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A breakthrough, then a surge, in stem cell research

A year after report, research into new type of stem cells continues to grow

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Less than a year after a Wisconsin team helped discover a major alternative to human embryonic stem cells, the Madison scientists say more than 800 labs have begun using the approach, suggesting that many stem-cell researchers are starting to move beyond controversial embryonic sources for their work.

Such shifts may reframe the emotionally fraught debate over stem cells—an issue that has ignited passions across the political spectrum. Both presidential candidates have indicated they would lift President George W. Bush's restrictions on research funding, though Sen. Barack Obama has been more adamant than Sen. John McCain.

The biologist doing more than anyone else to stir the debate is University of Wisconsin researcher James Thomson, who co-discovered human embryonic stem cells a decade ago, in November 1998. Last year Thomson shook the field again when his lab and a Japanese team showed a way of genetically reprogramming adult skin cells to act like stem cells, including the ability to form any of the body's tissues.

Some groups that oppose destroying embryos for research have hailed the new cells, called induced pluripotent stem cells, as a way to eliminate the need for stem cell research based on embryonic material. In a rare extended interview, Thomson said he shares some of their qualms but believes the issue's moral and scientific contours have never been more complex.

Thomson still supports lifting Bush's restrictions, he said, because no one knows whether the new iPS cells can match embryonic cells' knack for growing into any kind of tissue—brain cells, heart muscle, insulin-producing cells and dozens of others—in mass quantities.

Some scientists cite this potential in saying the true moral course is to accelerate research on embryonic cells because it might produce transplant tissue for illnesses like diabetes and Parkinson's disease. But Thomson also said many arguments for expanded federal funding have exaggerated the field's short-term promise. Perfecting such techniques could take many decades, he said. "It's certainly going to happen, but it's going to be hard, and people are not prepared for how hard it's likely to be."

The most profound effect of stem cells in the meantime could be to screen new drugs for safety and to gauge a medication's effectiveness on real human tissue without using patients as guinea pigs.

"It simply means that for the very first time we have access to the human body in the lab," Thomson said. "And for drug screening and drug discovery that's going to make a huge difference. When you use one of those drugs you won't know that human embryonic stem cells or iPS cells were involved. It won't make the front pages at all."

With a day's stubble on his chin and flip-flops on his feet, Thomson does not look like the sort of person who could change the world once, much less twice. He grew up in Oak Park and still keeps a beat-up dart board in his office that dates to his high school days. Thomson said he recently found a pay stub for $14 from his first job—delivering copies of the now-defunct Chicago Daily News.

One of his key skills as a biologist is the patient, constant nurturing of cells that other labs have found difficult to master.

"Things grow for me," Thomson said, gesturing to a set of flourishing staghorn fern plants in his office.

He said he's amazed at how quickly scientists have begun exploring the use of the reprogrammed skin cells he reported on last year. "People are jumping in very rapidly, much more rapidly than they did 10 years ago" after the initial discovery of embryonic stem cells, Thomson said.

In all, 812 labs in dozens of countries have requested the materials needed to reprogram ordinary cells into iPS cells, said Addgene, a Massachusetts-based repository for research supplies. By contrast, a half-dozen or so labs started working with embryonic stem cells in the months after his landmark 1998 paper, Thomson said.

In recent months Thomson has been racing other labs to grow an improved form of iPS cells that potentially could be used in human patients. The original method probably could not be tested in people because it relied on a retrovirus to activate a few genes that reprogram the cells.

The first successful attempt to make iPS cells without such potentially dangerous viruses was published online recently in the journal Science. A group from Massachusetts General Hospital grew the cells using relatively safe viruses that can be cleared from the cells once they do their jobs, though the method was not as efficient as existing techniques.

Already, researchers said, iPS cells have proved easier for individual labs to make than embryonic stem cells, fueling the intense interest.

Before the iPS papers, stem-cell research "was still a select fraternity," said Evan Snyder, director of the stem cells and regenerative medicine program at the California-based Burnham Institute. "Now it's been kind of opened to the masses."

To use embryonic stem cells, labs must either make their own—which requires the destruction of human embryos—or get them from a lab like Thomson's that already has made its own cell lines. Only cell lines made before August 2001 qualify for federal funding under Bush's research restrictions.

With iPS cells, Snyder said, "you can do a skin biopsy on yourself if you want" and use that tissue as raw material for the stem cells.

Many scientists said the absence of ethical concerns over iPS cells also is a draw. "As soon as you have a cell type that is relatively free of this black cloud, then obviously there's huge pent-up interest," said George Daley, director of the stem cell program at Children's Hospital Boston.

Yet no one knows whether iPS cells can fill the same roles as embryonic stem cells, most researchers said. Some believe iPS cells may work differently depending on the type of tissue they came from—that skin cells might be difficult to transform into blood cells, for example.

That's a major reason why Thomson still refers to his original embryonic stem cells as a "gold standard."

"My belief is that if iPS cells turn out to be completely biologically equivalent [to embryonic stem cells], scientists will just migrate to them because they're easier to deal with," Thomson said. "But that may not be true, and we should simply let the science play itself out."