

## A Brief Note on Recombinant DNA

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### Description

In biotechnology, medicine, and research, recombinant DNA is frequently employed. Recombinant proteins and other DNA-based goods may now be found in almost every western drugstore, physician's or veterinarian's office, medical testing laboratory, and biological research facility. Furthermore, organisms edited with recombinant DNA technology, as well as goods generated from those species, have made their way into many farms, supermarkets, home medicine cabinets, and even pet stores, such as those selling GloFish and other genetically modified animals.

Recombinant DNA is most often used in fundamental research, where the technique is critical to most contemporary work in the biological and biomedical sciences. Genes are identified, mapped, and sequenced using recombinant DNA, as well as in the tissues of whole organisms. Recombinant proteins are commonly utilised as reagents in lab research and to make antibody probes for studying protein production in cells and animals.

Industry, food production, human and veterinary medicine, agriculture, and bioengineering are just a few of the many practical uses of recombinant DNA. The following are some particular examples.

Chymosin recombinant is an enzyme found in rennet that is needed to make cheese. It was the first commercially available genetically modified food ingredient. Processors used to get chymosin from rennet, which is a product made from the fourth stomach of milk-fed calves. For large-scale laboratory synthesis of the enzyme, scientists developed a non-pathogenic strain (K-12) of *E. coli* bacterium. The cost of this microbiologically manufactured recombinant enzyme, which is physically similar to the calf-derived enzyme, is unknown. It is less expensive and abundantly manufactured. Currently, genetically modified chymosin is used in the production of around 60% of hard cheese in the United States. The FDA designated chymosin as "Generally Regarded As Safe" (GRAS) in 1990 based on studies demonstrating the enzyme's safety.

Recombinant human Insulin derived from animals (e.g. pigs and cattle) has nearly totally replaced animal-derived insulin in the treatment of insulin-dependent diabetes. There are several different types of recombinant insulin formulations on the market. The human insulin gene is inserted into *E. coli* or

yeast (*Saccharomyces cerevisiae*), which subsequently generates insulin for human usage.

HGH (somatotropin) is a recombinant human growth hormone that is given to individuals whose pituitary glands do not produce enough to sustain normal growth and development. Prior to the availability of recombinant HGH, HGH for pituitary glands from cadavers were used for medicinal purposes. Some individuals developed Creutzfeldt-Jakob disease as a result of this dangerous technique. This difficulty was solved with recombinant HGH, which is currently used medically. Athletes and others have also taken it as a performance-enhancing substance.

Recombinant blood coagulation Factor VIII is a blood-clotting protein that is administered to persons with haemophilia who are unable to produce enough factor VIII to keep their blood clotting normal. Prior to the discovery of recombinant factor VIII, the protein was obtained by processing large volumes of human blood from several donors, providing a high risk of HIV and hepatitis B transmission.

Recombinant hepatitis B vaccine is controlled through the use of a recombinant hepatitis B vaccine, which contains a form of the hepatitis B virus surface antigen that is produced in yeast cells. The development of the recombinant subunit vaccine was an important and necessary development because hepatitis B virus, unlike other common viruses such as polio virus, cannot be grown *in vitro*.

The use of recombinant DNA to diagnose HIV infection is one of three extensively used approaches for detecting HIV infection. A recombinant HIV protein is used in the antibody test (ELISA or western blot) to check for the presence of antibodies generated by the body in response to HIV infection. Using reverse transcription polymerase chain reaction, the DNA test looks for HIV genetic material (RT-PCR). The molecular cloning and sequence analysis of HIV genomes enabled the development of the RT-PCR test. The US Centers for Disease Control and Prevention has a page dedicated to HIV testing (CDC).

Golden rice is a recombinant rice type that has been genetically modified to express the carotene biosynthetic enzymes. This rice variety has a lot of potential in terms of lowering vitamin A deficiency in the world's population. Golden rice is now unavailable for usage due to regulatory and intellectual property concerns.

Herbicide-resistant crops are commercially available varieties of important agricultural crops (such as soy, maize/corn, sorghum, canola, alfalfa, and cotton) that contain a recombinant gene that confers resistance to the herbicide glyphosate (trade name Roundup) and simplifies glyphosate application. These crops are widely grown for commercial purposes in a number of nations.

Crops that are resistant to insects *Bacillus thuringiensis* is a bacteria that naturally generates an insecticidal protein (Bt

toxin). For many years, the bacterium has been used to control insects in crops, and this technique has become widespread in agriculture and gardening. Plants that express a recombinant version of the bacterial protein have recently been discovered, which may be beneficial in controlling some insect predators.