



Molecular Diagnostics in Healthcare: Future Scope for Next Generation Biotechnologists and Microbiologists

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Human health was always a major concern in the worldwide because of pathogens or infectious diseases. The present scenario in modern sciences including Biotechnology and Microbiology are playing a vital role in advanced diagnostics and help in improving human health and identifying the causative infectious agents. Recently newer technologies continue to emerge which are significantly help in reducing the time along with accurate diagnosis or causative organism by Next Generation Sequencing and Advanced molecular techniques has significantly improved the clinical outcomes and helped in saving a life. Molecular diagnostics has been ranked by the scientific experts as the most ideal technologies for improving the health status in the world. Over the past several years application of molecular diagnostics has been a revolution in the diagnosis and monitoring of infectious diseases.

About 40% deaths are mainly attributed by infectious and other parasitic diseases (malaria, tuberculosis, and AIDS) which occurring every year. Transmission of these deadlier diseases can be overcome by developing quick and accurate diagnostic tools for identification and detection. Many conventional methods or diagnostic tools are available but they are inaccurate, time consuming, laborious and expensive. In contrast, advanced biotechnology focused on molecular diagnostic tools applicable for the rapid diagnosis and detection of diseases. In the last two decades there has been a drastic change in field of Biomedical Science which is playing very important role in clinical practice and healthcare.

After successfully completion of Human genome project in early 2001, there are new avenues options for genome based diagnostics techniques or tools for healthcare sector for precise development of personalized medicine. Advancing molecular diagnostics has been the important targeted goal for several scientists all-round the globe. Molecular analysis is now focused techniques like PCR, NGS, Monoclonal antibodies and microarrays. These are very simple, quick, and cost effective and highly sensitivity with

more specificity. PCR reaction always requires small volume of sample to amplify and make multiple copies to identify the DNA sequence of pathogen (that causes the disease). It is now considered as very quick, rapid and accurate method compared to conventional diagnostics.

The Infectious or pathogenic organisms like HIV, Mycobacterium and plasmodium which are difficult to grow in laboratory culture are easily identified by the PCR technique. Nucleic acid techniques like plasmid profiling, RFLP, NGS are making increasing accuracy for point of care of patients introduced in clinical laboratories. PCR-based systems to detect the causative agents of disease from clinical samples are now very easy and it is not necessary to culture for detection of such fastidious microorganisms. Additionally, the sequence analysis performed on microbial DNA allows for identification and precise characterization of the pathogen. Other important advances include the detection and quantification of viral load for therapy monitoring and drug resistance. Now it is easy to detect gene mutations responsible for drug resistance in easy and rapid method which helps clinicians to take a specific call for patient monitoring. Molecular diagnostics help in understanding of the disease, treatment dose or regimen for drug resistant strains which implicated on success of the treatment.

Transmission of those infectious diseases may be overcome fast and accurate diagnostic tools. These advances or developments will increase in survival rate to facilitate non-suitable treatment. Modern or advances in biotechnology comprised of molecular diagnostic tools which helps to detect pathogens or infectious agents accurately. Nanotechnology is a modern area which also helps to identify pathogens accurately, these technologies use probes anneals to specific region of pathogen's DNA sequence. If present, it will be detected by Gold particles to which provide specific detectable signals. This technique is also considered to be sensitive as

compared to other traditional diagnostic methods. Currently microarrays have become a strong tool in distinction to the normal DNA based tests. It is best for the study of causes of gene alterations, mutations to quantify the gene at identical time. Microarray features a nice potential because it has been revolutionized the popularity and treatment of common diseases. DNA microarrays and genotypic arrays and super molecule microarrays are playing a vital role in monitoring the health care of the patients. . In addition, it also helps to identify novel discoveries in clinical pathologic correlations, including studies in oncology, infectious diseases, inherited diseases, predisposition to disease, and the description or polymorphisms linked to disease and genetic diversity applications.

Molecular Diagnosis is now offered advances biomedical devices for accurate diagnostic and preventive purposes, which include diagnostic test kits for Point of care testing, vaccines and targeted drugs for therapeutics used for treating the diseases. Molecular Diagnostics also brings the scientific advances in the translation and validation of cellular and molecular discoveries in medicine into the clinical diagnostic settings. It also supports its applications in the field of cellular and molecular diagnostic medicine, providing an overview of specialized fields, such as biomarker, genetic marker, screening, DNA-profiling, NGS, cytogenetic, transcriptome, cancer biomarkers and drug discovery.

Health, life quality and expectancy of life have been increased worldwide through the services provided through molecular diagnosis which will help mankind to lead a disease free life by accurate diagnosis and providing better targeted treatment.

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