Detroit Free Press

November 21, 2007

Stem cells without the fuss? Possibly

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Two separate research teams said Tuesday that they have reprogrammed ordinary human skin cells to behave like embryonic stem cells, a breakthrough that could overcome ethical and scientific obstacles to the dream of regenerative medicine.

The scientists -- at the University of Wisconsin and the University of Kyoto in Japan -- used the same approach for their simultaneous coup. They identified four genes that, when slipped into the DNA of skin cells in lab dishes, reversed the cells' developmental clock.

Although only a tiny fraction of the skin cells were successfully reprogrammed, they displayed the essential characteristics that make embryonic stem cells so valuable: the ability to grow indefinitely, and to spin off all cell types in the body.

Until now, embryonic stem cells had to be isolated from a 5-day-old human embryo, destroying the embryo in the process -- an act abortion opponents equate with murder.

An even more controversial way to obtain stem cells, dubbed "therapeutic cloning," has worked only in animals, not humans; it requires making an embryo by replacing the DNA of a human egg with DNA from an adult cell. Some fear it could lead to human reproductive cloning.

"We weren't trying to avoid controversy with this approach; we thought it would be quicker," said James Thomson, whose University of Wisconsin lab published the feat in the journal Science. "If it turned out that 100 genes are needed for reprogramming, it never would have worked."

While ducking ethical debate wasn't the goal, Thomson said this is "probably the beginning of the end of the controversy" over embryonic stem cells.

Opponents of embryonic stem-cell research, led in Michigan by the Catholic Conference and Right to Life organizations, were buoyed by developments they said indicated that lifesaving research was possible without the moral entanglement that comes from the destruction of human embryos.

Ed Rivet, legislative director for Right to Life, was effusive.

Research using non-embryonic sources for stem cells is moving so rapidly, Rivet said, that the debate on proposals to end Michigan's ban on the destruction of embryos for research will soon be outdated.

"A paradigm shift kind of thing," he called it.

The Rev. Tad Pacholczyk, director of education at the National Catholic Bioethics Center, agreed: "It's a very highly promising strategy and really affects the ethical landscape dramatically. It may help to steer the entire field of stem-cell research in a more ethical direction by circumventing the ... destroying of human embryos."

Huge questions remain

Last year, the Japanese team, led by Shinya Yamanaka, proved that just four genes were enough to reprogram a mouse skin cell into an apparent mouse embryonic stem cell.

No one knew whether the technique would work in humans, but researchers who were once skeptical of the promise of reprogramming rushed to try it.

Ian Wilmut, the Scottish scientist famous for cloning Dolly the sheep in 1997, was quoted last week by London's Daily Telegraph saying he was abandoning therapeutic cloning to pursue cell reprogramming research.

Yamanaka's latest work was published Tuesday by the journal Cell.

"So many labs are working on reprogramming, including mine," said John Gearhart, the Johns Hopkins University scientist who in 1998 tied Thomson in the race to isolate human embryonic stem cells. "These are cheap experiments as opposed to working with embryos."

Huge questions remain to be answered, but reprogramming "represents the future for stem-cell biologists," he said.

The ultimate goal of the fledgling field is regenerative medicine -- the use of stem cells to regrow and repair tissues tailored to patients, perhaps curing diseases such as Alzheimer's and Parkinson's. Embryonic stem cells also are seen as a way to develop models of the disease process.

There's a catch

The technology Yamanaka and Thomson used to produce the pseudo-embryonic stem cells wouldn't be safe for use in humans. To ferry the four genes into the DNA of the skin cells, the researchers used deactivated viruses as vehicles, also known as vectors.

Both the vectors and the added genes are capable of triggering cancer-causing mutations in the cell's DNA, and the researchers saw evidence that this was happening. So the question is how to reset the developmental clock in a limited way.

"The process uses techniques that still are problematic and may cause complications when the cells multiply," said Marcia Baum, executive director of the Michigan Citizens for Stem Cell Research and Cures.

"It is wonderful news but like all scientific discovery, it inches its way along," said Baum, who directs a nonprofit, nonpartisan coalition of some of the state's top stem-cell backers, as well as health and research institutions.

"This is just the beginning," said Junying Yu, Thomson's coauthor. "We hardly understand how these cells work."

Staff writers Patricia Anstett and Dawson Bell contributed to this report.