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Alternative cell source investigated

Human embryo research is highly controversial

By Dr David Whitehouse
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Adult stem cells could be just as versatile as embryonic stem (ES) cells as a source of new tissue for transplant, according to research just published.

Scientists have been working with special stem cells taken from the bone marrow of rats.

These cells were injected into mouse embryos, where they transformed into most, if not all, of the cell types in the body, showing they have the potential to replace or repair tissues which have become diseased.

Other related research, also published by the journal Nature, shows that ES cells can generate neurons in the brain to effectively treat the symptoms of Parkinson's disease in rats.

More powerful

ES cells are arousing great interest among scientists because of their ability to become virtually any type of body cell - this is why they are often called "master cells".

But they are controversial because five-day-old embryos have to be destroyed to obtain them.

Using stem cells obtained from adults may overcome the ethical objections, but so far scientists have yet to show clearly that they

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have the full flexibility of ES cells.

Now, Professor Catherine Verfaillie and colleagues, at the University of Minnesota, US, may have produced the evidence to show the versatility is there.

They cultured adult rodent stem cells taken from bone marrow which normally can only differentiate into mesenchymal tissues, such as bone, muscle and fat.

But hidden in these cultures, they isolated more powerful stem cells, given the name multipotent adult progenitor cells or MAPC.

'Too early'

Put into rodent embryos, these MAPC differentiated into most, if not all, of the cell types in the body. And injected into adults, they could be prompted to become specific kinds of tissue such as the lining of the liver, gut and lung.

Professor Verfaillie's team has also discovered MAPC in human bone marrow.

So are MPAC just as versatile as ES cells? Professor Verfaillie told the BBC: "At least in the studies done today, MAPC appear to have potency close to or possibly similar to ES cells. MAPC do not, however, form tumours, at least not that we have seen so far.

"So, that may be an advantage over ES cells. It is hard to say at this early stage whether, like ES cells, we will be able to coax MAPC in vitro to all the same cell types that have been shown for ES cells, as we have not yet tested.

"Therefore, it is too early to make any firm comparison."

Delight and caution

The research has received a cautious welcome by leading scientists and ethicists.

Professor Tom Kirkwood, of the Department of Gerontology at Newcastle University, UK, said: "These are very exciting reports. We really need to understand just how versatile adult stem cells can be, and whether embryonic or adult stem cells can transform correctly when put into adult tissue."

Tom Baldwin, Professor of Philosophy at York University, said: "This is exciting news about the potential of adult stem cells. But it is much too early to conclude that research

involving embryonic stem cells is unwarranted."

A spokesperson for the UK's Human Fertilisation and Embryology Authority (HFEA) said: "We think this research is important and exciting and we're watching developments in this area very closely."

Recovery signs

Peter Garrett, from the British charity Life, told BBC News Online: "I think it is remarkable research and vindicates the line of argument we have been using for the last three years.

"You don't need to kill embryos to treat sick people. There is a population of pure stem cells in adult bone marrow that can be transformed into anything."

In a separate paper, also published online by Nature, scientists show that mouse ES cells can be used in cell-replacement therapy in an animal model of Parkinson's disease.

From cultured ES cells, the researchers generated a large supply of neurons that produce the brain chemical dopamine. When transplanted into the brains of rats with damaged dopamine neurons (modelling Parkinson's disease), the neurons worked normally.

The rats even showed signs of recovery.

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