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Commentary

DNA Cloning and Characteristics of Recombinant DNA

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ABOUT THE STUDY

Recombinant DNA technology has made breakthroughs in plant and animal biotechnology. The power of RDNA technology derives from its ability to study and alter gene function by manipulating genes into plant and animal cells. To achieve this, DNA isolation and analysis, molecular cloning, quantification of gene expression, determination of gene copy count, suitable host transformation for replication or transplantation into crop plants, transgenic plants various molecular biology tools such as analysis are used.

DNA cloning

In biology, a clone is a group of individual cells or organisms that are descendants of an ancestor. This means that the members of the clone are genetically identical because cell replication produces the same daughter cell each time. The use of the word clone has been extended to recombinant DNA technology, allowing scientists to make many copies of a single fragment of DNA, such as a gene, to make the same copy that forms a DNA clone. In practice, this procedure is performed by inserting a DNA fragment into a small DNA molecule and replicating this molecule into a simple living cell such as a bacterium. Small replication molecules are called DNA vectors (carriers). The most commonly used vectors are plasmids (circular DNA molecules of bacterial origin), viruses and yeast cells. Although plasmids are not part of the major cellular genome, they can carry genes that give useful properties to the host cell and the drug resistance, mating ability and toxin production. It's small enough to be conveniently manipulated experimentally.

Within the cell, the DNA is organized into long structures called chromosomes. During cell division, these chromosomes are replicated during DNA replication, giving each cell its own complete set of chromosomes. Eukaryotes (animals, plants, fungi) store most of their DNA in the nucleus and some of their DNA in organelles such as mitochondria and chloroplasts. In contrast, prokaryotes (bacteria and archaic) store DNA only in the cytoplasm. Recombinant DNA Technology Tools, there are various ways to achieve this. Effectively transformed cells or organisms pass the recombinant gene to their offspring.

Characteristics of organisms containing recombinant DNA

In most cases, organisms containing Recombinant DNA appear to have a normal phenotype. That is, their appearance, behavior and metabolism usually do not change and the only way to demonstrate the presence of recombinant sequences is usually to examine the DNA itself using a Polymerase Chain Reaction (PCR) assay. If the Recombinant DNA sequence encodes an expressed gene, the presence of RNA and protein products of the recombinant gene can usually be detected using RT-PCR or Western hybridization. Overall phenotypic changes are non-standard unless recombinant genes have been selected and modified to produce biological activity in the host organism. Additional phenotypes encountered include toxicity to the host organism induced by the recombinant gene product, especially when overexpressed or expressed in inappropriate cells or tissues.

In some cases, recombinant DNA can have harmful effects even if it is not expressed. One of the mechanisms by which this occurs is insertion inactivation, in which Recombinant DNA is inserted into a gene in the host cell. In some cases, researchers use this phenomenon to "off" genes and determine their biological function and importance. Another mechanism by which the insertion of Recombinant DNA into chromosomal DNA can affect gene expression is improper activation of previously unexpressed host cell genes. This is the case, for example, when a recombinant DNA fragment containing an active promoter is localized next to a previously silent host cell gene, or when a host cell gene having the ability to limit gene expression is inserted by recombinant DNA. It can occur when undergoing inactivation.

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