Genome India Project

This article is based on **"Mapping life"** which was published in The Indian Express on 10/02/2020. It talks about the significance, challenges and benefits emanating from Genome India Project.

Recently, the **Ministry of Science and Technology** has approved an ambitious gene-mapping project called the **Genome India Project (GIP).** The project has been described by the researchers as the "first scratching of the surface of the vast genetic diversity of India".

It will enable new efficiencies in healthcare, medicine and life sciences. However, GIP also raises concerns pertaining to medical ethics, political misuse, etc.

What is the Genome India Project?

- The Genome India Project, a collaboration of 20 institutions including the Indian Institute of Science and some IITs, will enable new efficiencies in medicine, agriculture and the life sciences.
- Its aim is to ultimately build a grid of the Indian "reference genome", to fully understand the type and nature of diseases and traits that comprise the diverse Indian population.
- The mega project hopes to form a grid after collecting 10,000 samples in the first phase from across India, to arrive at a representative Indian genome.

What is a Genome?

- Every organism's genetic code is contained in its Deoxyribose Nucleic Acid (DNA), the building blocks of life.
- The discovery that DNA is structured as a "double helix" by James Watson and Francis Crick in 1953, started the quest for understanding how genes dictate life, its traits, and what causes diseases.
- A genome is all the genetic matter in an organism. It is defined as "an organism's complete set of DNA, including all of its genes.

- Each genome contains all of the information needed to build and maintain that organism.
- In humans, a copy of the entire genome contains more than 3 billion DNA base pairs.

What is the significance of GIP?

- **The Genome India Project is inspired by the Human Genome Project (HGP 1990-2003)**- an international programme that led to the decoding of the entire human genome.
- **HGP has a major diversity problem** as most genomes (over 95%) mapped under HGP have been sourced from urban middle-class white people. Thus, HGP should not really be seen as representative of the human genome.
- In this context, the GIP aims to vastly add to the available information on the human species and advance the cause, both because of the scale of the Indian population and the diversity here. This diversity can be depicted by:
    - **Horizontal Diversity:** The Indian subcontinent has been the site of huge migrations, where the first migrations were from Africa. Also, there have been periodic migrations by various populations from all around the world, making this a very special case of almost all races and types intermingling genetically.
    - **Vertical Diversity:** There has been endogamy or inter-marriage practised among distinct groups, resulting in some diseases passed on strictly within some groups and some other traits inherited by just some groups.
- Studying and understanding both diversities would provide the bedrock of personalised healthcare for a very large group of persons on the planet.

Intended Benefits of GIP

- **Precision Healthcare:** GIP will help in the development of personalised medicine, anticipating diseases and modulating treatment according to the genome of patients.
    - For example, the cardiovascular disease generally leads to heart attacks in South Asians, but to strokes in most parts of Africa.
    - If such propensities to disease can be mapped to variations across genomes, it is believed that public health interventions can be targeted better, and diseases anticipated before they develop.
- **Sustainable Agriculture:** Similar benefits would come to agriculture if there is a better understanding of the genetic basis of the susceptibility of plants to pests, insects and other issues hampering productivity.
    This can reduce dependence on chemicals.
- **International Cooperation:** Global science would also benefit from a mapping project in one of the world's most diverse gene pools.
    The project is said to be among the most significant of its kind in the world because of its scale and the diversity it would bring to genetic studies.

Associated Challenges

- **Fear of Scientific Racism:** The question of heredity and racial purity has obsessed civilisations, and more scientific studies of genes and classifying them could reinforce stereotypes and allow for politics and history to acquire a racial twist.
    - The work on cranial volume measurements of the physician **Samuel Morton** (regarded in America as the father of scientific racism) justified slavery before the US Civil War.
    - In India, a nation divided by identity politics, scientific work in mapping genetic groups may further strengthen the divisions in the society based on the prevalent notion of race.
- **Data & Storage:** After collection of the sample, the anonymity of the data and questions of its possible use and misuse would need to be addressed.

    India is yet to pass a **Data Privacy Bill** with adequate safeguards and launching the GIP before the privacy question is settled could give rise to another set of problems.
- **Medical Ethics:** In a project that aims only to create a database of genetic information poses a risk of doctors privately performing gene modification.

    Selective breeding or Eugenics has always been controversial for long, as recently a Shenzhen-based scientist, created the world's first gene-edited babies, has been sentenced to three years in prison.

Conclusion

To gain fully from the genomics revolution, India needs to collect information about the genetics of its population and train manpower capable of interpreting it. The information that is needed has to come from a large and sustained collection of data — fully sequenced individual genomes along with medical histories for the individuals who volunteer for this effort.

Genome India Project provides an opportunity for India to make leap and bounds progress in the fields of biotechnology, agriculture and healthcare. Thus, it should be carried with maximum speed and maximum caution.

Drishti Mains Question

Genome India Project provides an opportunity for India to make great progress in the fields of biotechnology, agriculture and healthcare. Discuss.