# Crucial advance in stem cell research: Human skin cells converted to neural precursor cells

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(Medical Xpress)—Scientists at The University of Auckland's Centre for Brain Research have succeeded in converting human skin cells directly into immature brain cells (or neural precursor cells).

The team, assisted by funding from the Neurological Foundation of New Zealand, the Auckland Medical Research Foundation, and the Maurice and Phyllis Paykel Trust , has led the world in developing a fast and efficient means of accomplishing this without having to go through the intermediate stage of conversion to embryonic stem cells.

"This is an advance of huge significance to stem cell research on a global level," says Principal Investigator, Associate Professor Bronwen Connor, who is head of the Neural Repair and Neurogenesis Laboratory at the University. "It has the potential to lead to a new understanding of neurodegenerative diseases such as Huntington's, Parkinson's and Alzheimer's.

"We are all very excited about it."

A key advantage of this research is that it enables researchers to take skin cells from patients with genetically-linked neurological diseases and use these to create brain cells which will be affected by the disease.

"This helps in gaining understanding of the mechanisms causing the disease. It will allow us to test potential treatments on actual brain tissue ", says Associate Professor Connor. "It also takes us further towards the possibility of replacing damaged brain cells."

While teams in top universities in the United States and other parts of the world are also investigating ways of converting skin cells to brain cells, the work of The University of Auckland team is unique.

First, it is the only group to have reprogrammed adult human skin cells. Other groups using this technique are working with cells taken from animals' skin.

Second, the Auckland team is using just two genes for the process of reprogramming from skin cells to neural precursor cells. Other international groups are using between five and 11 genes.

One effect of her team's methods, says Associate Professor Connor, is to speed up the process. The conversion from skin cells to embryonic stem cells and then to neural precursor cells takes four months. If the skin cells are converted directly to neural precursors, this takes one and a half months or 20 days, depending on the type of technology used. The system developed by her team is also very efficient, resulting in a high conversion rate from one cell type to another.

The direct conversion also overcomes a problem of tumour formation which can arise when embryonic stem cells are used.

Associate Professor Connor and her team have for several years been looking at the possibility of using embryonic stem cells to replace brain cells injured through accident or disease. However, as she explains, the very reason for using embryonic stem cells – which is their capacity for making any type of cell in the human body - also brings a problem that has to be overcome before cell replacement can be considered.

"When creating brain cells from embryonic stem cells you have to make sure that all of them are converted. Otherwise the ones that remain can convert to other types of cells, typically cancer cells."

The elimination of this risk through direct conversion from skin cells to neural precursor cells therefore gives a strong boost to the prospect of cell replacement therapy in the future.

The other members of Associate Professor Connor's team are Dr Christof Maucksch, a postdoctoral fellow at The University of Auckland, and Dr Mirrella Dottori from the University of Melbourne.

The paper has been published in the *Journal of Stem Cell and Regenerative Medicine*.

Provided by University of Auckland

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