

## Genetically modified organisms

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Biotechnology has created several techniques that specialise in genetic recombination by transferring genes between organisms or by modifying existing genes. One of the examples of such a procedure is genetically modified organisms (GMOs). GMOs refer to living organisms, such as bacteria, plants, animals and even viruses whose genetic material is modified and changed in vitro. For producing GMOs, recombinant DNA or RNA technology is being used. Many of these GMOs help in improving the life of humankind, for example, the production of improved products in agriculture, medicine and environmental sustainability. Genetically modified crops in agriculture such as golden rice have been engineered to produce a higher amount of beta-carotene that is converted by the human liver into vitamin A, thereby producing larger quantities of vitamin A, which is essential for maintaining the body's metabolism. Transgenic fishes are genetically modified fishes that have improved growth, feed utilisation and are highly resistant to diseases. Due to their high growth rate, fish breeders are able to produce better yields per year. Many transgenic animals are being used as animal bioreactors for the production of proteins, enzymes, hormones, etc. that are therapeutic in nature.

Recombinant DNA and RNA technology have been used to produce recombinant proteins from fluids obtained from animals like milk, cocoon, egg white, urine, etc. Such recombinant proteins can be engineered for therapeutic purposes and can also be produced at an industrial scale. For example, transgenic tilapia have been used to produce human clotting factor VII which is helpful for treating injuries. In some cases, GMOs have been used to produce ornamental fish and plants also. For example, by utilising genes that express glowing features, genetically engineered luminous zebrafish, *Danio rerio* (known as GloFish) has been produced. They can be obtained in different colours and sold as pets. Gene knockout technology is a newly developed method where one of the genes of an organism is made inactive through genetic engineering. Organisms like knockout mice are used to study the effects and function of a certain gene or protein by investigating and comparing how normal functions get disrupted when a gene becomes inoperative. Even though GMO products are regulated by the FDA and other regulatory bodies, products that contain genetically modified ingredients must be labelled accurately. In conclusion, research on genetically modified organisms has gained interest nowadays despite the ethical issues surrounding them because of their unusual and relatively advanced production process and uncertainty about their impact. However, these GMOs still provide many benefits to human health while trying to maintain animal welfare and sustain the environment.

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