HUMAN GENETIC ENGINEERING

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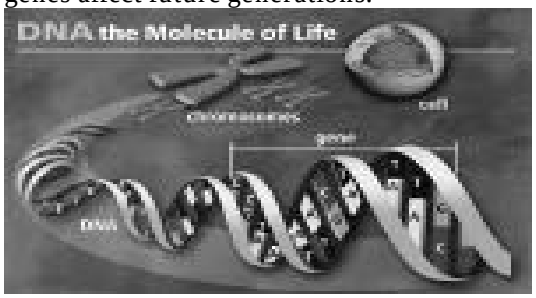
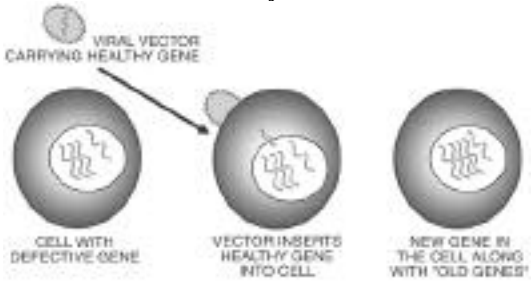
Biomedical Engineering Seminar I

Genetic engineering is the process of changing an organism's genetic composition in order to introduce new characteristics, enhance existing characteristics, or repair genetic defects in the organism. The two types of genetic engineering are: (1.) somatic and (2.) germline. Somatic engineering targets the genes in specific organs and tissues of the human body without affecting genes in the eggs or sperm, while germline genetic engineering is specifically aimed at the genes in eggs or sperm (or very early embryos). Germline genetic engineering is banned in most countries because the altered genes affect future generations.



The Human Genome Project (HGP) has been an extremely important part of the development of human genetic engineering. HGP, which was recently completed in 2003, was an international project seeking to identify all of the genes in human DNA and determine the 3 billion chemical base pair sequences. This project will help scientists associate specific human traits and genetic diseases at precise locations in the DNA.

Genetic engineering is performed by taking a specific gene from one living organism and placing it into another living organism. The concept of the process is that the gene will enter the human body, invade host cells, and insert itself directly into the genes of that particular host cell. Desired genes are isolated by restriction enzymes, cloned by Polymerase Chain Reaction, and carried into a living organism by a *gene construct*. The desired function or characteristic is then carried out in the organism. This procedure is called *pronuclear injection*. The procedure has not yet been permitted for use on humans, however, is successfully used on animals.



While human genetic engineering could have many positive effects, there are still many risks, especially since procedures have not yet been perfected. Injected genes may get randomly lost in the body, "silenced" by existing DNA in the body, or may interfere with normal, existing DNA functions in the body. However, once the procedures are perfected, human genetic engineering will be able to help treat diseases like diabetes, cystic fibrosis, cancer, and many more. The procedure could also make it possible for humans to re-grow limbs, enhance intelligence, increase lung capacity, etc.

The FDA and NIH have the authority to approve research proposals involving gene transfer, but their authority is limited in that they do not have the authority to ban any technologies.

Human genetic engineering has the potential to either revolutionize the world of genetics and cure life-threatening diseases, or it could create more chaos in the human body (and in society) than already exists.

Resources:

1. http://www.ifgene.org/beginner.htm
2. Wikipedia Online Encyclopedia. http://en.wikipedia.org/wiki/Human_Genetic_Engineering
3. "Human Genetic Engineering." http://www.unixl.com/dir/molecular_sciences/genetics/genetic_engineering/
4. "What is Genetic Engineering?" http://www.srtp.org.uk/geneng1.htm
5. "Genetics and Society." http://www.genetics-and-society.org/index.asp