International initiative to address safety issues in stem cell therapy

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An international study, published today in the prestigious journal *Nature Biotechnology*, reveals more about human pluripotent stem cells and their genetic stability and has important implications for the development of therapies using these cells.

Scientists from the University of Melbourne, University of NSW and CSIRO contributed to this study, which examined how the genome of 138 stem cell lines of diverse ethnic backgrounds changed when the cells were grown in the laboratory.

Professor Martin Pera, co-author of the paper, Chair of Stem Cell Science at the University of Melbourne and Program Leader of Stem Cells Australia, said the collaborative study from the International Stem Cell Initiative was the largest survey of its kind on the genetic and epigenetic stability of human embryonic stem cell and induced pluripotent stem cells.

"Australian scientists made important contributions to this work, which shows clearly that during prolonged culture, stem cells can acquire genetic changes similar to those seen in human cancers," he said.

"While it is reassuring that 75% of the stem cell lines studied remained normal after prolonged growth in the laboratory, detecting and eliminating abnormal cells is an absolute prerequisite for clinical use of stem cell products.

"Scientists in Stem Cells Australia are making important contributions to this effort."

Dr Andrew Laslett, a CSIRO researcher and co-author on the paper said, "as well as the scientific outcomes, what has been particularly satisfying about this project is the significant international collaborative networks that have been formed and flourished among the more than 35 laboratories and 125 collaborators".

Human pluripotent stem cells show promise as a source of cells for regenerative medicine. Human embryonic stem (HES) cells and induced pluripotent stem (iPS) cells are of interest because they can be converted into any cell type in the body and because they are able to grow and divide indefinitely in the laboratory. However, scientists are concerned that over time the cells can acquire genetic mutations, which may compromise their usefulness for cell therapy.

In this study, researchers analysed the pattern of genes expressed in 127 HES cell lines and 11 iPS cell lines from ethnically diverse backgrounds.

Although most of the HES cell lines studied retained the normal number of chromosomes, even after prolonged culture, about 20% of the cell lines acquired amplifications of a specific region in chromosome 20. Among the small number of iPS cell lines studied, three out of 11 had abnormal karyotypes (chromosome numbers).

The data generated in this study will be useful for understanding the frequency and types of genetic changes affecting cultured hESCs, an important issue in evaluating the cells for potential therapeutic applications.

Provided by University of Melbourne