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Advisory Committee on Assisted Reproductive Technology

Human Reproductive Research in New Zealand

Should human gametes and embryos be used for research purposes? If so, under what conditons?

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Human reproductive research in New Zealand

Should human **gametes** and **embryos** be used for research purposes?

If so, under what conditions?

Before making a decision, the New Zealand government is interested in your opinion.

Scientists overseas are currently using embryos and gametes in research. This helps with the understanding of human development and diseases. New Zealand researchers would like to join in this work which, as well as adding to knowledge, may in the future be able to help with curing some injuries and diseases.

A 2004 Act of Parliament (Human Assisted Reproductive Technology – the HART Act) – addresses some of these issues, and provides an overarching framework for assisted reproductive technology in New Zealand. The Act established an Advisory Committee and an Ethics Committee to manage this area. New Zealand now requires a policy on whether to allow research using gametes and embryos here, and if it is allowed, what limits, if any, to place on such research.

To inform the future policy in New Zealand we are currently consulting on the use of human gametes and embryos in research.

What are gametes and embryos?

Gamete is the name given to an egg or sperm before they are combined (fertilisation) and their cells begin to multiply.

Embryo is the name given to the fertilised egg in its first eight weeks (while its cells are multiplying), after which time the nervous system and organs begin to form and it becomes a foetus. In the first 14 days after fertilisation, the embryo is often called a pre-embryo.

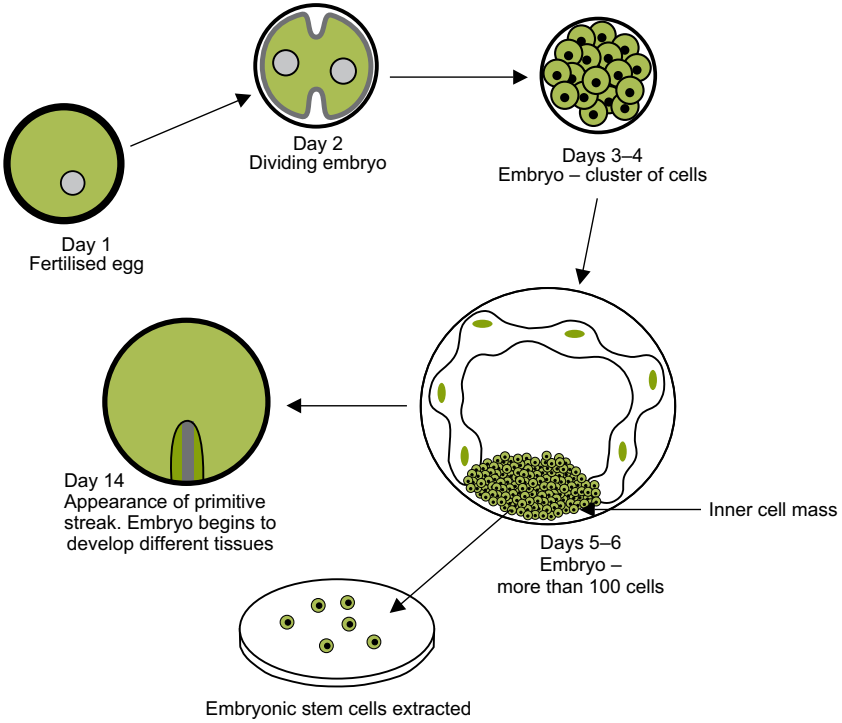
Stem cells

Stem cells are some of the very first early cells of the pre-embryo. They can divide over and over again and develop into many kinds of tissue. They are the 'master' cells that can develop into any of the many different types of cells in the human body.

Five days after fertilisation, the pre-embryo is made up of more than 100 cells. Some go on to become the embryo, known as the inner cell mass, but most become support tissue (such as the placenta). It is the cells from the inner cell mass that are the source of embryonic stem cells.

The most useful cells for scientists doing stem cell research come from the very early stage embryo – in the first 14 days. Embryonic stem cells are not embryos and cannot become human beings, but they hold the potential to form the many different types of cells in the human body. Researchers believe these cells help us to understand human development and diseases, and may one day lead to improved treatment and cures.

Embryo development and extraction of embryonic stem cells



Even in societies that allow research on human embryos, embryos older than 14 days are not allowed to be used. In New Zealand, the HART Act prohibits the use of embryos for research or transfer into a woman (following IVF) after the 14th day of development.

In vitro fertilisation (IVF) – laboratory fertilisation

- In vitro fertilisation is when an egg is fertilised with sperm outside the body in a laboratory.
- Only about 60 percent of eggs fertilised *in vitro* develop into usable embryos, and of these only 50–70 percent become usable for implantation into a woman's uterus, where further loss is likely to occur. This is much the same rate of development, implantation and loss as with non-assisted reproduction.
- Some embryos produced for IVF treatment are not viable – meaning they do not have the potential to form a living individual. In New Zealand such embryos have already been approved for use in research.
- Sometimes embryos grown for IVF are left over after successful treatment. Currently in New Zealand these embryos may be stored or donated to others for reproductive purposes. In the future, these embryos could be donated for use in research. However, in New Zealand there is no policy in place for using such embryos in research and so at the moment, such research cannot happen until the government makes a decision.

Cloning

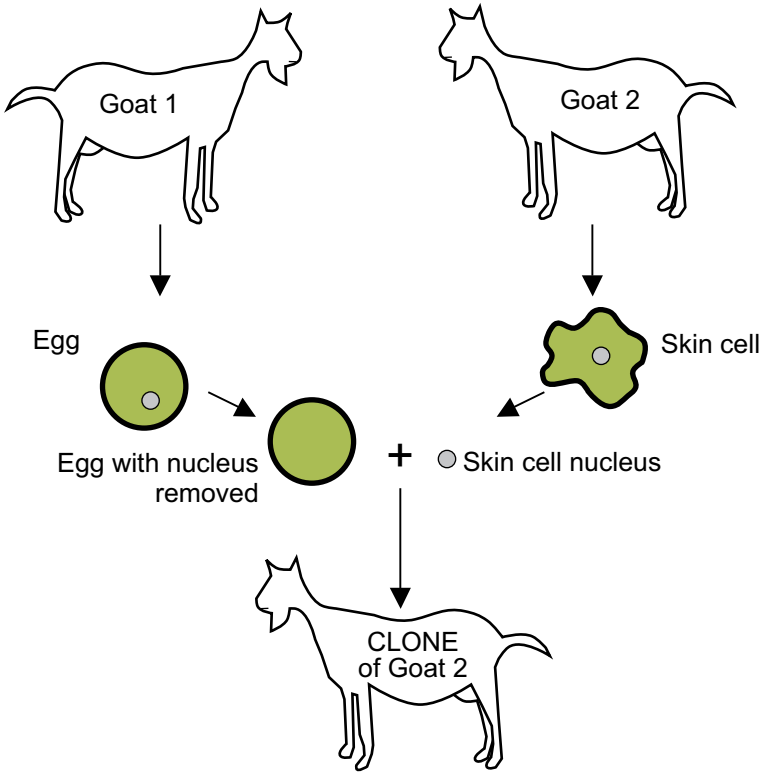
Embryo splitting

Embryo splitting is considered the most conservative of the human cloning techniques. Identical twins are an example of embryo splitting. One egg fertilised by one sperm splits, and forms two separate embryos after fertilisation, each with exactly the same genetic make-up. Embryo splitting could be used in the future to obtain embryos for use in research.

Reproductive cloning

You've probably heard of Dolly the sheep. Cattle, mice, pigs, cats, dogs, rabbits and goats have been also been cloned from body cells of the adult animal.

Goat example: With its nucleus removed, an egg taken from Goat 1 is put with the nucleus taken from Goat 2's cell (eg, skin cell). Goat 1's egg, with its new nucleus from Goat 2, can now develop into a goat that is a clone of Goat 2.



Therapeutic cloning

The same method of nucleus removal and combination is used to make a pre-embryo. The aim is to produce stem cells for research, not to produce a cloned human being.

Hybrid embryos

Hybrid embryos have genetic material from two different species. A human nucleus could be transferred into a rabbit egg to produce a human-rabbit hybrid that could be used as a source of human-like stem cells or as a model of human disease (for studying). The human nucleus could come from, say, a skin cell, and there would be no need for human egg donation as the egg could come from an animal. In New Zealand it is prohibited to implant a cloned or hybrid embryo into a human.

Other sources of stem cells for research

As well as from embryos (which are then destroyed), stem cells can be sourced from:

- cells removed from embryos during a cell biopsy that tests for disease
- frozen embryos that fail to thrive after thawing (may be already damaged)
- adult stem cells.

While there is some debate, most scientists agree that so far, pre-embryos are the best place to find stem cells to use for further research into human development and curing diseases. However, adult stem cells could also be of use in this research. There is considerable research effort in this area, and new ideas for sources of stem cells are being developed on a regular basis.

Why do scientists want to do research using gametes and pre-embryos?

The main purposes of gamete and embryo research are to find out more about:

- the early embryo and human biological development, for both development of knowledge about early development and potential therapeutic purposes
- fertility and infertility (including miscarriage)
- hereditary diseases (including Huntington's Disease)
- treatment of general human diseases and injuries (including cancer, heart disease and spinal cord injury).

Research in the very early stages after fertilisation could help find out what causes serious developmental abnormalities. Finding out what happens in these early stages could be the first step towards treating – and possibly preventing – such abnormalities.

Embryos for research could be:

- non-viable IVF embryos
- viable, or IVF embryos left after successful fertility treatment
- created specially – with the donors' consent - using donated eggs and sperm (gametes). This would be most useful for specific conditions, for example, for the study of specific diseases that run through families (hereditary diseases)
- created by therapeutic cloning – the tissue derived from embryonic stem cells could be used for treating the person providing the donor nucleus (such as new skin to repair burns, or pancreas cells to produce insulin if they have diabetes)

Gametes and embryos for research could also be:

- imported into New Zealand for research purposes.

Embryo and gamete research raises a number of questions, such as:

- Does the pre-embryo or embryo deserve the same rights and protections as the rest of us?
- What are the rights and wrongs of using pre-embryos and embryos for research?
- Is it acceptable to use embryos from some sources (eg. those leftover from IVF treatment), but not others (eg. those created specially by therapeutic cloning)?
- Should the import or export of eggs, sperm, or embryos for research be allowed?
- Should what is happening overseas influence our thinking?

We need to hear your views about embryo and gamete research to help us decide what advice we should give to the Minister of Health.

Would you like to have your say?

Submissions on the use of human gametes and embryos in research close at **5 pm Friday 2 March 2007**.

Before then, there will be a series of public meetings, hui and fono to discuss these issues.

More information, including a copy of the ACART (Advisory Committee on Assisted Reproductive Technology) discussion paper, is available:

- from the website – www.newhealth.govt.nz/acart
- by emailing acart@moh.govt.nz
- or by telephoning (04) 496 2145.