

CUSTOMIZED HUMAN EMBRYONIC STEM CELL (HESC) LINES

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Embryonic stem cells (ESC) are traditionally derived from the inner cell mass (ICM) of the blastocyst. Similar to the cells of the ICM, they have the capacity to differentiate into virtually any cell of the human body and exhibit unlimited growth potential, thus representing ideal candidates for use in cell therapies and pharmacological testing. However, producing therapeutic cells from generic ESC lines requires extensive cell expansion thereby increasing the risk of genetic abnormalities. In addition, immunologic histocompatibility may also limit the application of generic cells. We and others (Klimanskaya et al., 2006, *Nature* 444, 481-485; Chung, Y., et al., *Cell Stem Cell*, 2008, 2(2): p. 113-7) have recently reported successful derivation of the hESC lines from the extracted blastomeres of the human embryo raising a possibility that lines may be created that are genetically identical to the embryo. To our knowledge, we are the first group to improve this technique and derive hESC from biopsied blastomeres on human feeders with limited use of serum (Ilic et al., 2009, *Stem Cells and Development*, *in press*). More recently, we have been able to eliminate serum from our protocol and successfully derive therapeutic-grade hESC lines from extracted blastomeres under serum- and virtually xeno-free conditions. Derived lines express all characteristics of traditionally derived hESC lines with the potential to differentiate into cells from all three germ layers, including insulin-producing cells, neurons, cartilage, bone, beating heart cells, and other cells of therapeutic importance. Therefore, therapeutic-grade ESC lines genetically identical to the embryo from which the blastomere is extracted can be efficiently obtained while preserving the embryo. As development of ESC-based therapies continues, and efficiency of derivation from isolated blastomeres is further increased, personalized ESC may become a clinical reality for future IVF babies and their families.

References: Klimanskaya et al., 2006, Nature 444, 481-485; Chung, Y., et al., Cell Stem Cell, 2008, 2(2): p. 113-7; Ilic et al., 2009, Stem Cells and Development, in press