Researchers find human menstrual blood-derived cells 'feed' embryonic stem cells

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Researchers investigating the use of human menstrual blood-derived mesenchymal cells (MBMCs) as culture 'feeder layers' found that MBMCs can replace animal-derived feeder systems in human embryonic stem cell culture systems and support their undifferentiated growth, while helping the cells proliferate and survive. For medical transplantation, human embryonic stem cells (hESCs) may need to remain "undifferentiated" and the experimenter's technique preserves the undifferentiated nature of hESCs destined for transplantation and also prevents potential animal cell contamination.

To be suitable for medical transplantation, one idea is that human embryonic stem cells (hESCs) need to remain "undifferentiated" i.e. they are not changing into other cell types. In determining the best way to culture hESCs so that they remain undifferentiated and also grow, proliferate and survive, researchers have used blood cell "feeder-layer" cultures using animal-derived feeder cells, often from mice (mouse embryonic fibroblasts [MEFs]). This approach has, however, been associated with a variety of contamination problems, including pathogen and viral transmission.

To avoid contamination problems, a Brazilian research team has investigated the use of human menstrual blood-derived mesenchymal cells (MBMCs) as feeder layers and found that "MBMCs can replace animal-derived feeder systems in human embryonic stem cell culture systems and support their growth in an undifferentiated stage."

The study will be published in a future issue of *Cell Medicine*, but is currently freely available on-line as an unedited early e-pub.

"Human embryonic stem cells present a continuous proliferation in an undifferentiated state, resulting in an unlimited amount of cells with the potential to differentiate toward any type of cell in the human body," said study corresponding author Dr. Regina Coeli dos Santos Goldenberg of the Instituto de Biofisica Carlos Chagas Filho, Universidade Federal do Rio de Janeiro. "These characteristics make hESCs good candidates for cell based therapies."

Feeder-layers for hESCs comprised of MEFs have been efficiently used for decades but, because of the clinical drawbacks, the authors subsequently experimented with human menstrual blood cells as a potential replacement for animal-derived feeder-layers, not only for negating the contamination issues, but also because human menstrual blood is so accessible. MBMCs are without ethical encumbrances and shortages, nor are they difficult to access - a problem with other human cells, such as umbilical cord blood cells, adult bone marrow cells or placenta cells.

"Menstrual blood is derived from uterine tissues," explained the researchers. "These cells are widely available 12 times a year from women of child-bearing age. The cells are easily obtained, possess the capability of long-term proliferation and are clinically compatible with hESCs-derived cells."

The researchers found that their culture system using MBMCs as a feeder-layer for hESCs are the "closest and more suitable alternative to animal-free conditions for growing hESCs" and a "good candidate for large-expansion of cells for clinical application." They also found no difference in growth factor expression when comparing the use of growth factors in both the standard feeder system using animal cells and

the feeder system they tested using hESCs.

"It is also noteworthy to highlight that our group reported the rapid and efficient generation of induced pluripotent stem cells (iPSCs) from MBMCs, indicating that these cells can be used as a model to study patient-specific disease and that in the future they might be used in clinical settings."

"This study provides a new means of culturing hESCs without potential xenocontamination and after further study to confirm that there is no contamination of the ESCs with the feeder cells, this could prove to be a viable way to culture ESCs for clinical purposes" said Dr. Maria C. O. Rodrigues, at the Ribeirão Preto School of Medicine, University of Sao Paulo, Brazil and section editor for *Cell Medicine*.

More information: Silva dos Santos, D.; Coelho de Oliveira, V. C.; Asensi, K. D.; Vairo, L.; Carvalho, A. B.; Campos de Carvalho, A. C.; Goldenberg, R. C. dos S. Human Menstrual Blood Derived Mesenchymal Cells As New Human Feederlayer System For Human Embryonic Stem Cells. *Cell Med*. Appeared or available online March 3, 2014.

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