

## How gene technology is carried out

Scientists can work with plants, animal or human cells. Regardless of the organism studied, broad principles apply to most biotechnology research and laboratory work.

Some of the techniques might be fancier and more involved than others, but the process of modifying the genes of an organism nearly always involves a common set of steps.

1. A feature to be introduced into an organism is identified.
2. A gene that controls the identified feature is located.
3. The gene that controls the new feature is isolated and made ready for insertion into a new cell.
4. The new gene is put into the DNA of cells of the organism to be changed.
5. The genetically modified cells are cultured.

At the end of this activity you will understand the steps that scientists usually follow to produce a genetically-modified organism.

### You will need:

- access to the internet
- access to information in *How do you do biotechnology?* from *Biotechnology Online*.

### What to do:

1. Work with a partner to find a project and organism that interests you amongst the research projects listed on CSIRO's *Current Australian Research* page, at <http://www.csiro.au/org/BiotechAtCSIRO.html>
2. Write down the name of the organism and the feature of the organism that is being worked on.
3. Find out which of the following techniques are being used:
  - microinjection into an animal egg using a fine tube
  - insertion of DNA into cells on gold or tungsten fragments
  - *Agrobacterium*, a bacterium, to transfer DNA into plant cells
  - the use of calcium silicate crystals to puncture holes in the cells to allow DNA to enter
  - use of a virus to carry the genes into the cells of the organism
  - an electric shock to encourage cells to take up DNA.

A description of each these techniques can be found in the material from *Biotechnology Online*. Are there other techniques used that do not feature here?

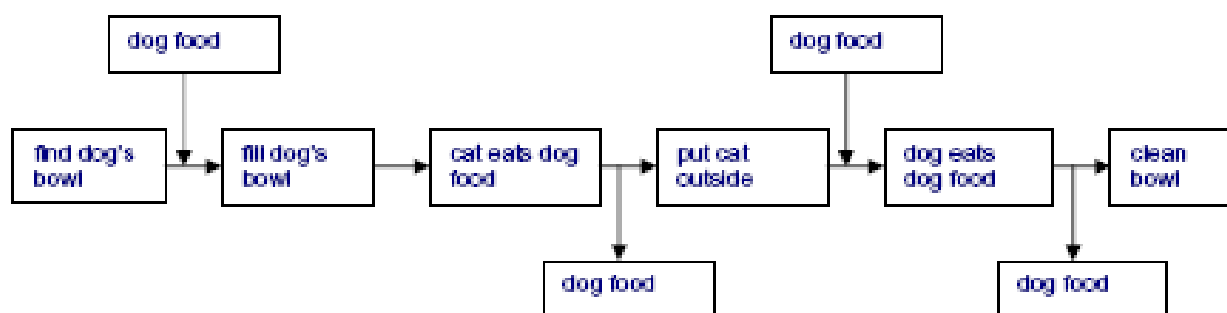
4. Work out the steps involved in the process you have studied. Include the steps needed for approval of the research and for the possible use of the product
5. If you were to undertake this work, what processes would you need to go through to get approval (eg ethics committees or licenses) and would you need a special type of laboratory or other precautions?

**What to do with this information**

1. Display your information as a flow chart. These charts consist of:
  - a box for each stage of the process where action has taken place
  - arrows that connect each box showing the direction of the process
  - input and output boxes, connected with the arrows between the process steps, that show anything that is added to or removed from the process.

**Preparing a flow chart**

- You might find it useful to write each step, input and output onto small rectangles of paper and to reposition these until the steps are in the correct order.
- Draw up the flow chart using a word processing package using text boxes and arrows.
- Here is an example:



**Useful resources**

CSIRO – The science behind gene technology

<http://www.csiro.au/science/ScienceBehindBiotech.html>

CSIRO - Current research

<http://www.csiro.au/org/BiotechAtCSIRO.html>

OGTR - Evaluation process and flow chart for intentional release licence applications

<http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/dirclass-2> and

[http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/evalprocess-3/\\$FILE/DIRprocessdiagram.pdf](http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/evalprocess-3/$FILE/DIRprocessdiagram.pdf)