying home and staying safe.

Since genetic discoveries need very large numbers of patients, patients who have already had COVID-19 and have now recovered are invited to volunteer to take part in the study.

Find out how to register interest to take part in the GenOMICC study