



## KEYWORDS

DNA & RNA

Next Generation Sequencing

Pharmacogenetics

Gene Therapy

Health Management

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## Applications of Genomics

No two individuals are phenotypically identical. Seldom if they are identical by genotypes too, their individual biochemistry may differ subject to predisposition to different environments. One should definitely know why one human is different from other or why one human is more susceptible to external stimuli or infection than others who confer resistance. Extinction, adaptation and evolution processes are governed by changes in the DNA of an organism. The field of science that deals with all the factors associated with whole genome, the DNA content of an organism is called "Genomics". A well-defined standalone technology platform for sequencing DNA or RNA that helped man to understand the structure, function, diversity and evolution of human genome. The technology with escalating applications has been taking science further to get an unrestricted view of biology. One would get surprised to read the applications of genomics which is now becoming a mandatory diagnostic with broad implications in health and allied sectors.



Figure: Software analysis of DNA sequence data.

[Courtesy: <https://www.futurelearn.com/courses/the-genomics-era/0/steps/4911>]

The major applications of genomics are well appreciated in the field of clinical medicine, agriculture and livestock, food safety and microbial biotechnology which are frontline disciplines with huge societal impact factor.



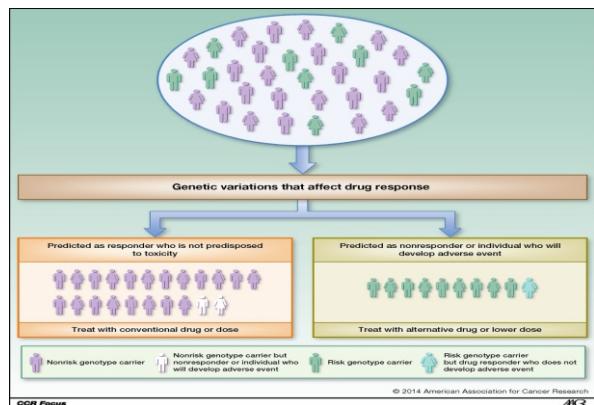
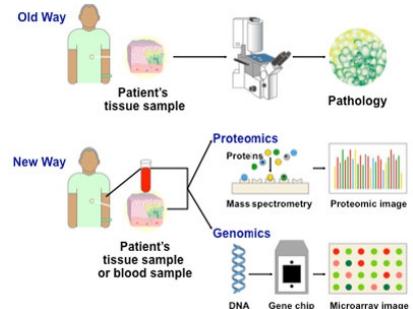
Figure: NGS services in Biomedical Research

(Courtesy: <https://www.sanger.ac.uk/science/dna-pipelines-operations>)

## Clinical applications of genomic technologies

### Gene discovery and diagnosis :-

Clinicians can diagnose their patients who have high risk genetic errors causing disease. Researchers are using these techniques to identify new genes which cause genetic disease at an astonishing rate - over 4000 diseases now have a known single genetic cause. Genomic technologies are increasingly being used to understand the contribution of both rare and common genetic factors to the development of common diseases, such as high blood pressure, diabetes and cancer.

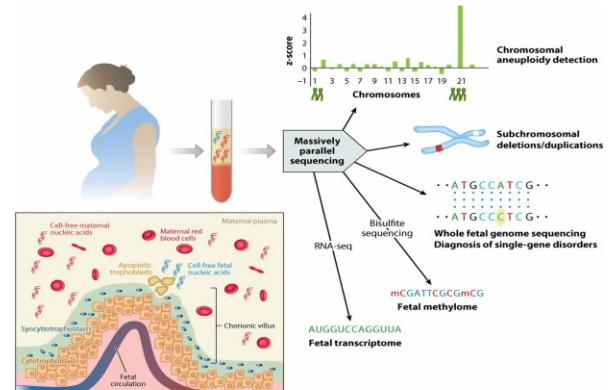


### Prenatal diagnosis and testing :-

Genetic diseases are often devastating and may cause significant disability and even death in childhood. Prenatal diagnosis of genetic diseases allows parents to make appropriate decisions for possible treatment in utero or at birth. Genomic technology can look directly at the DNA of the foetus from a maternal blood test, without increasing the risk of miscarriage - which is known as non-invasive prenatal testing (NIPT). The use of NGS (Next Generation Sequencing) and array technology in prenatal samples is also on the increase to improve diagnostic yields in a pregnancy.

### Pharmacogenetics and targeted therapy :-

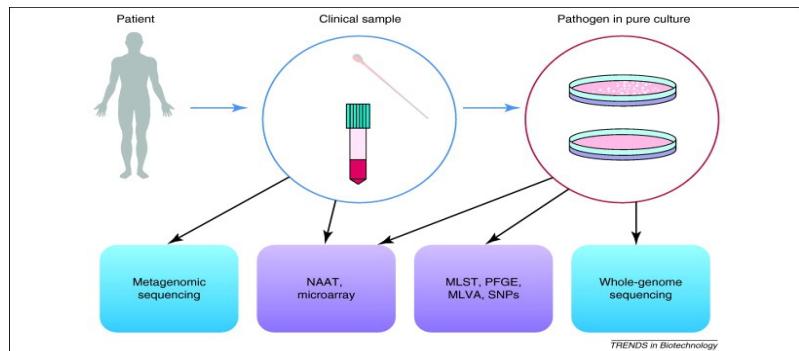
Genetic information may be used to predict whether a person will respond to a particular drug, whether they are likely to get any side effects from the use of that specific drug. This allows clinicians decisions about personalised medicine. As the exact DNA sequence of the genome of each human is unique to them, they exhibit corresponding disease susceptibilities and treatment responses. Personalised or Precision medicine is described as the use of our genetic information to prescribe health care intervention to our own individual need.



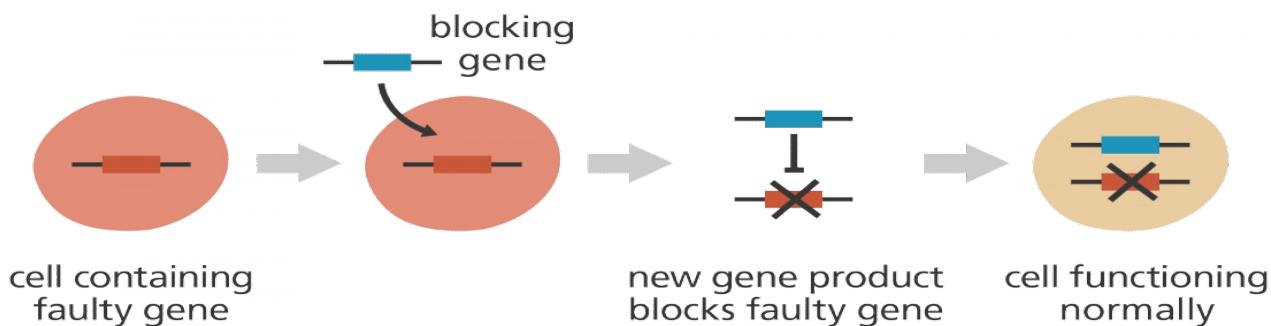
Wong FCK, Lo YMD. 2016. Annu. Rev. Med. 67:419-32

### Infectious diseases :-

Sequencing the genomes of microorganisms which cause human infection can identify the exact organism causing symptoms, help to trace the cause of infectious outbreaks, and give information as to which antibiotics are most likely to be effective in treatment.



### **Gene inhibition therapy**

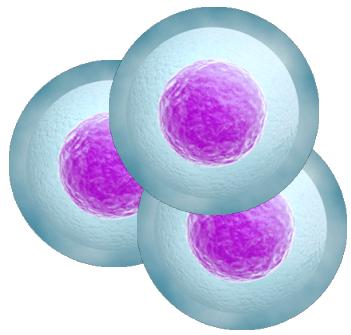


### Gene therapy :-

Gene therapy involves the administration of DNA or RNA, in order to correct a genetic abnormality, or modify the expression of genes by genome editing tools. Genomic approaches can enhance the potential of gene therapy by pin pointing the abnormal region of DNA.

### References:-

- <https://www.futurelearn.com/courses/the-genomics-era/0/steps/4911>
- [https://link.springer.com/chapter/10.1007/978-94-015-9783-8\\_4](https://link.springer.com/chapter/10.1007/978-94-015-9783-8_4)
- <https://www.biotecharticles.com/Biotech-Research-Article/Genomics-and-Its-Applications-in-Agriculture-2164.html>



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