
Human stem cells from single blastomeres reveal pathways of embryonic or trophoblast fate specification.

Journal: Development

Publication Year: 2015

Authors: Tamara Zdravkovic, Kristopher L Nazor, Nicholas Larocque, Matthew Gormley, Matthew Donne, Nathan Hunkapillar, Gnanaratnam Giritharan, Harold S Bernstein, Grace Wei, Matthias Hebrok, Xianmin Zeng, Olga Genbacev, Aras Mattis, Michael T McMaster, Ana Krtolica, Diana Valbuena, Carlos Simon, Louise C Laurent, Jeanne F Loring, Susan J Fisher

PubMed link: 26483210

Funding Grants: TSRI Center for hESC Research, The Stem Cell Matrix: a map of the molecular pathways that define pluripotent cells, Ensuring the safety of cell therapy: a quality control pipeline for cell purification and validation

Public Summary:

Mechanisms of initial cell fate decisions differ among species. To gain insights into lineage allocation in humans, we derived ten human embryonic stem cell lines (designated UCSFB1-10) from single blastomeres of four 8-cell embryos and one 12-cell embryo from a single couple. Compared with numerous conventional lines from blastocysts, they had unique gene expression and DNA methylation patterns that were, in part, indicative of trophoblast competence. At a transcriptional level, UCSFB lines from different embryos were often more closely related than those from the same embryo. As predicted by the transcriptomic data, immunolocalization of EOMES, T brachyury, GDF15 and active beta-catenin revealed differential expression among blastomeres of 8- to 10-cell human embryos. The UCSFB lines formed derivatives of the three germ layers and CDX2-positive progeny, from which we derived the first human trophoblast stem cell line. Our data suggest heterogeneity among early-stage blastomeres and that the UCSFB lines have unique properties, indicative of a more immature state than conventional lines.

Scientific Abstract:

Mechanisms of initial cell fate decisions differ among species. To gain insights into lineage allocation in humans, we derived ten human embryonic stem cell lines (designated UCSFB1-10) from single blastomeres of four 8-cell embryos and one 12-cell embryo from a single couple. Compared with numerous conventional lines from blastocysts, they had unique gene expression and DNA methylation patterns that were, in part, indicative of trophoblast competence. At a transcriptional level, UCSFB lines from different embryos were often more closely related than those from the same embryo. As predicted by the transcriptomic data, immunolocalization of EOMES, T brachyury, GDF15 and active beta-catenin revealed differential expression among blastomeres of 8- to 10-cell human embryos. The UCSFB lines formed derivatives of the three germ layers and CDX2-positive progeny, from which we derived the first human trophoblast stem cell line. Our data suggest heterogeneity among early-stage blastomeres and that the UCSFB lines have unique properties, indicative of a more immature state than conventional lines.

Source URL: <https://www.cirm.ca.gov/about-cirm/publications/human-stem-cells-single-blastomeres-reveal-pathways-embryonic-or-trophoblast>