

A Brief Note on Applications of Gene Cloning

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DESCRIPTION

Gene cloning involves the *in vitro* production of new DNA molecules containing new combinations of genes or oligonucleotides and such recombinant DNA *in vivo* by utilizing the replication mechanism of bacteria and other organisms. The development of genetic engineering technology has made it possible to modify the genome of microorganisms to produce substances of great medical or economic value to humankind, although they have little intrinsic value. The foreign gene has been transplanted into *E. coli* DNA to enable the production of useful proteins. Members of a family of antiviral proteins called interferons are manufactured in these ways and are undergoing clinical trials to determine their effectiveness in the treatment of certain types of cancer.

Human hormones such as insulin, somatostatin and somatotropin are synthesized in *E. coli*. Insulin controls blood sugar levels and its deficiency can cause a variety of serious diabetic conditions. Human insulin is commercially available to overcome problems associated with patient immune sensitization due to insulin production from the pancreas of pigs and bovines, increased need for insulin and continuous injection of animal protein. It was successfully synthesized from an artificial gene on a large scale. The first human polypeptide hormone found in *E. coli* is a somatostatin and was used with 14 amino acid residues to develop techniques for production. Somatostatin is used to treat many disorders characterized by overgrowth. The hormone that antagonizes somatostatin is somatotropin (human growth hormone), which is used to treat dwarfism.

Gene cloning may give a potentially clean, high-purity product. Certain Hemophilia requires a coagulation factor, factor VIII (antihemophilic factor). The risk of hepatitis and Acquired Immuno Deficiency Syndrome (AIDS) due to inadvertent blood sampling from viral carriers has identified this factor as a candidate for production by recombinant DNA technology.

Agriculture has developed techniques that allow the transfer of the properties of one plant to another by bacterial infection.

Such techniques can produce new plant varieties with the desired properties like infection resistance, ability to withstand bad weather or ability to fix nitrogen.

Non-protein products can be synthesized by recombinant methods. Many important medicines are small molecules and their biosynthesis requires the continuous involvement of various enzymes. Cloning of all genes associated with a single plasmid can increase the production of the substance. The antibiotic actinorhodin was synthesized in *Streptomyces* by such a method. Experimental vaccines for specific viral diseases are also produced by recombinant DNA technology.

Gene cloning has played an important role in basic biological research. Its value lies in the generation of DNA fragments containing a particular gene, leading to advances in knowledge about the regulation of the structure, function, expression and activity of that gene. Recombinant DNA technology has been used to study the regulation of metabolism

The attribution role of citrate synthase in metabolic regulation is evident from the interpretation of data from *in vitro* studies. However, by cloning the *coli* citrate synthase gene, the intracellular level of citrate synthase is engineered by the regulatory portion of the gene *via* the non-metabolism inducer isopropyl- β -D thiogalactopyranoside.

To fully understand the regulation of metabolic pathways, it is necessary to elucidate the properties of regulatory enzymes. Manipulation of cloned genes has provided significant amounts of enzymes for their purification. Further studies of their structures/tissues included their primary structure, determination of structure-function relationships and analysis of the role and expression of multiple gene families. Protein kinase C-related genes have advanced knowledge of metabolic regulation. Indeed, genetic engineering promises enormous benefits in a wide range of biological activities.

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