



Michael Cook | Friday, 23 November 2007

Stem cell breakthrough: ethical science is good science

As forecast, therapeutic cloning is well and truly on the skids. But how did it happen so quickly?



A *MercatorNet* headline last week posed the question: "Is therapeutic cloning on the skids?" Amazingly, the definitive answer came only a couple days later: an emphatic Yes. Two separate teams in Japan and the US simultaneously published papers showing that ordinary human skin cells can be reprogrammed to behave like embryonic stem cells. In other words, all the potential benefits of stem cells can be achieved without major ethical or political obstacles. It was astounding news. Leading stem cell scientists were agog. "This is a tremendous scientific milestone, the biological equivalent to the Wright brothers' first airplane," said Robert

Lanza, of Advanced Cell Technologies.

The articles appeared in two journals. A team led by Dr Shinya Yamanaka of Kyoto University published in *Cell*, following up work on mice which they had reported last year. A paper in *Science* came from a rival team led by Junying Yu, who works in the laboratory of stem-cell pioneer James Thomson of the University of Wisconsin-Madison.

The ultimate goal of stem cell research has always been to produce cells which are tailor-made for each patient. Until now scientists have been speaking as if cloning embryos were the only way to achieve the near-miraculous gains they forecast. But now it appears that reprogrammed cells can do everything that embryonic stem cells can do. Therapeutic cloning has become an also-ran in the quest for patient-specific cells.

The two major ethical objections to cloning human embryos have been the destruction of human life and the exploitation of women for their eggs. But neither is an issue with this new technique. There was once a concern that reprogrammed cells might revert back to a totipotent, or embryonic state, meaning that your dandruff could be morphed into an embryo. But apparently this cannot happen with the techniques unveiled this week.. Becoming an embryo requires certain factors which exist only in the cytoplasm of the egg, amongst other things. [According to Father Thomas Berg](#), the executive director of the Westchester Institute for Ethics and the Human Person,

"reprogramming clears the bar in terms of reasonable concern for human dignity in biotech research. Never at any point in the process of reprogramming is there ever a danger of involving -- even accidentally we might say--techniques that could bring about a human embryo, as would happen in cloning."

It also takes the heat out of the US debate over government funding for embryo research. President Bush said that the new research was consistent with his policy of "encouraging scientific advancement within ethical boundaries". And a spokesman for the Institutes of Health's stem cell task force said that the new cells would almost certainly be eligible for Federal funding.

Here is what happens. The cells, called induced pluripotent stem cells (iPSCs), were created by using a retrovirus to introduce four genes into ordinary skin cells. After a while, the skin cells revert to a pluripotent state, meaning that they can change into nearly any type of cell in the body. At the moment there are some drawbacks, as the cells can turn cancerous, but scientists are confident that this will swiftly be overcome. Dozens of research teams around the world are already beavering away.

Furthermore, the new technique appears to be simpler, more efficient and cheaper. "People didn't know it would be this easy," Dr Thomson says. "Thousands of labs in the United States can do this, basically tomorrow."

Which raises the question of why they didn't think of it yesterday. The idea has been around for a long time. Back in May 2005, a [white paper from the US President's Council on Bioethics](#) mentioned it as one of the four major alternatives to the use of embryonic stem cells, although it concluded that "it is much too early to know whether this will succeed".

Perhaps one reason why Yamanaka succeeded is that he was thinking outside the square. He didn't plod along behind Ian Wilmut, Rudi Jaenisch, George Daley, Irving Weissman, Austin Smith, Alan Trounson and the other luminaries of stem cell research. Was it because he began his career as an orthopaedic surgeon? Was it because he seems to have greater sensitivity to ethical and social concerns? "Neither [human] eggs nor embryos are necessary. I've never worked with either," he commented earlier this year. The boldness of Yamanaka's approach is instructive. Over five years, his team compiled a list of 24 factors that seemed to help stem cells stay flexible. But which ones? Toiling 12 to 14 hours a day in his lab, using brute force, Yamanaka found them. "He gambled everything on the key factors being included within his pool of 24 candidates," said *Nature*. And he won.

Meanwhile, other scientists were working on an increasingly frustrating battle with cloning human embryos for their stem cell lines, a battle in which victory was always somewhere over the rainbow. The lesson seems to be that ethical science is good science. The ethical misgivings of President Bush and other foes of destructive embryo research, have been vindicated.

Unfortunately, the good news still hasn't done away with fundamental ethical questions; it has merely bypassed them. Researchers are not budging from their insistence that research on embryos and cloning is still absolutely necessary. The use

of embryos is the "gold standard" for the production of stem cells, commented Shoukhrat Mitalapov, the researcher who became the first to clone a primate successfully last week. The human embryo is still regarded as a mere research tool by many scientists. Even Yamanaka insists that embryonic stem cell research should continue.

Furthermore, this new stage in stem cell research opens the door to the transhumanist dreams of manufacturing "better humans". Yamanaka himself has fretted over the potential for a new route to cloned children. "Our technology, however, create a new ethical concerns. It might be possible to generate sperm and eggs from skin cells, via iPS cells," [he says](#). Lesbians could create sperm; and gays could create eggs. With the ability to create gametes, genetic engineering will become possible, as well. IVF clinics will be able to delete genes for hereditary diseases from embryos but also insert genes for greater athletic ability or a higher IQ. Pluripotent cells can lead not only to tailor-made therapies, but to tailor-made children.

At the moment, such developments are far, far away. But scientists will soon be working on induced pluripotent cells and progress will be swift now that funding is no longer a major problem. A new chapter in bioethics is about to begin.

Michael Cook is the editor of MercatorNet.