# Selective Breeding & Genetic Engineering

## Selective Breeding
Animals with the most desirable characteristics are bred together. The offspring with the best characteristics are also bred together. This is repeated over many generations. Over time the characteristic becomes enhanced.

## What characteristics are selected for
- Animals that produce more meat or milk
- Crops that are resistant to disease
- Dogs that have a gentle nature
- Flowers that are large or unusual

## Genetic Engineering – modifying the genome of an organism by introducing a gene from another organism.

1. A useful gene is cut out of an organisms genome using an enzyme (eg. the human gene for insulin)
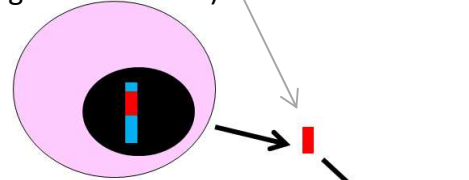
2. A plasmid from a bacteria is removed and cut open using an enzyme. The plasmid acts as a vector.
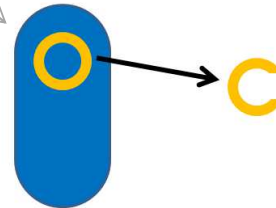
3. The useful gene is inserted into the plasmid.

4. The plasmid (vector) is introduced to the target organism so the useful gene is inserted into its cells.
This is usually done at an early stage in the development of an organism (eg. when it is an embryo). This means the organism will develop with the desired characteristic.

## Problems with selective breeding
The **gene pool is reduced** – the number of different alleles in the population due to inbreeding.

This can cause **health problems** as there is a greater chance of inheriting genetic defects.

The animals/plants may be **susceptible to new diseases**. This is because there is less chance of genes that are resistant to a disease being present in the population.

## Genetically Modified Crops
**Advantages:**
- can be engineered to contain extra nutrients. Important for people living in nations where there are missing nutrients in their diet.
- GM crops are being grown in some places without any problems.

**Disadvantages:**
- May affect the number of wild flowers and reduce biodiversity.
- Some people think they may not be safe
- Concern that the transplanted genes may get into the environment, affecting the wild populations.

## Examples of Genetic Engineering
Bacteria modified to produce human insulin.

Crops that are resistant to disease, insects and herbicides.

Sheep to produce useful drugs in their milk.