

## Genetic Modification And Cloning

Genetic modification (GM, also called genetic engineering) involves taking a gene from one species and putting it into another species. It involves these steps:

1. selection of the desired characteristic
2. isolation of the gene responsible for the characteristic
3. insertion of the gene into another organism
4. replication of the transgenic organism

Genetic modification can be used to produce plants that improve food production. For example, a plant may be produced with improved resistance to pests.

However, there are ethical issues involved in genetic modification. There are concerns about the possible health risks of genetically modified food. For example, a GM food might contain a substance that causes an allergic reaction in some people, or higher levels of a toxin naturally found in the food.

Others think it is morally wrong to create new life forms, or to move genes between different species.

Scientists have added genes to crop plants that make them resistant to herbicides. This means that less herbicide needs to be used. However, there are disadvantages to creating these plants. For example:

- the potential development of herbicide-resistant weeds
- loss of biodiversity because fewer weeds survive - resulting in reduced food and shelter for animals

## CLONING MAMMALS

The stages of cloning a mammal include:

1. removal of diploid nucleus from a body cell
2. enucleation - removing the nucleus from an egg cell
3. insertion of the diploid nucleus into the enucleated egg cell
4. stimulation of the diploid nucleus to divide by mitosis

The new animal is genetically identical to the animal that provided the nucleus from one of its body cells.

## Variation and Mutation

### VARIATION

Individuals in a population are usually similar to each other, but not identical. Some of this variation within a species is genetic, some is environmental, and some is a combination of both.

**Each sperm cell and each egg cell contains half of the genetic information needed for an individual** (each one is haploid - it has half the normal number of chromosomes). When these **join at fertilisation, a new cell is formed**. This zygote has all the genetic information needed for an individual (it is diploid - it has the normal number of chromosomes).

Environmental causes; Characteristics of animal and plant species can be **affected by factors such as climate, diet, accidents, culture and lifestyle**. For example, if you eat too much you will become heavier, and if you eat too little you will become lighter. A plant in the shade of a big tree will grow taller to reach more light.

### CONTINUOUS AND DISCONTINUOUS VARIATION

Some of the features of the different organisms in a species show continuous variation, and some show discontinuous variation.

Continuous; For any species, a characteristic that changes gradually over a range of values shows continuous variation. Examples of such characteristics are: