

The Australian Stem Cell Centre is the first Australian Biotechnology centre of Excellence

An embryonic stem cell has the unique capacity to renew itself indefinitely.

Stem cells are the body's own biological repair kit.



Australian Stem Cell Centre

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Media release

Latest Stem Cell Discovery Destined for the Australian Stem Cell Centre

Tuesday, 10 June 2008, Melbourne Australia:

Scientists from the Australian Stem Cell Centre (ASCC) will be the first in Australia to gain access to human induced pluripotent stem (iPS) cells, one of the latest and most significant developments in stem cell research.

The iPS cells have been imported under an agreement with Professor James Thomson from the University of Wisconsin, United States of America who has developed the human iPS cell lines and was, at the same time as Professor Shinya Yamanaka from Japan, the first to describe human iPS cells in November 2007. Professor Thomson was also the first scientist to identify and describe human embryonic stem cells in the scientific press in 1998 and has been a leader in the field of embryonic stem cell research since.

The human iPS cells arrived at the ASCC's Melbourne laboratories in late May. Drs Andrew Laslett and Naoki Nakayama, both senior scientists in the human embryonic stem cell laboratory, will be the first at the ASCC to work with them.

Dr Laslett said, "We plan to comprehensively compare the iPS cell lines to existing human embryonic stem cell lines using the first class scientific infrastructure and innovative characterisation and differentiation strategies in place at the Australian Stem Cell Centre. These experiments will give us a greater understanding of the relative utility, advantages and potential barriers to the clinical use of iPS cells as compared directly to human embryonic stem cells."

iPS cells are derived from human adult cells (skin for example) that have been reprogrammed to be more embryonic-like in behaviour. Currently there are two types of approaches to reprogramming cells – somatic cell nuclear transfer (also known as therapeutic cloning which is now legal in Australia) and the creation of iPS cells.

Some people have declared iPS cells a preferable alternative to working with human embryonic stem cells as iPS cell derivation does not require donated excess IVF embryos or human eggs (oocytes) and no embryos are destroyed in the process. "In my view, iPS cells are not yet a proven alternative to human embryonic stem cells,

said Dr Andrew Laslett. "There is still no definitive evidence to suggest iPS cells are as good, or better than human embryonic stem cells – comparative studies showing the stability of iPS cells and full equivalence with embryonic stem cells is yet to be demonstrated."

The Australian Stem Cell Centre believes it is too early to draw conclusions about which types of cells, human embryonic stem cells, cloned cells via somatic cell nuclear transfer, iPS cells or adult stem cells will be most useful.

"It would be extremely premature and a serious mistake for anyone to conclude at this stage that iPS cells avert the need for ongoing human embryonic stem cell research," said Professor Stephen Livesey, Chief Executive of the Australian Stem Cell Centre.

The Australian Stem Cell Centre undertakes adult and embryonic stem cell research as well as umbilical cord blood stem cell research.

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What are reprogrammed cells?

The term reprogramming is often used to refer to techniques developed by scientists to change the developmental potential or fate of a cell. The objective of reprogramming is to take a defined adult cell from the body (somatic cell) and convert it to a more primitive cell which would be capable of developing into other cell types such as blood or kidney cells.

Mouse iPS cells were first described in 2006 by Professor Shinya Yamanaka from the Kyoto University in Japan.

How are iPS cells derived?

iPS cells are a type of pluripotent (ability to generate numerous cell types) cell artificially derived from a non-pluripotent cell, such as a human skin cell. This is achieved by using retroviruses to insert four genes into the human skin cell to reprogram it. Following insertion of the four genes, four-five weeks of culture in the laboratory is required before the extraordinary iPS cells begin to appear. To date, the technique can only convert between 1 in 5,000 to 1 in 10,000 somatic cells to one iPS cell, therefore the cells are difficult to generate at this stage and relatively rare.

Are there any limitations with iPS cells?

While an undeniable breakthrough in cell reprogramming, iPS cells are relatively difficult to create and populations of the cells are very small. The use of iPS cells in treatments is many, many years away – if at all – as several hurdles need to be overcome. The current method to generate iPS cells uses retroviruses to genetically engineer cells to achieve a reprogrammed status. It is unclear how genetically stable or safe iPS cells will be for potential clinical use. Considerations of safety must also take into account the implication of an over-expression of specific reprogramming genes to achieve the end result, especially when several approaches to date have relied on over-expression of cancer causing genes.

About the Australian Stem Cell Centre

The **Australian Stem Cell Centre** is Australia's Biotechnology Centre of Excellence. The ASCC has partnered with ten leading Australian universities and research institutions, and brings together a critical mass of outstanding Australian stem cell research that is internationally competitive and well regarded.

The ASCC's vision is to undertake research of the highest quality in the stem cell field, in order to discover and ultimately commercialise new therapies for human disease.

The Australian Stem Cell Centre is funded by the Australian and Victorian Governments.

For further information or to arrange an interview, contact:

Michelle Gallaher
Public Affairs Director
Australian Stem Cell Centre
Phone + 613 9271 1100
Mobile: 0423 056 952
Email: michelle.gallaher@stemcellcentre.edu.au
www.stemcellcentre.edu.au