Researchers Grow Neural, Blood Vessel Cells from Adult Stem Cells

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Scientists have predicted that embryonic stem cells might lead to cures for various diseases and conditions such as heart disease, Parkinson's or spinal cord injuries. Now, a University of Missouri-Columbia researcher has isolated adult stem cells from blood that can be directed to turn into five types of cells, including bone, blood vessel and nerve cells. The study is the cover article in the August edition of *Stem Cells and Development*.

"Embryonic stem (ES) cells are able to give rise to the remarkable diversity of cell types that constitute a whole organism such as a human," said Elmer Price, a scientist at the MU Dalton Cardiovascular Research Center and associate professor of biomedical sciences in the College of Veterinary Medicine. "However, this 'pluripotency,' or the ability of the cells to become anything, can also be a curse because ES cells can be misled by biochemical signals when they are transplanted into an adult during cell transplantation experiments. This often leads to the generation of unwanted cell types and, on occasion, tumor formation. Because of this, ES cell transplantation can raise serious safety issues. In this study, we developed adult stem cells from the blood of an mature animal that were able to be directed into specific cell types such as neurons and blood vessel cells, but they were not as pluripotent as ES cells. We have not observed any evidence of tumor formation."

Price extracted the adult stem cells from pigs' blood. These particular pig cells are unique because the pigs also contained a gene that makes their cells fluorescent. This allowed Price to track the cells as they developed into nerve or blood vessel cells or upon transplantation. The fluorescent pigs were created by MU animal scientist Randy Prather, who along with MU researcher Mike Foley, is a co-author of this paper.

In the study, Price was able to develop and sustain adult stem cell lines and then induce them to turn into specific cell types by exposing them to different chemical signals, depending on which type of cell he wanted to develop. For successful adult stem cell transplantation therapy, different diseases will require different cell types. Unlike embryonic stem cells, which are difficult to grow as pure cell populations and can develop into tumor-type tissue, Price's adult stem cells efficiently developed into specific cell types with no abnormal tissue.

"In theory, embryonic stem cells have the ability to become almost any cell type or organ," Price said. "Very complex chemical signals need to be in place with embryonic stem cells in order for them to develop into the appropriate type of cell. However, we have shown that if you can isolate adult stem cells, you can make them generate the appropriate type of cell with much more ease and specificity. One day, we may be able to isolate similar adult stem cells from a patient, manipulate the cells in a petri dish, and then re-introduce them back into that same patient as a therapy."

The next step is to determine if enough cells can be produced with Price's method, as well as whether similar cells can be isolated from humans. So far, he has been able to grow cells for more than a year, creating large numbers of nerve and blood vessel cell precursors. However, since human treatment is the ultimate goal, large numbers of the correct type of cells will need to be produced.

"We think that these blood-derived adult stem cells are normally used by the body for regeneration and repair, and we have been able to isolate these cells, grow them in a lab, and direct them toward a specific cell type for eventual therapeutic use," Price said. "In humans, aging, chronic disease, and a lack of exercise may result in a lowered production of these cells, so it's important to lead a healthy lifestyle to maintain the body's own circulating population of stem cells."

Source: University of Missouri-Columbia

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