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A Short Note on Applications of PCR based Biomarkers

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Introduction

With the help of oligonucleotide primers produced from sequence information and small amounts of biological sample, DNA fragments can be amplified in vitro using the polymerase chain reaction (PCR). The PCR process has brought DNA technology into common labs since it is quick and simple. Here, PCR applications for the following were briefly observed: 1) Gene fragment amplification as a quick alternative to cloning 2) The alterations made to DNA fragments. 3) The correct genotyping that follows the sensitive identification of harmful bacteria, if needed. 4) DNA testing of archaeological artefacts. 5) Finding mutations that are important for inherited disorders, cancer, or tissue typing. 6) The mapping of hereditary traits, paternity testing, and forensic uses of genetic marker analysis. 7) The amplification of DNA fragments between interspersed-repeat elements that is species-specific. 8) Researching how genes are expressed.

Description

Recent advances in molecular techniques have completely changed how microorganisms are found and characterised in a variety of medical diagnostic disciplines, including virology, mycology, parasitology, microbiology, and dentistry. Among these techniques, Polymerase Chain Reaction (PCR) has produced significant advantages and facilitated scientific progress. PCR is a great method for quickly detecting infections, even ones that are challenging to culture. Real-Time PCR, a technical advancement that has joined traditional PCR methods, is becoming more and more important in clinical diagnostics and research labs. Real-Time PCR is regarded as a quick and accurate platform since it may produce both qualitative and quantitative findings. One of the greatest contributions to biological science in the XXth century was the development of molecular biology.

Scientific advancements like genome sequencing, gene expressions in recombinant systems, the study of molecular genetic analyses, including the quick determination of paternity and the diagnosis of infectious diseases, were made possible by the discovery of the Polymerase Chain Reaction (PCR), which has had enormous positive effects. Through in vitro nucleic acid synthesis made possible by PCR, a DNA fragment can be specifically reproduced in a semi-conservative manner. The detection limits are often very good. Real-Time PCR, a PCR technology advancement that may produce quantitative data, has recently grown in significance in clinical diagnostics and research facilities. Unlike traditional PCR, which only shows the qualitative results, this method enables accompanying the reaction and presenting of data in a faster and more precise manner. Kary Mullis, who got the Nobel Prize in 1994, created PCR in the 1980s. Since it was first described, this method has sparked a true revolution in biological research by proving that fundamental biological processes remain consistent in practical contexts like diagnosis and genetic enhancements for plants and animals. A DNA-polymerase enzyme, which participates in the replication of the cellular genetic material, is used in PCR to enable the synthesis of particular DNA fragments. As a tiny fragment (primer) is joined to one of the DNA strands in the exact site selected to start the synthesis, this enzyme creates a complementary sequence of DNA. A specific DNA sequence is amplified with billions of copies when primers restrict the sequence that can be reproduced.

Gene analysis, the diagnosis of numerous genetic illnesses, and the detection of bacterial, viral, and fungal infections have all greatly benefited from the invention of methods for amplifying DNA segments. Cloning a specific DNA segment, which enables the investigation of gene expression and has significant potential in forensic medicine, is another beneficial PCR use. The measurement of DNA and RNA fragments has undergone a revolutionary change thanks to the availability of Real-Time PCR monitoring. These nucleic acids can be precisely quantified with higher reproducibility using real-time PCR. This method offers a delicate approach for the precise measurement of individual species, which may be crucial for the identification of infections and genetic disorders. Real-Time PCR has several benefits, including simplicity in quantification, increased sensitivity, reproducibility, and precision, quick analysis, improved process quality control, and reduced risk of contamination. For real-time PCR, you need a thermocycler with an optical system to record fluorescence and a computer with software that can record the data and conduct the reaction's final analysis. The programmes offered by various manufacturers differ in terms of sample capacity, excitation technique, and overall sensitivity. Additionally, there are variations in how data is processed. The number of PCR products directly correlates with the rise in signal produced by the emission of fluorescence. Fluorescence measurements, which indicate the volume of amplified product, are noted during each cycle.

The Polymerase Chain Reaction (PCR) has grown into a crucial instrument for determining the quantity and kind of nucleic acids present in tissues and bodily fluids. It is the enzymatic creation and amplification of certain DNA sequences carried out in vitro. One DNA or RNA molecule can be multiplied into billions of copies in a matter of hours [1-5].

Conclusion

This makes it possible to follow mutations for the management of any tumour, which is very important for targeted medicines. Analysis of blood for circulating DNA for tumor-associated mutations is one of the novel applications. The measurement of gene expression has frequently employed RNA analysis. Several gene expression assays, such as multigene panels being developed for prognostic and predictive applications, are based on this.'

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