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WHAT IS 'INDIGEN' PROJECT THAT IS SEQUENCING INDIAN GENES?

Relevant for: Science & Technology | Topic: Biotechnology, Genetics & Health related developments

The story so far: The Council of Scientific and Industrial Research (CSIR) recently announced the conclusion of a six-month exercise (from April 2019) of conducting a “whole-genome sequence” of a 1,008 Indians. The project is part of a programme called “IndiGen” and is also seen as a precursor to a much larger exercise involving other government departments to map a larger swathe of the population in the country. Project proponents say this will widen public understanding in India about genomes and the information that genes hide about one’s susceptibility to disease.

A genome is the DNA, or sequence of genes, in a cell. Most of the DNA is in the nucleus and intricately coiled into a structure called the chromosome. The rest is in the mitochondria, the cell’s powerhouse. Every human cell contains a pair of chromosomes, each of which has three billion base pairs or one of four molecules that pair in precise ways. The order of base pairs and varying lengths of these sequences constitute the “genes”, which are responsible for making amino acids, proteins and, thereby, everything that is necessary for the body to function. It is when these genes are altered or mutated that proteins sometimes do not function as intended, leading to disease.

Sequencing a genome means deciphering the exact order of base pairs in an individual. This “deciphering” or reading of the genome is what sequencing is all about. Costs of sequencing differ based on the methods employed to do the reading or the accuracy stressed upon in decoding the genome. Since an initial rough draft of the human genome was made available in 2000, the cost of generating a fairly accurate “draft” of any individual genome has fallen to a tenth, or to a ball park figure of around $1,000 (70,000 approximately). It has been known that the portion of the genes responsible for making proteins — called the exome — occupies about 1% of the actual gene. Rather than sequence the whole gene, many geneticists rely on “exome maps” (that is the order of exomes necessary to make proteins). However, it has been established that the non-exome portions also affect the functioning of the genes and that, ideally, to know which genes of a person’s DNA are “mutated” the genome has to be mapped in its entirety. While India, led by the CSIR, first sequenced an Indian genome in 2009, it is only now that the organisation’s laboratories have been able to scale up whole-genome sequencing and offer them to the public.

Under “IndiGen”, the CSIR drafted about 1,000 youth from across India by organising camps in several colleges and educating attendees on genomics and the role of genes in disease. Some students and participants donated blood samples from where their DNA sequences were collected.

Globally, many countries have undertaken genome sequencing of a sample of their citizens to determine unique genetic traits, susceptibility (and resilience) to disease. This is the first time that such a large sample of Indians will be recruited for a detailed study. The project ties in with a much larger programme funded by the Department of Biotechnology to sequence at least 10,000 Indian genomes. The CSIR’s “IndiGen” project, as it is called, selected the 1,000-odd from a pool of about 5,000 and sought to include representatives from every State and diverse ethnicities. Every person whose genomes are sequenced would be given a report. The participants would be informed if they carry gene variants that make them less responsive to certain classes of medicines. For instance, having a certain gene makes some people less

responsive to clopidogrel, a key drug that prevents strokes and heart attack. The project involved the Hyderabad-based Centre for Cellular and Molecular Biology (CCMB), the CSIR-Institute of Genomics and Integrative Biology (IGIB), and cost 18 crore.

Anyone looking for a free mapping of their entire genome can sign up for “IndiGen”. Those who get their genes mapped will get a card and access to an app which will allow them and doctors to access information on whether they harbour gene variants that are reliably known to correlate with genomes with diseases. However, there is no guarantee of a slot, as the scientists involved in the exercise say there is already a backlog. The project is free in so far as the CSIR scientists have a certain amount of money at their disposal. The driving motive of the project is to understand the extent of genetic variation in Indians, and learn why some genes — linked to certain diseases based on publications in international literature — do not always translate into disease. Once such knowledge is established, the CSIR expects to tie up with several pathology laboratories who can offer commercial gene testing services.

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