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Advancement in Genomics: A Review

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Abstract

Genomics is an endeavor term 10 years ago which is achieving momentum across the entire clinical continuum from risk assessment in healthy individuals to genome-guided treatment in patients with complex diseases. The review process is going on the latest achievements in genomic research and their significance on modern system of medicine, primarily in the past decade. Advances in technology have enabled the development of genomic tools that are responsible for transformation not only the science of medicine but also the health care application. The importance of genomics includes cancer pharmacogenomics, in the diagnosis of rare disorders, and in the tracking of infectious disease. The function of genetics in medical science is extending in high manner, single-gene disorders is beginning to complete many areas of medical science across primary and specialty care.

***Keywords**: clinical genetics; genomic medicine; medical genetics, pharmacogenomics, single-gene disorders.*

Introduction

Genomics as a field is beginning to show its potential in reforming healthcare sector and in turn improve the method of patient care. The use of pharmacogenomics and targeted drug therapy in treatment [1-7] is a revolutionary technology. Theranostics which is a kind of genetically modified diagnostics to the world of medical diagnosis and clinical practice paving the path for personalized medicine, another great application of genomic study is personalized medicine which is medical procedure that combines a patient's genomic information, family history, life style and environmental factors to give better estimations about their risk of a disease[13-19]. Patients can be classified based on the medical procedure conducted – with medical decisions [20-27], interventions, tailored drugs based on predicted result and risk of disease for an individual patient [28-31].

There are few major topics relevant to genomics which is also need to discuss while talking about genomics is likely, Genome is the total set of genetic information in an organism [8-12]. It provides the information for organism's function. In living organisms, the genome is stored in long molecules of DNA known as chromosomes. Small sections of DNA, called genes, code for the RNA and protein molecules required by organism. In eukaryotes, each cell's genome contains within a membrane-bound structure called the nucleus [32-36]. Prokaryotes, doesn't contain inner membrane which store their genome in a region of the cytoplasm called the nucleoid.

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The joining of two DNA molecules from two different species into a better genetic combination is known as Recombinant DNA technology [37-43]. There are three different methods by which Recombinant DNA is prepared. They are Transformation, Phage Introduction, and Non-Bacterial Transformation.

There is an another branch of genomics is Human Genetics which concerned with genes, genetic variation and heredity in living organisms and genetic aspects of humans as a species [44-47]. Genetic information is the information about an individual's genetic tests and the genetic tests of an individual's family members, as well as information about the disease or disorder in an individual's family members [48-56]. Family medical history is also important because it is often used to determine whether someone has an increased risk of getting a disease, disorder, or condition in the future.

Molecular medicine is a branch of medicine that develops the ways to diagnose and treat disease by understanding the way genes, proteins and other cellular molecules work. It is based on research that shows how certain genes, molecules, and cellular functions may become abnormal in diseases such as cancer.

Bioassay is a technique for the determination of concentration, purity, and/or biological activity of a substance like vitamin, hormone, plant growth factor, antibiotic, and enzyme. The aim of most bioassays is to perform a dilution assay, which measures the biological responses at several doses. Prediction of a dilution assay is that the active component follows the same principle of activity in standard and sample preparation.

Tissue Engineering involves the application of cells combination, suitable biochemical & physiochemical factor for the improvement purpose of biological tissue [57-64]. Tissue engineering can also defined as the use of a combination of cells, engineering materials, and suitable biochemical factors to improve or replace biological functions.

Stem cell research have a contribution as a central role in regenerative medicine, which also spans the disciplines of tissue engineering, cellular therapeutics, gene therapy, developmental cell biology, biomaterials, chemical biology and nanotechnology. Stem cells have remarkable potentials to develop into different types of cell in the body during early life and growth. In many tissues stem cell act as a sort of internal repair system, dividing essentially without limit to replenish other cells as long as the person or animal is still alive [65-69].

There are many societies all around the world which helps to develop current technologies, growth in genomic field. The American Society of Human Genetics (ASHG), founded in 1948, is the primary professional membership organization for human genetics specialists worldwide [70-73]. The Society strength is nearly eight thousand members including researchers, academicians, clinicians, laboratory practice professionals, genetic counselors and others who have a special interest in the field of human genetics. There is an another major societies named The Genetics Society was founded by William Bateson in 1919 and is one of the oldest "learned societies" loyal to Genetics in the world. Its membership of over 1700 consists of most of the UK's active professional geneticists, including teachers, researchers and students. Industry and publishing are also well represented in their membership. Human genome variation society helps for enhancement of human health through identification and characterization of changes in the genome that lead to susceptibility to illness.

Many Journals and Conferences are there presents the current status and future plans for the growth of genomics worldwide. Journal of Next Generation Sequencing & Applications is a peer reviewed medical journal Where Oscar

Campuzano presented an article regarding. The improvement in the high throughput sequencing techniques [74-79]. Archives on Medical Biotechnologyis a multidisciplinary, open access, peer-reviewed, scientific journal that focusses on the publication of scientific manuscripts pertaining to avant-garde medical biotechnological research studies. An article posted in Journal of Genetic Disorders and Genetic Reports named Maternal and Paternal Age at Pregnancy for Low Incidence Trisomy Groups: Preliminary Findings and Implications that reports the examination of maternal and paternal age at pregnancy related to children diagnosed with trisomy18, trisomy 13, and trisomy 9 mosaics [80-84]. 9th International Conference on Genomics and Pharmacogenomics which will be held at London, UK during June 15-16, 2017 presents the modern research updates of Genomics around the world [85-88]. 2nd Biomedical Engineering Conference and Expo was arranged on November 30-December 01, 2015 San Antonio, USA where Bhanu Bahl (Director for Informatics at Harvard Clinical and Translational Science Center) presented an lecture on Patient Cohort discovery, data sharing, and integration across multiple healthcare institutions.

Novel Technologies in Genetics

Genetics, which is also known as study of heredity, that means the study of genes and factors related to all characteristics of genes[89-92]. The scientific history of genetics begins with the contributions of Gregor Johann Mendel in 19th century. Developments in all fields of genetics in the 20th century provided a basis for the later developments. In 20th century, the molecular background of genetics has become more understandable. Rapid technological innovations, followed by the completion of Human Genome Project, which have contributed a great deal to the knowledge of genetic factors and their impact on human life and diseases [93-94]. Novel technologies, mostly next generation sequencing, had accelerated the step of biological research. These novel applications have the promise to change the system of clinical care as we move into the era of personalized medicine.

Conclusion

If the dramatic developments in genetics continue to progress at their present speed, history has shown us we can look forward to some amazing developments in human life in the future [95-97]. Some realistic scenarios of human lifestyle in the future could even see us carrying identity cards that include human genome characteristics, rather than the format people use nowadays. Correction of gene, cloned individuals and organs and even genetic-based techniques as a initial laboratory analysis in human diseases for a clinician will be successful. We have reached to the point where genetic testing is commercially available nowadays; the people now has the possible means to know this delicate information named as direct to consumer genetic testing. Today, many companies, from all over the world, offer DTC (direct to consumer) service to the public. Moreover, there is also a notable risk for unauthorized use of sensitive genetic information by big business, particularly in the fields such as health insurance. On the other hand, DTC does provide early awareness of genetic diseases and thereby people can take precaution in their own health care [98-100]. To conclude, in parallel with the fast developments in the field of genetic technologies, ethical & legal issues regarding the application of those novel technologies need to be addressed due to the reason of use of personal genetic information which looks certain to directly contribution our lives in the near future, protocols need to be discussed in detail, with proper guidelines provided and updated regularly manner as part of a regulated multidisciplinary approach.

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