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New Genetics and Our Society

Kuldeep Singh*, Pratibha Singh**

*Additional Professor and Head, Pediatrics, **Additional Professor and Head, Obstetrics & Gynecology, All India Institute of Medical Sciences, Jodhpur-342005, Rajasthan

The New Genetics is proving to be a disruptive technology meaning, thereby, that it is making our everyday life much easier, productive and with affordable cost displacing an earlier technology. Though Moore's law is applicable to the computer processors and says that the processing complexities of a computer changes every two year, it is more applicable to field of genetics. Now bio-informatics is providing us a robust technology in studying chromosomal micro-array (CMA) with high sensitivity. Another new development in the field is Next-Generation Sequencing (NGS) also known as high-throughput sequencing. They allow us to sequence DNA and RNA much more quickly and cheaply than the previously used Sanger sequencing and as such have revolutionised the study of genomics and molecular biology. The newer system of error detection in such arrays and also in Next Generation Sequencing may mitigate some of the problems.[1]

The old genetics dealt with disorders caused by an extra or missing part or whole of chromosome or due to single gene defects. They were more important to individuals and their families and are relatively rare. They were considered to be rare enough that care can be provided mostly by the medical geneticists and genetic counsellors. The general physicians were occasionally involved. However, with mapping of human genome through Human Genome Project, rapid strides have been made the way we deal with genetics. The focus of Genetics is now being shifted from individual to the community.[2]

The Human Genome Project (HGP) was an international scientific research project with a primary goal to determine the sequence of chemical base pairs which make up DNA and to identify the approximately 25,000 genes of the human genome from both a physical and functional standpoint.

The project began in 1990 initially headed by James D. Watson at the U.S. National Institutes of Health. A working draft of the genome was released in 2000 and a complete one in 2003, with further analysis still being published. Many private labs also joined in extending the work done during HGP.

The "genome" of any given individual (except for identical twins and cloned animals) is unique; mapping "the human genome" involves sequencing multiple variations of each gene. The project did not study the entire DNA found in human cells; some heterochromatic areas (about 8% of the total) remain un-sequenced.

The work on interpretation of genome data is still in its initial stages. Commercialization of genomic data and the service being offered as chip based prediction for common conditions has been claimed by some labs. However, there is competition among private labs to offer the tests as "Over the Counter (OTC) Tests". The education of general physician regarding this expanding branch will help target lay man who can then take an appropriate medical decision which will also ethically acceptable to the community and society.

Another area which is going to impact our society is Pharmacogenomics which has already proved to significantly impact in cancer management. Developing sufficient evidence for use of pharmacogenomic markers has been difficult, in part because Randomized Clinical Trials cannot be performed for every marker identified. A move toward

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retrospective analyses, large population studies using Electronic Medical Records, and the establishment of mechanism-based evidence can enhance progress in the field.[3] A large, ground breaking trial in which patients with non-small cell lung cancer will be given specific drugs according to the genetics of their tumour has been launched in the UK this year.[4]

In addition, embracing new methods, such as Next Generation Sequencing and adaptive clinical trials, will be providing a wealth of information about tumor biology and changing the landscape of cancer treatment.

We can say that use of Genomic medicine can be utilized to do population screening at a fraction of cost with more sensitivity and specificity. We may not be wrong in further proving the theory of Disruptive technology given by Clayton M Christensen to be applied in Genomic Medicine.

In this issue of IJGMR, we will see the recent advances of use of molecular technology for Down syndrome, a chromosomal disorder. The genetic disorder can affect the sexual organ and can lead to disorder of sexual differentiation. Two articles highlight the situation in this issue.

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Kuldeep Singh, MD, DM*

Editor-in-Chief

Additional Professor and Head, Pediatrics
All India Institute of Medical Sciences,
Jodhpur-342005.
E-mail: kulpra@hotmail.com