

## Review (Narrative)

# Genetic Engineering

## Pros versus Cons in Deciphering Disease Mechanism

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**SUMMARY**

Genetic engineering is a group of techniques that are being employed to change the genetic makeup of cells and move genes across the boundary of species to supply new organisms. There are a variety of techniques for moving genes by artificial means into recipient organisms. These methods include using chemical or electrical treatments to facilitate direct DNA uptake by the host cells; microinjecting of genes directly into host cells; firing tiny metal particles covered with the genes of interest into host cells (bioballistics); and using plasmids found in bacteria. Advantages and disadvantages exist for genetic engineering. Some advantages include produce new foods, tackling and defeating diseases and getting rid of illnesses in young and unborn children. Some of the disadvantages are may lead to genetic defects and limits genetic diversity. Genetic Engineering is one of the most controversial topics of this century. It might work miraculously but who knows the consequences of playing with the nature. ■

**KEYWORDS** Genetics; Medical science; Engineering; Regeneration; Intervention

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**G**enetic engineering is a group of techniques that are being employed to change the genetic makeup of cells and move genes across the boundary of species to supply new organisms. This essay discusses what genetic engineering is, furthermore it talks regarding the techniques used for genetic engineering and discusses its benefits and drawbacks. But first of all we need to know what DNA and genes are.

Deoxyribonucleic acid, or DNA, is found within the nucleus of each cell. Deoxyribonucleic acid tells the cell a way to behave and carries data that is passed from generation to generation. Deoxyribonucleic acid is made up of four repeating units, nucleotides or bases, organized in pairs. The sequence of those units carries the data (1). A gene refers to a specific sequence of bases that perform as a unit, carrying specific commands for making macromolecule within the body (2). Genes are accountable for expression of diverse traits in living organisms.

The techniques involve extremely subtle manipulations of genetic material (DNA) and various biologically necessary chemicals. Such a transfer of genetic material is attainable through employment of a restriction enzymes. These enzymes, created by different species of bacteria, are capable of recognizing a specific sequence of the chain of chemical units, referred to as nucleotide bases, which make up the deoxyribonucleic acid molecule, and of breaking this chain wherever the particular sequence lies. Fragments of deoxyribonucleic acid created by same restrictive enzymes tend to hitch along permanently (3). Thus, if the deoxyribonucleic acid strands of two different organisms are treated with the same restriction enzyme, they will combine to make a hybrid deoxyribonucleic acid molecule. If this molecule is incorporated into a cell, a new organism will be created that has characteristics of both the parent organisms.

Genetic engineering so far has been administrated mainly with bacterium and viruses. The explanation is that the method of genetic manipulation works in a very minute proportion of the organisms treated. With bacterium and viruses, massive numbers of organisms are often screened to choose out the few productive transfers. For example, by incorporating into the deoxyribonucleic acid of an organism gene that confers resistance to some chemicals, and subjecting the recipient organisms to these chemicals. Only those with a successful transfer will survive.

## GENETIC ENGINEERING TECHNIQUES

- There are a variety of techniques for moving genes by artificial means into recipient organisms. These methods include:
- Using chemical or electrical treatments to facilitate direct DNA uptake by the host cells (electro or chemical proration).

- Microinjecting of genes directly into host cells.
- Firing tiny metal particles covered with the genes of interest into host cells (bioballistics).
- Using plasmids found in bacteria.

### Recombinant DNA

These techniques use biological vectors like plasmids and viruses to transfer foreign genes into cells. Plasmids are tiny circular items of genetic material found in microorganism that have the power to cross species boundaries. The circles are often broken and new genetic material injected to them. Plasmids carrying new genetic material will move across cell boundaries of bacteria and place the new genetic material next to the bacterium's own genes. New technologies have developed, that ensure the insertion of gene to predetermined site present in DNA (4). Usually the microorganism takes up the gene and start to supply the protein molecule that the sequence codes. Wherever the new sequence codes for insulin, the microorganism can begin to supply insulin together with its alternative gene product. in this way a huge vat of bacteria can be genetically engineered to get insulin for pharmaceutical consumption

Viruses can also be used as vectors. Viruses are infectious particles, containing genetic material in which a desirable gene can be replaced. While infecting a cell, virus can transport the new genes into the recipient cells. Another fact that make viruses useful for gene transfer is that they can be made inactive so that they do not infect the new cell.

### Microinjection

Other strategies don't use biological vectors like plasmids and viruses. One amongst these is termed microinjection and involves merely injecting the new gene into the receiver cell. At the point where the cell is massive enough, as in case of several plant and animal cells are, the injection is done through a fine-tipped glass needle. The injected genes make their way to the host cell's genes and incorporate themselves among them.

### Bioballistics

In bioballistics, the third technique, a kind of bio gun is employed to shoot the genes into the host cell (5). Scientists coat thousands of little shards of tungsten or gold with the desired genes and shoot these projectiles into the host cell, hoping that the genes are going to be carried to the host cell's nucleus. These techniques are imprecise and rely upon luck.

### Electro or Chemical Proration

The electro or chemical proration technique involves direct gene transfer that involves making pores within the semipermeable membrane to permit for the entry of the new gene.

## PROS OF GENETIC ENGINEERING

Although in the beginning the pros of genetic engineering won't be as obvious as the cons but upon addition inspection, there are some of advantages that we can attain if scientists observe and strengthen this precious department. Here are just a few of the benefits:

### Produce New Foods

Genetic engineering isn't just for human beings. With genetic engineering we are able to design meals, which might be better able to face up to harsh temperatures, that is extreme warm or very cold conditions and which are packed of all of the right nutrients that people and animals need to live on. Some companies that have created genetically engineered plants claim that crop development through this process is quicker and less expensive (6) and that the process of genetic engineering reveals predictable results in plants (7). We are also being able to create edibles that have a high medical value, thus making edible vaccines easily available internationally.

### Tackling and Defeating Diseases

Some of the deadliest and troublesome diseases within the world, that have a resisted destruction, can be exhausted by the utilization of gene-splicing. There are variety of genetic mutations that humans might suffer from that may most likely will never be terminated unless scientists actively intervene and genetically engineer future generation to face these issues. As an example, cystic fibrosis, a progressive and dangerous sickness for which there's no notable cure, can be fully cured with the assistance of selective gene-splicing. Another example is the therapy of pain. Through genetic engineering, the researchers can do engineering modifications on nociception-related genes like receptors of gamma-Aminobutyric acid (GABA), glutamate, dopamine, opioids etc. Furthermore, genetic engineering provides a promising future in the epigenetic field that including gene methylation, acetylation, and microRNAs.

### Getting Rid of All Illnesses in Young and Unborn Children

There are several issues that can identify even before babies are born. For instance, in the uterus, doctors can tell whether or not your baby will suffer from sickle cell anemia or from Down's syndrome. In fact, the date by which you'll be able to have an abortion has been pushed back comparatively late so that parents can decide whether or not to abort a baby if it is suffering from one these kinds of problems. However, with genetic engineering, we might not need to worry. One among the most advantage of genetic engineering is that it will facilitate cure of diseases and sickness in unborn kids. All children would be able to

turn healthy with no diseases present at birth. Genetic engineering is also used to facilitate people that risk passing on really chronic diseases to their kids.

For instance, if you are suffering from Huntington's there is a 50 percent likelihood that your offspring will inherit the sickness and, if they don't, they're possibly the carriers of the sickness. You cannot merely stop individuals from having kids if they suffer from a sickness like this, so gene-splicing will help to make sure that their kids live long and healthy lives free from either the sickness itself or from passing it on to their young ones.

## CONS OF GENETIC ENGINEERING

Perhaps more obvious than the benefits of gene-splicing, there are many of disadvantages to permitting scientists to break down barriers that are would better left untouched. Here are some of these disadvantages:

### May Lead to Genetic Defects

A problem with genetic engineering is the question concerning creating changes at the cellular level. Scientists have not recognized completely everything regarding the manner that the human body works, so how can they possibly perceive the ramifications of slight changes created at the cellular level? What if they manage to wipe out one illness but introduce something new and even more dangerous? In addition, if scientists genetically engineer babies still within the uterus, there is a danger that this might cause complications, as well as miscarriage (early on), premature birth or perhaps spontaneous abortion, all of which are undesirable. The results of an investigation performed on human cells show that genetic engineering can cause unintended mutations in many regions of genome (8). In another investigation it was found that there is a 53%–66% chance that this process will disrupt a gene (9).

### Limits Genetic Diversity

Diversity is an essential aspect in all organisms. By genetic engineering of species, however, we are going to have a damaging impact on our genetic diversity in the same manner as practices like cloning would as there is no regulation to ensure that these organisms go through risk assessment (10).

Genetic engineering is one of the most controversial and disputed subjects of this century. Changing the DNA of organisms has actually raised a number of eyebrows. It might work miraculously but who knows the consequences of playing with the nature. This article will help you to evaluate all aspect of genetic engineering and forming your opinion regarding it.

## CONCLUSIONS

Genetic engineering makes great progress in the past decades, and also contributed to the development of medicine. Even though it is a promising means in solving a lot of thorny medical problems, it is not a perfection, which also has some drawbacks. We need pay enough attention on

genetic engineering by pushing the beneficial effects to the biggest, and avoiding corresponding potential deficits on gene evolution. ■

## ARTICLE INFORMATION

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