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### Genetic engineering and ethical issues

Genetic engineering is a set of technologies used to change the genetic makeup of cells, including the transfer of genes within and across species boundaries to produce improved or novel organisms. The techniques involve sophisticated manipulations of genetic material and other biologically important chemicals. Genetically modified organisms (GMOs) can be defined as organisms (i.e. plants, animals or microorganisms) in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination. The technology is often called “modern biotechnology” or “gene technology”, sometimes also “recombinant DNA technology” or “genetic engineering”. It allows selected individual genes to be transferred from one organism into another, also between non related species.

How is genetic engineering done?

1). First, find an organism that naturally contains the desired trait.

2) The DNA is extracted from that organism. This is like taking out the entire cookbook.

3) The one desired gene (recipe) must be located and copied from thousands of genes that were extracted. This is called gene cloning.

4) The gene may be modified slightly to work in a more desirable way once inside the recipient organism.

5) The new gene(s), called a transgene is delivered into cells of the recipient organism. This is called transformation. The most common transformation technique uses a bacteria that naturally genetically engineer plants with its own DNA. The transgene is inserted into the bacteria, which then delivers it into cells of the organism being engineered.

Transgenic biotechnology presents an exciting range of possibilities, from feeding the hungry to preventing and treating diseases; however, these promises are not without potential peril. Some of the issues that need to be considered are the following:

Social Concerns: if the blending of animal and human DNA results, intentionally or not, in chimeric entities possessing degrees of intelligence or sentience never before seen in nonhuman animals, should these entities be given rights and special protections?

Extrinsic Concerns. What, if any, health risks are associated with transgenics and genetically modified foods?

Intrinsic Concerns. What, if any, research in genetic engineering should be considered morally impermissible and banned (e.g., research undertaken for purely offensive military purposes)?