

Overview on Recent Advances in Molecular Biology Techniques

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DESCRIPTION

Molecular biology is the science of studying the chemical structures and biological processes that involve the growth, function and other activities of life. In that field structures and mechanisms of macromolecules found in living things are studied, like protein, macronutrients and their process of absorption, molecular nature of gene and its mechanisms, process of protein synthesis, replication, mutation etc.

Molecular biology helps to understand structures, functions, and internal processes within an individual cell. These understandings can be used in drug development, helps to diagnose disease, and to better understand cell physiology.

Molecular biology methods are used to study the biological activities at the molecular level. Most commonly used molecular biology methods are protein methods, immunostaining methods, nucleic acid methods. These methods used to help to understand cells, their parts, characteristics, and chemical processes to know how molecules control a cell's activities and growth.

This subject is a convergence of various distinct disciplines of biological and physical science such as biochemistry, genetics, microbiology, virology and physics. Precisely molecular biology is the subject at the intersection of biochemistry and genetics so with the great improvement in those subjects with new theories and innovation of new technique molecular biology evolved as a distinct research field in the 20th century.

The quick expanding information flow, development of precise computational tools, constantly updated biological databases for analyzing gene, cytogenetic profile give this subject chance to grow like never before.

Molecular biology reached its golden age to the middle of 20's. New technologies developed to help real-time monitoring of biological processes. Researchers get the access to increasingly affordable sequencing data help to develop modern genetic manipulation methods. All those novel techniques help industries to produce small and macro molecules through the introduction of exogenous metabolic pathways in various cells.

Affordable sequencing data started to be utilized in many different scientific fields. This will drive increase accessibility to researchers.

This helps molecular biology to approach progressively reasonable sequencing information with higher profundities, working with the improvement novel genetic helps to come with manipulation methods in new non-model organisms. Some of those techniques are molecular cloning, polymerase chain reaction, gel electrophoresis, expression cloning, bradford assay, macromolecule blotting and probing, microarrays, and allele-specific oligonucleotide.

Molecular cloning

Molecular cloning is a set of methods used to assemble recombinant DNA molecules and direct their replication within host organisms.

Polymerase chain reaction

Polymerase Chain Reaction (PCR) advances are one of the techniques that develop new approaches in order to generate information more quickly, easily, accurately or in a more easily repeatable fashion. This discovery of different gene expression patterns between different cells helps to transgenic/gene knockout technology, and gene delivery to tissues/gene therapy.

Gel electrophoresis

Gel electrophoresis method used in laboratories to separate mixtures of DNA, RNA, or proteins as per molecular size. With this method the separated molecules are pushed by an electrical field through a gel containing small pores.

Expression cloning

Expression cloning technique helps to understand function of protein. The DNA is copied using PCR into an expression vector called a plasmid. The plasmid is introduced to a bacterial cell. This plasmid has promoter elements to stimulate high processing of the desired protein to help to examine the enzymatic activity.

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The Bradford assay

The Bradford protein assay is a spectroscopic analytical approach for measuring the concentration of protein in a solution that is quick and accurate. The amino acid makeup of the tested proteins influences the response.

Macromolecule blotting and probing

Another important technique in modern molecular biology is macromolecule blotting and probing technique. Blotting refers to transfer DNA or RNA to nitrocellulose membrane and then a probe binds to the complementary strand in the sample. The result we get in the form of signal using radioactive indicators or through biotin labeled probe.

DNA microarray

A DNA microarray is a solid-surface collection of microscopic

DNA patches. DNA microarrays are used by scientists to concurrently evaluate the expression levels of a large number of genes or genotype numerous sections of a genome. Each DNA patch comprises probes, which are picomoles (10¹² moles) of a specific DNA sequence (or reporters or oligos). A small piece of a gene or other DNA element can be utilized to hybridize a cDNA or cRNA (also known as anti-sense RNA) sample (called target) under high-stringency conditions.

Allele-specific oligonucleotide

A short length of synthetic DNA complementary to the sequence of a variable target DNA is known as an Allele-Specific Oligonucleotide (ASO). In a southern blot assay or, more typically, in the simpler dot blot assay, it works as a probe for the presence of the target. It's a widely used tool in genetic testing, forensics, and molecular biology research.