Pangenome Reference Map

Why in news?

A pangenome reference map has been built using genomes from 47 anonymous individuals (does not include Indians).

What is genome?

- The genome is the *entire set of DNA instructions* found in a cell.
- It contains all the information needed for an individual to develop and function.
- In humans, the genome consists of *23 pairs of chromosomes* located in the cell's nucleus, as well as in the mitochondria.
- Each chromosome is a contiguous stretch of DNA string which in turn is composed of millions of individual building blocks called ***nucleotides or bases***.
- The four bases include *adenine, thymine, guanine and cytosine (A, T, G and C).*
- The genome is an identity card like Aadhaar as each our genome is unique.
- To date, humans are the *only life form* that has successfully sequenced its own genome, yet there are many life forms that have substantially larger genomes.

What is genome sequencing?

- ***Genome sequencing*** is the method used to determine the precise order of the four bases (A, T, G and C) and how they are arranged in chromosomes.
- It helps us understand human diversity at the genetic level and how prone we are to certain diseases.

What is a reference genome and a pangenome reference map?

Feature	Reference Genome	Pangenome Map
Definition	A complete sequence of DNA for a particular species that acts as a reference map for newly sequenced genomes.	A collection of genomic sequences found in the entire species rather than a single individual.
Purpose	Used as a standard for comparing other genomes.	Used to study genetic diversity and identify genes associated with diseases.
Accuracy	Typically more accurate than pangenome maps.	More comprehensive than reference genomes.
Diversity	Typically based on the genomes of a small number of individuals.	Typically based on the genomes of a large number of individuals.

Applications	Gene mapping, genome sequencing, and drug discovery.	Disease research, personalized medicine, and evolutionary biology.

What is the importance of pangenome reference map?

- **Human genetic diversity** - A complete and error-free human pangenome map will help to understand the differences and explain human diversity better.
- **Genetic variation** - It will also help us understand genetic variants in some populations.
- **Health** - It will allow scientists to identify the genes and gene variants that are associated with specific diseases.
- **Personalized medicine** - Information in the map can be used to develop personalized medicine approaches that are tailored to the individual patient's genetic makeup.
- **New insights into human evolution** - Can be used to study how genetic variation has changed over time and the history of our species.

Quick facts

- **Human Genome Project**- The HGP was the international, collaborative research program for complete mapping and understanding of all the genes of human beings.
- It began in 1990 and was completed in 2003.
- **Genome India Project** – It was initiated and funded by the Department of Biotechnology (DBT) in 2020 for 3 years.
- It aims to build a grid of the Indian “reference genome”, to understand fully the type and nature of diseases and traits that comprise the diverse Indian population.
- This is spearheaded by the Centre for Brain Research at Bengaluru-based Indian Institute of Science as the nodal point of about 20 institutions.
- **The Human Pangenome Reference Consortium (HPRC)** – It is a project funded by the National Human Genome Research Institute, Maryland, United States.
- It aims to sequence and assemble genomes from individuals from diverse populations in order to better represent genomic landscape of diverse human populations.

References

1. The Hindu|Pangenome Reference Map
2. Humanpangenome | Human Pangenome Reference Consortium

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