Pluripotent Human Embryonic Stem Cell Line Derived from a Cloned Blastocyst and Its Potential Applications

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The isolation of pluripotent human embryonic stem (ES) cells and breakthroughs in somatic cell nuclear transfer (SCNT) in mammals have raised the possibility of performing human SCNT to generate potentially unlimited sources of undifferentiated cells for research, with potential applications in tissue repair and transplantation medicine. This concept, known as "therapeutic cloning," refers to the transfer of the nucleus of a somatic cell into an enucleated donor oocyte. In theory, the oocyte's cytoplasm would reprogram the transferred nucleus by silencing all the somatic cell genes and activating the embryonic ones. ES cells would be isolated from the inner cell mass (ICM) of the cloned preimplantation embryo. When applied in a therapeutic setting, these cells would carry the nuclear genome of the patient; therefore, it is proposed that following directed cell differentiation, the cells could be transplanted without immune rejection for treatment of degenerative disorders such as diabetes, osteoarthritis, and Parkinson's disease, among others. In this study, we report the derivation of a pluripotent embryonic stem cell line (SCNT-hES-1) from a cloned human blastocyst. The SCNT-hES-1 cells display typical ES cell morphology and cell surface markers and are capable of differentiating into embryoid bodies *in vitro* and of forming teratomas *in vivo* containing cell derivatives from all three embryonic germ layers in SCID mice. After continuous proliferation for >70 passages, SCNT-hES-1 cells maintain normal karyotypes and are genetically identical to the somatic nuclear donor cells. Although we cannot completely exclude the possibility of a parthenogenetic origin of the cells, imprinting analyses provide support that the derived human ES cells have a somatic cell nuclear transfer origin.