

# New genetic technologies

Genetic technology is a rapidly changing field. What is unknown today may be known tomorrow and some of what is known today may be proved wrong tomorrow.

Genetics is involved in a number of complex and sometimes controversial fields, such as:

- Designer drugs (pharmacogenomics)
- Gene therapy
- Stem cells
- Genetically modified foods.

In all these areas, research has shown that there are benefits to people. There is controversy over how beneficial the technologies are, the risks involved with using them and, in some cases, the ethics of using them.

All technologies are likely to develop further as people get more used to them and as their use is refined.

## Designer drugs

These are drugs which are designed to work mostly with people who have a particular gene functioning in a particular way.

Pharmacogenomics is the study how a person's genetic makeup affects their body's response to drugs.

It is very early days for designer drugs, but one example is the use of the drug herceptin (to block the effects of the growth factor protein HER2, which transmits growth signals to breast cancer cells) to treat women with advanced breast cancer.

## Gene therapy

Gene therapy involves changing or replacing faulty genes by inserting a normal gene into the body of a person with a serious illness.

We all carry about half a dozen faulty genes. Most of us do not suffer any harmful effects from our faulty genes because we carry two copies of nearly all genes. Scientists are looking at replacing the missing or faulty gene with a working gene as a treatment for genetic disorders.

This treatment is highly experimental, but has the potential to treat conditions that are currently incurable.

## Stem cells

Most cells in the body do a particular job. There are many different cell types including: brain cells, skin cells, liver cells, kidney cells, red and white blood cells and heart cells. None of these types of cell can change into a different type of cell.

Stem cells are different. They have the ability to develop into many different types of cell.

Stem cells taken from bone marrow have been used for many years to treat people whose bone marrow is damaged by cancer treatment. Bone marrow stem cells can develop into red blood cells and several different types of white blood cell – these are also called adult stem cells. Based on current research, adult stem cells appear to have a more restricted ability to produce different types of cells and to self-regenerate. Many scientists are working with embryonic stem cells because they do not have this problem.

Embryonic stem cells are derived from embryos that are 5 to 6 days old. At this stage of development the embryo is a hollow ball of about 200 to 250 cells, no bigger than a pinhead, and is called a blastocyst.

It is illegal in Australia to conduct any type of research on embryos that are conceived naturally. Embryonic stem cells are taken from embryos that come from eggs fertilised in an IVF (in vitro fertilisation) clinic. Only embryos not required for implantation in IVF procedures are used. They are donated for research purposes only with informed consent from the donors. They are not derived from eggs fertilised within a woman's body and embryos are not created specifically for research purposes.

Stem cells are controversial at the moment because of discussion over whether or not they should be taken from early embryos. They could help in the treatment of illness if the ethical issues are resolved.

Stem cells could potentially replace damaged tissue and cells in the body to treat a range of conditions including: heart failure, spinal injuries, diabetes and Parkinson disease. Stem cells could also be used to study early events in human development and why some cells become cancerous, and how some genetic diseases develop, which may lead to clues as to how they may be prevented.

## Genetically modified foods

Genetically modified (GM) foods are foods grown from plants which have had one or a few of their genes altered.

Genetically modified foods are grown in some parts of the world, but in Australia GM cotton is currently the only GM crop that is commercially grown. The food product that comes from the cotton plant is cotton seed oil. This oil is a highly refined product. In the process of making this oil, all the cotton plant's genes, including the inserted gene that makes it genetically modified, is removed. So the makeup of cotton seed oil from a regular cotton seed plant and a GM cotton plant is no different.

## Safety approval

All foods that are sold in Australia, including GM foods, must pass a comprehensive and demanding safety assessment by our food authority, Food Standards Australia New Zealand (FSANZ), to gain approval for consumption.

FSANZ's safety assessment process for genetically modified foods is based on concepts and principles developed by the World Health Organization (WHO), the Food and Agriculture Organization (FAO) of the United Nations and the Organisation for Economic Co-operation and Development (OECD).

Eating genetically modified foods will not change our genes. There are a lot of myths and inaccurate information about GM foods, including that eating GM foods will insert the gene which has been inserted into the GM food into our genes. We eat millions of genes everyday. So when we eat an apple, we eat all the genes in that apple, but it will not change us in any way into an apple.

## Food labelling laws

As part of our general food labelling laws, GM foods/ingredients are labelled to allow people to choose whether or not to buy GM foods or foods with GM food ingredients. This labelling law applies to both Australian and overseas produced foods that are sold in Australia and New Zealand.

## Contacts and further information

- Your local genetic service, which you can contact through your nearest community health centre, public hospital or health department.
- Australian Health Ethics Committee at <http://www.nhmrc.gov.au/ethics/human/ahec>
- National Health and Medical Research Council at <http://www.nhmrc.gov.au>
- Australasian Gene Therapy Association at <http://www.agts.org.au>
- Australian Stem Cell Centre at [www.stemcellcentre.edu.au](http://www.stemcellcentre.edu.au)
- Food Standards Australia New Zealand at <http://www.foodstandards.gov.au>
- The Office of the Gene Technology Regulator at <http://www.ogtr.gov.au> or email [ogtr@health.gov.au](mailto:ogtr@health.gov.au) or dial **freecall Australia-wide 1800 181 030**
- For other related fact sheets, you can contact the Gene Technology Information Service on **free call Australia-wide 1800 631 276** or email [gtis-australia@unimelb.edu.au](mailto:gtis-australia@unimelb.edu.au) or visit Biotechnology Australia's website at <http://www.biotechnology.gov.au>