



L&BROTORY INSTUMENT&TION &ND TECHNIQUES

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LECTURE ELEVEN POLYMERASE CHAIN REACTION

PCR stands for Polymerase Chain Reaction, which is often used in biological and chemical labs. A thermal cycler, or PCR machine, has the ability to produce DNA copies of a specific segment that can range from thousands to millions in numbers. PCR MachineThis machine, also called a DNA amplifier, can serve various purposes such as gene analysis, the evolutionary study between organisms or phylogeny and for diagnosing various long term diseases with the help of DNA structure.

Also, it's used in the field of forensic sciences in arriving at the results based on fingerprints patterns and for testing paternity. How PCR Machines Work

The basic function of this machine is copying the sections of DNA and this is performed though a heating cycle. This is performed when the temperature rises to 95 degree Celsius which in turn melts the DNA strands. This melting of DNA strands causes the backbones of

sugar phosphate to split apart.

Then as the temperature lowers, the primers bind them 3 inch end of each sequence of target. Primers are able to perform this task as the DNA polymerase taq and free nucleotides aid it in the process.

This process goes on so that there are two strands of double partially stranded molecules of DNA at the end of first cycle. The same process continues to be repeated again and again causing thousands of copies of the particular target sequence.

Features and Uses for a PCR Machine

- There are various features of attraction in a DNA amplifier, such as the automated ability, array of thermo cyclers and models, number of manufacturers to choose from, different cooling system designs
- variant tubing capacity, heating block in various sizes, multiple heating blocks models and ability to reach to high amplifications within short time.
- Though these thermal cyclers are essential tool for all the biologists, they are not very easy to afford. In spite of its price, this DNA amplifier can be found to be extensively used in various laboratories in universal standards, public school facilities, health centers and forensic departments.
- There are various advantages of using an automated thermal cycler in comparison to the traditional ones, like the former helps in clinical diagnosis, finds DNA sequencing, medicines, gene manipulation, gene expression study, genomics comparative study and helps in cloning of genes.

Types of PCR Machines

A DNA amplifier is highly versatile in nature and serves great purpose in various fields. It is available in various types to suit the requirements of different sector and other applications. Some of these types are:

Quantitative and Real Time PCR Machine

To quantify and detect DNA sample, this type of machine is widely used for amplification. This thermal cycler uses DNA dyes and fluorescent reporter for its method of probing.

Inverse PCR Machine

This is used to carry out amplification method that helps you identify the flanking sequence of different genomic inserts. This is DND amplification from known sequence to unknown sequence.

Anchored PCR Machine

When small sequence of nucleotides needs to be tagged to a particular DNA of target, the anchor is frequented by poly G by using poly C primer.

Reverse Transcriptase PCR Machine

This is used of RNA molecules amplification. This type of machine is highly used for profiling expression, finding gene expression and identifying RNA sequence in a transcript

Asymmetric PCR Machine

When there is a requirement for single strand molecules synthesis of DNA, which is essential for DNA sequencing, this PCR machine is widely used. It can perform 20 to 25 cycles of amplification using two primers. When one cycle is completed, one primer gets exhausted and in another 5 to 10 cycles, single strand DNA is produced.

Allele Specific PCR Machine

When there is a need to identify and detect a selective single nucleotide polymorphism, this thermal cycler is widely used. It uses a special design primer, which will match or not match the alleles at the primer end of 3'.

Colony PCR Machine

This machine is used to detect the formation of bacterial colonies after a plasmid transformation.

Conventional PCR Machine

This makes use of standard Polymerase Chain Reaction process that helps you produce billion copies of DNA and RNA strand.

Nested PCR Machine

After the initial 30 to 35 Polymerase Chain Reaction cycles, the new primers are nested along with the old primers to aid in a sensitive process as it reduces the risk involved in it.

What Is The Polymerase Chain Reaction?

- Polymerase chain reaction (PCR) is a revolutionary method used to analyze and amplify short DNA (or RNA) sequences in a sample with small quantities of RNA or DNA. PCR amplifies the selected sequence of DNA segment producing millions of copies within a few hours.
- Initially, DNA or RNA amplification involved cloning the selected segment using bacteria. This took weeks to amplify. But with PCR, it only takes few hours to produce millions of DNA sequence of interested.