Scientists made fundamental discovery about how properties of embryonic stem cells controlled

May 2 2013

The study, which focuses on the process by which these cells renew and increase in number, could help research to find new treatments.

Researchers have found that a protein, which switches on genes to allow embryonic stem cells to self-renew, works better when the natural occurring level of the protein is reduced.

It was previously thought that once levels of this protein – called Oct 4 – were reduced the numbers of new stem cells being produced would also fall.

The finding will inform stem cell research, which is looking to find treatments for conditions including Parkinson's, motor neurone, liver and heart disease.

During embryonic development, cells that have the capacity to become any cell type in the body – called pluripotent stem cells – can either renew themselves by multiplying in number or differentiate to become cells found in different parts of the body, for instance skin or liver.

This need for pluripotent cells to increase in number is important so that there is a sufficient supply of them to be differentiated into other cell types.

Scientists at the Medical Research Council Centre for Regenerative Medicine at the University of Edinburgh found that when there were lower levels of Oct 4, the protein bound much more tightly to key parts of DNA in cells.

The strong attraction of Oct 4 to these sections of DNA enabled the efficient switching on of key genes that caused pluripotent stem cells to renew.

The findings could help to improve the way in which stem cells are cultured in the laboratory, providing a better understanding of the processes needed for cells to divide and multiply or to generate different cell types.

The study, published in the journal *Cell Stem Cell*, was funded by the Medical Research Council, the Wellcome Trust, the Biotechnology and Biological Sciences Research Council and the Human Frontier Science Programme

Professor Ian Chambers, of the MRC Centre for Regenerative Medicine at the University, who led the study, said: "What we found was a complete surprise, as we thought that when levels of this key protein were reduced the numbers of pluripotent stem cells being generated would also fall. Instead, it appears that when the levels of Oct 4 are lower, the balance is tipped in favour of self-renewal over stem cell differentiation."

Provided by University of Edinburgh