Press Release

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Genetic study gives extensive insights into severe Covid-19

The world’s largest study of the genetics of critical Covid-19, involving more than 57,000 people, has revealed fresh details about some of the biological mechanisms behind the severe form of the disease.

Some 16 new genetic variants associated with severe Covid-19, including some related to blood clotting, immune response and intensity of inflammation, have been identified.

These findings will act as a roadmap for future efforts, opening new fields of research focused on potential new therapies and diagnostics with pinpoint accuracy, experts say.

Researchers from the GenOMICC consortium – a global collaboration to study genetics in critical illness – led by University of Edinburgh in partnership with Genomics England, made these discoveries by sequencing the genomes of 7,491 patients from 224 intensive care units in the UK.

Their DNA was compared with 48,400 other people who had not had Covid-19, participants in Genomics England's 100,000 Genomes Project and that of a further 1,630 people who had experienced mild Covid.

Determining the whole genome sequence for all participants in the study allowed the team to create a precise map and identify genetic variation linked to severity of Covid-19. The team found key differences in 16 genes in the ICU patients when compared with the DNA of the other groups.

They also confirmed the involvement of seven other genetic variations already associated with severe Covid-19 discovered in earlier studies from the same team.

The findings included how a single gene variant that disrupts a key messenger molecule in immune system signaling – called interferon alpha-10 – was enough to increase a patient’s risk of severe disease.

This highlights the gene’s key role in the immune system and suggests that treating patients with interferon – proteins released by immune cells to defend against viruses – may help manage disease in the early stages.

The study also found that variations in genes that control the levels of a central component of blood clotting – known as Factor 8 – were associated with critical illness in Covid-19.

This may explain some of the clotting abnormalities that are seen in severe cases of Covid-19. Factor 8 is the gene underlying the most common type of haemophilia.

Professor Kenneth Baillie, the project’s chief investigator and a Consultant in Critical Care Medicine at University of Edinburgh, said: “Our latest findings point to specific molecular targets in critical Covid-19. These results explain why some adsfasdfpeople develop life-threatening Covid-19, while others get no symptoms at all. But more importantly, this gives us a deep understanding of the process of disease and is a big step forward in finding more effective treatments.

“It is now true to say that we understand the mechanisms of Covid better than the other syndromes we treat in intensive care in normal times – sepsis, flu, and other forms of critical illness. Covid-19 is showing us the way to tackle those problems in the future.”

Professor Sir Mark Caulfield, previously Chief Scientist at Genomics England and now Vice Principal (Health) from Queen Mary University of London and co-author on this study, said: “As Covid-19 evolves, we need to focus on reducing the number of people getting seriously ill and being hospitalised. Through our whole genome sequencing research, we’ve discovered novel gene variants that predispose people to severe illness – which now offer a route to new tests and treatments, to help protect the public and the NHS from this virus.”

Dr. Rich Scott, Chief Medical Officer at Genomics England, said: “Strategically, we’re at a point where genomic science is becoming an integral part of the national infrastructure in routine healthcare. This study illustrates the value of whole genome sequencing to detect rare and common variants that influence critical illness requiring intensive care. It represents a major leap forward in our understanding of how our genetic makeup influences severe illness with Covid.”

“All those involved in the study went to great efforts to engage with all communities within the UK – including groups that have historically been under-represented in medical studies. The inclusive element of our work has generated meaningful results for everyone in the country.”

**Quote to come from DHSC spokesperson**

GenOMICC (Genetics of Susceptibility and Mortality in Critical Care) started in 2015 as an open, global consortium of intensive care clinicians dedicated to understanding genetic factors influencing outcomes in intensive care from diseases such as SARS, flu and sepsis.

The consortium is led by the University of Edinburgh, and since 2020 it has been focused on Covid-19 research in partnership with Genomics England and in collaboration with NHS Lothian, the Intensive Care National Audit and Research Centre (ICNARC), and Queen Mary University of London.

This study is one of a number of Covid-19 studies that have been given urgent public health research status by the Chief Medical Officer and Deputy Chief Medical Officer for England.

The ground-breaking 100,000 Genomes Project was established in 2014 to sequence 100,000 genomes from people with a rare disease or cancer. The Project was completed in 2018 and paved the way for the creation of a new genomic medicine service for NHS England, transforming patient care by bringing advanced diagnosis and personalised treatments.

GenOMICC is funded by DHSC, the charity Sepsis Research FEAT, the Intensive Care Society, Wellcome, UK Research and Innovation, Scotland’s Chief Scientist Office, the Department of Health and Social Care and the National Institute for Health Research.

**ENDS**

**Notes to editors**

**For further information, please contact: Shane Canning, Press and PR Office at the University of Edinburgh, 0755 782 0266 /** [**shane.canning@ed.ac.uk**](mailto:shane.canning@ed.ac.uk)

**Genomics England press contacts:**  **Kevin Maxwell, 07736 373123 /** [**kevin.maxwell@genomicsengland.co.uk**](mailto:kevin.maxwell@genomicsengland.co.uk) **or Linda Todd 07753 962850** [**linda.todd@genomicsengland.co.uk**](mailto:linda.todd@genomicsengland.co.uk)

Additional quotes

Dr David Bentley, Vice President and Chief Scientist, Illumina, said: "Illumina is very pleased to be part of this public-private consortium, which came together early in the pandemic to tackle a key healthcare question; we are delighted to witness the power of human whole genome sequencing in revealing important new insights into why some patients have severe responses to COVID. This is a unique study which demonstrates how the application of genomics medicine delivers the ability to predict patient response to coronavirus infection, and paves the way for the development of novel targeted treatments.”

**LifeArc quote**

**MRC/UKRI quote**

**NIHR quote**

**ICNARC quote ? Kathy Rowan**

**About University of Edinburgh (www.ed.ac.uk)**

The University of Edinburgh is a global university, rooted in Scotland. We are globally recognised for our research, development and innovation and we have provided world-class teaching to our students for more than 425 years. We are the largest university in Scotland, with more than 41,000 students and 15,000 staff. We are a founding member of the UK’s Russell Group of leading research universities and a member of the League of European Research Universities.

**About Genomics England (**[**www.genomicsengland.co.uk**](http://www.genomicsengland.co.uk)**)**

Genomics England is the global leader in advancing and delivering precision medicine at scale, for all. We are the world's largest community in genomic healthcare and medical research, bringing together patients and participants from across the 56 million-member NHS, tens of thousands of doctors and researchers, and more than 130 UK and global biopharmaceutical and healthcare industry partners. As an enterprise, we serve our stakeholders in two ways. We are the platform powering the world's first national Genomic Medicine Service, delivering the most advanced genomic healthcare today; and through the same trusted and proven infrastructure and expertise we enable patients, academic scientists, and industry to come together to develop the genomic medicine of tomorrow.

[**About Queen Mary University of London**](https://www.qmul.ac.uk/) **(www.qmul.ac.uk)**

At Queen Mary University of London, we believe that a diversity of ideas helps us achieve the previously unthinkable. Throughout our history, we’ve fostered social justice and improved lives through academic excellence – and we continue to live and breathe this spirit today, not because it’s simply ‘the right thing to do’ but for what it helps us achieve and the intellectual brilliance it delivers.

A member of the prestigious Russell Group, Queen Mary is a research-intensive university that connects minds worldwide. We work across the humanities and social sciences, medicine and dentistry, and science and engineering, with inspirational teaching directly informed by our world-leading research.

Our distinctive history stretching back to 1785 is built on four historic institutions (the London Hospital Medical College, St Bartholomew’s Medical College, Westfield College and Queen Mary College) with a shared vision to provide hope and opportunity for the less privileged or otherwise under-represented. Today, we remain true to that belief in opening the doors of opportunity for anyone with the potential to succeed and helping to build a future we can all be proud of.

About NHS Lothian

About ICNARC