Genomics and Personalised Medicine

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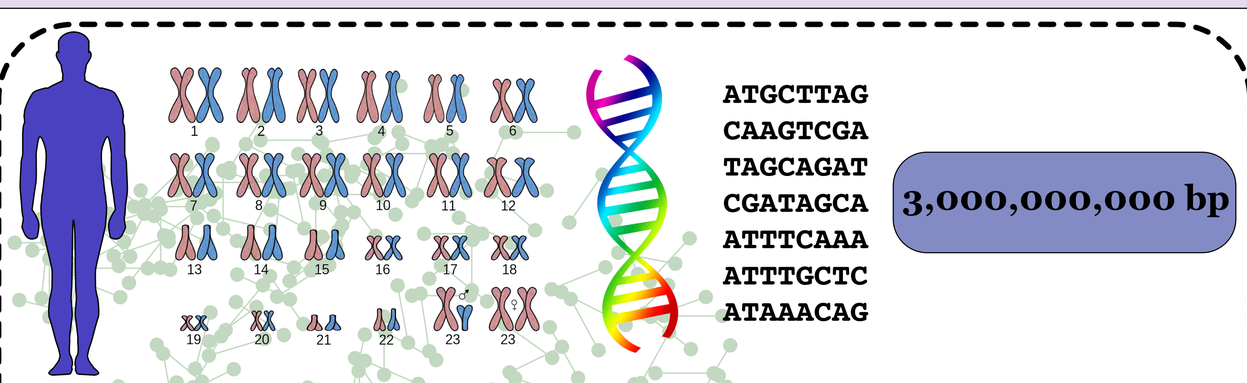
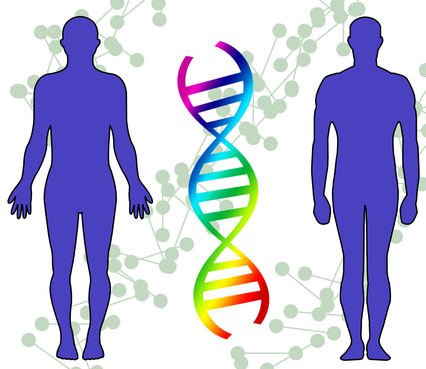
Abstract:

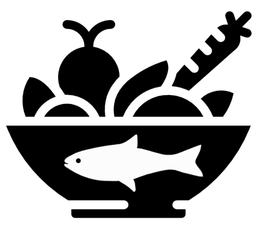
Genome is our genetic material that consists a complete set of DNA, including all of our genes. Each of our genome carries all the information required to build and maintain almost 37 trillion cells in our bodies. Any two individuals share around 99.9% of their genomes and only around 0.1% that makes us unique. Although this does not sound a lot, but because of our DNA is 3 billion base pairs long, there can still be millions of differences between the DNA of two individuals. These differences can affect our susceptibility to any disease and response to drugs. As people differently respond to drugs (e.g., some are benefitted, some do not gain benefits, or some suffer from side effects), scientific investigation of these differences in our genome is crucial to understand the best possible way to treat a patient for a range of diseases – from diabetes and heart disease to cancer. In addition to our genome, different environmental factors, such as our lifestyle and diets play an important role on how we response to a drug. The Wellcome Sanger institute is a world leading genomic institute where we generate population scale sequencing data and study various genomic variations to understand the genetic factors underpinning predisposition to life-changing diseases, which eventually will help in developing better therapeutic approaches in personalised healthcare. One of our ongoing projects is generating whole genome sequence data for UK Biobank volunteers, which will enable the scientific community to understand, diagnose, treat and prevent life-changing diseases. We are possibly not far away from when doctors will prescribe the right combination of medicines at the right time that is most suitable for an individual.



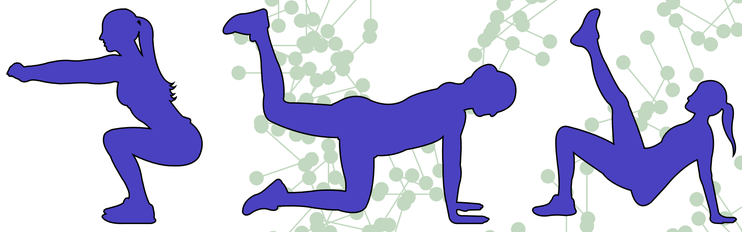


- Two people share **99.9%** of their genome.
- **3.5M** variable sites over 3 billion bases.
- These differences can affect our susceptibility to any **disease** and **response to drugs**.

Is DNA destiny ?
The answer is **NO**
for most of the common complex diseases, e.g., T2D, Heart attack etc.
Because the environmental factors play a crucial role

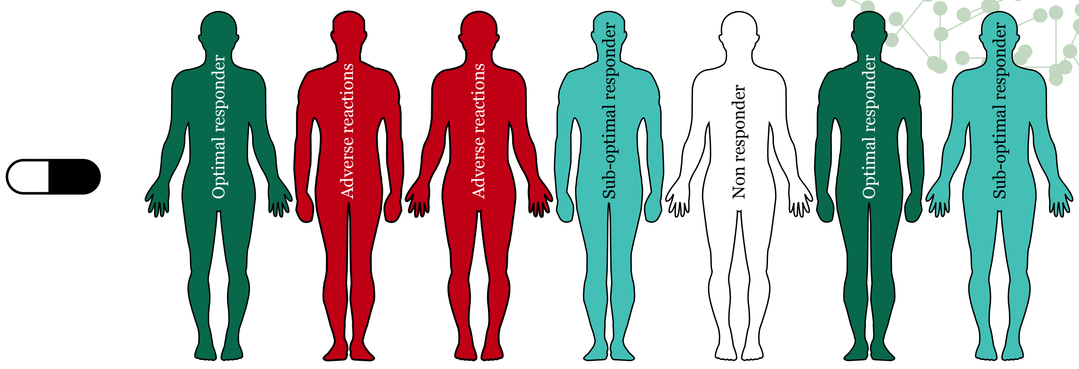


Healthy diet

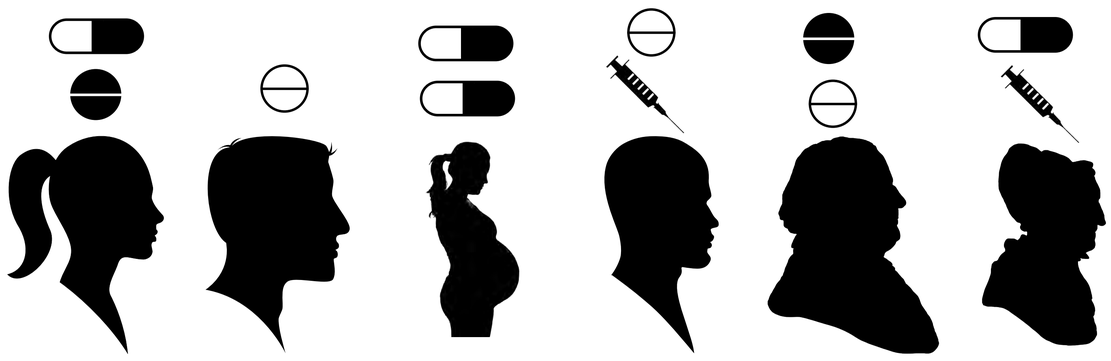


Regular exercise

One drug for all

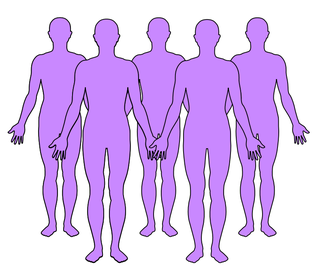


Personalised medicine

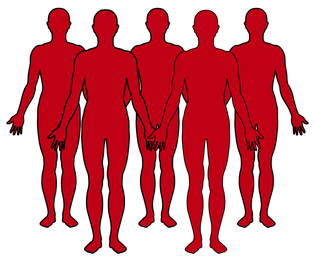


Population

Controls



Cases

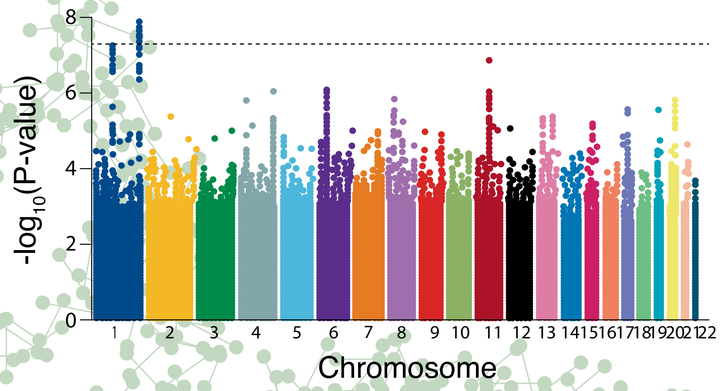


Genotyping

Genome sequencing

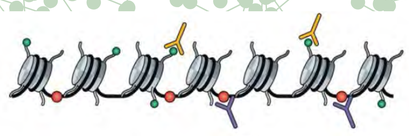
SNP array and imputation

Statistical analysis

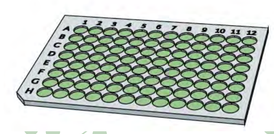


Genome-wide association test

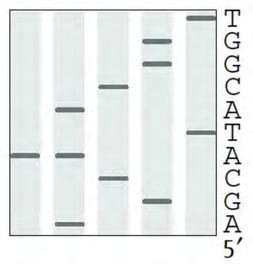
Experimental validation



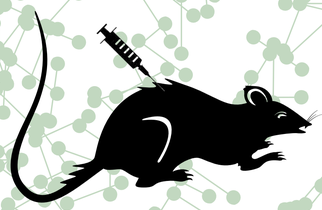
Chromatin immunoprecipitation



Chromosome conformation capture



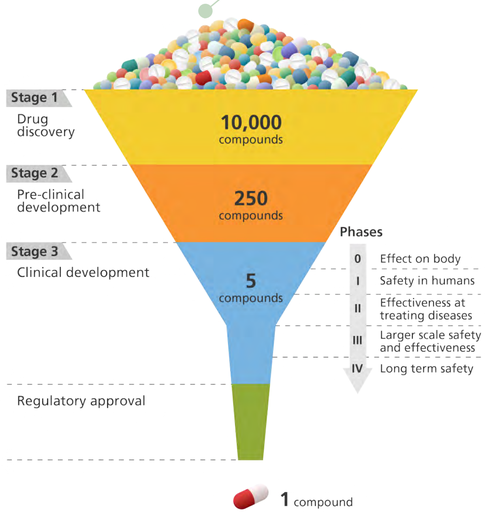
In-vitro reporter assay



In-vivo models

CRISPR-Cas9

Drug discovery



References:

1. Tam et al., Benefits and limitations of genome-wide association studies, Nature Review, 2019
2. www.yourgenome.org