Human embryonic stem cell lines created that avoid immune rejection

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In a groundbreaking experiment published in *Cloning & Stem Cells*, scientists from International Stem Cell (ISC) Corp. derived four unique embryonic stem cell lines that open the door for the creation of therapeutic cells that will not provoke an immune reaction in large segments of the population. The stem cell lines are “HLA-homozygous,” meaning that they have a simple genetic profile in the critical areas of the DNA that code for immune rejection.

The lines could serve to create a stem cell bank as a renewable source of transplantable cells for use in cell therapy to replace damaged tissues or to treat genetic and degenerative diseases.

“This study has used a novel approach to producing cells that may one day be used to treat large numbers of patients. While there is a great deal of discussion about the possibility of producing stem cells for each patient this approach to therapy is unrealistic because of the enormous costs involved. Rather it is likely that treatment of large numbers of patients by cell therapy will only be possible if methods are found using any one cell line to treat very large numbers of patients. This very exciting paper represents a significant step forward towards the use of such cells in cell therapy,” says Ian Wilmut, PhD, journal Editor-in-Chief and Director of the Centre for Regenerative Medicine at the Queen’s Medical Research Institute, University of Edinburgh.

“Immune reaction is one of the most serious problems facing the development of stem cell therapy, and cell lines of this type may enable

us to treat a large number of patients without immune rejection, offering an enormous practical advantage. Further research is required to confirm that the cells produced in this way are able to replace cells that have been lost in human degenerative disease."

Jeffrey Janus, President of International Stem Cell and colleagues at the company and from the Russian Academy of Medical Sciences, described the successful parthenogenetic activation of human oocytes and the subsequent derivation of cell lines having the morphology and markers characteristic of human embryonic stem cells. In a paper entitled, "HLA Homozygous Stem Cell Lines Derived from Human Parthenogenetic Blastocysts," the authors emphasize two key factors that would make this technology so valuable for future efforts to generate replacement tissues and organs and to use donor-derived cell repositories to develop cell-based therapies.

First, the four human parthenogenetic stem cell lines, designated as HpSC-Hhom, are HLA (human leukocyte antigen) homozygous. This makes it possible to match the HLA types of a donor and recipient, reducing the chances of provoking an immune reaction against the transplanted donor cells.

Second, the stem cells are derived from unfertilized donor eggs, not from fertilized embryos, so the technique does not carry the same ethical burden.

The future clinical relevance of this work will depend on the ability to reproduce these results and to demonstrate that the stem cell lines can be induced to form pluripotent progenitor cells and, ultimately, to differentiate into specific mature cell types that can be safely and successfully delivered to patients.

The paper was published online ahead of print in the Journal and is

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