Genomics Beyond Healthcare: future uses and considerations of genomic science

A new wide-ranging report Genomics Beyond Health published today by the Government Office for Science investigates how genomics could play a part in our lives in the future, from sport to education and tackling crime.

Until now genomics has mostly been used within healthcare and medical research where it can help provide more precise diagnosis, target better treatments, and help predict the risks of developing certain disease. The UK's use of genomics in healthcare is world-leading and viral genomics has been critical for monitoring COVID-19 and detecting emerging variants.

This report examines how the genome can provide insights into people's traits and behaviours beyond health and how studying our DNA code presents both benefits and challenges to society.

Sequencing the whole human genome, which once took years and cost billions of pounds, now takes less than a day and costs about £800. As the technology continues to mature and its usage widens there must be greater focus on how policy and regulation might adapt to developments in genomic science. The report recommends these rapid technological and scientific advances should be considered when defining policy and regulation that will help shape and ensure the privacy, anonymity, and security of the genomic sequence of UK citizens.

Although in its infancy, genomics technology could in principle be used to predict the traits and behaviours that could determine how expensive our car insurance is, support the academic achievement in children and how decisions are made in the criminal justice system. These concepts clearly raise ethical questions for our society, but by exploring these issues now we will be able to fully consider and widely engage to make informed decisions.

Key issues to consider

- **Sport:** Variants of certain genes have been associated with elite athletic performance. In theory, gene-editing techniques could be illegally used to potentially enhance performance
- **Education:** Over a thousand genes have been identified that relate to educational and cognitive outcomes, potentially being used to help tailor education for pupils with learning disabilities

Sir Patrick Vallance, Government Chief Scientific Adviser, said:

> We are still in the infancy of understanding the complexity of genomic data but this is changing very rapidly. Now is the time to

> consider what might be possible, and what actions government and the public could take to ensure the widespread application of genomics can occur in a way that protects and benefits us all. This report looks at the current landscape of genomics, investigates how the science is developing, and looks at what is possible now, what might be possible in the future.

George Freeman, Minister for Science, Research and Innovation, said:

> Since we launched the UK Genomics Healthcare program in 2011, the UK has grown into a global powerhouse in genomic healthcare, from diagnostics to drugs and vaccines. But this is just the start of the genomic revolution. As this timely report shows, our growing understanding of the genetic code of life opens up exciting new opportunities from drought and disease resistant crops to harnessing cells or factories, and new net zero biofuels and marine agriculture. To unlock these opportunities, we need to lead in both the science and the ethics and reputation for consumer confidence and public support.

Professor Ewan Birney, EMBL Deputy Director General and Director of EMBL's European Bioinformatics Institute (EMBL–EBI) said:

> Genomics has the potential to transform the world we live in, and help us tackle some of the greatest challenges facing our species and planet. This report is a timely reminder that policy makers and the public need the right information at the right time, to understand and exploit the insights these new technologies provide.

While some of the potential uses of genomics may not be realised in the short or even medium-term, people are already exploring new ways to use genomic information today. To keep pace with the science, policy will need to consider areas such as data inequality, privacy and regulation.

Note to editors

Thirty subject and policy experts in science and technology across academia and government have contributed to this report. To request interviews or comment from contributors please contact goscomms@go-science.gov.uk.