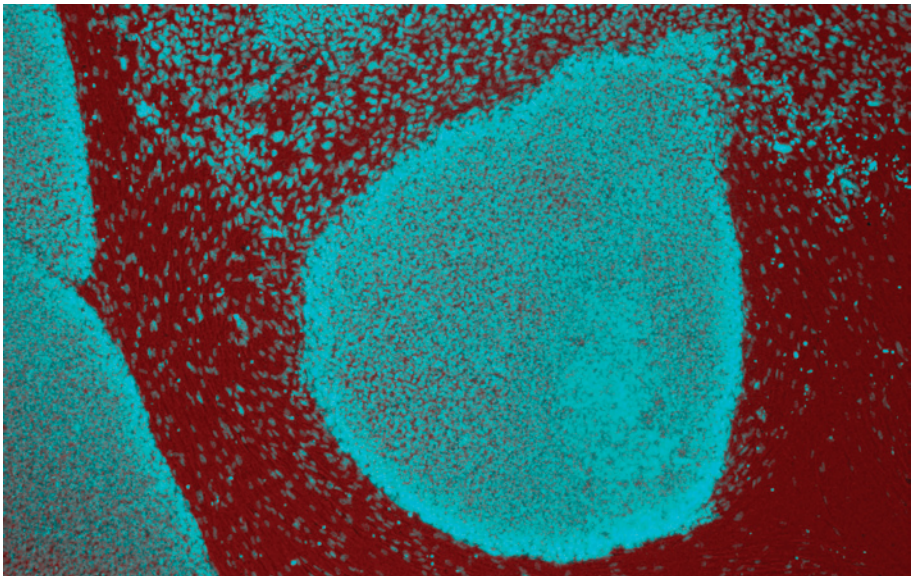


SILVIA RICCARDI/SPL

Researchers are keen to compare induced pluripotent stem cells (pictured) with their embryonic cousins.

STEM CELLS

Court lifts cloud over embryonic stem cells

But research on induced stem cells may be the real winner.

BY MONYA BAKER

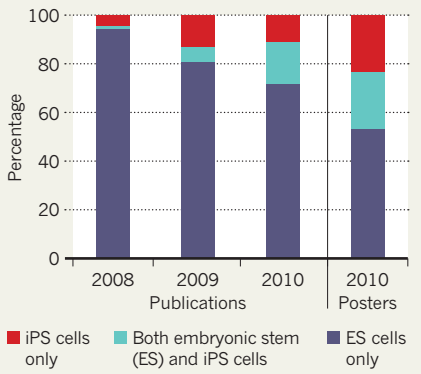
The US Supreme Court's decision last week to throw out a lawsuit that would have blocked federal funding of all research on human embryonic stem cells cleared the gloom that has hung over the field for more than three years. Yet the biggest boost from the decision might go not to work on embryonic stem (ES) cells, but to studies of their upstart cousins, induced pluripotent stem (iPS) cells, which are created by 'reprogramming' adult cells into a stem-cell-like state.

At first glance, iPS-cell research needs no help. Researchers flocked to the field soon after a recipe for deriving the cells from adult mouse cells was announced in 2006, partly because this offered a way to skirt the thorny ethical issues raised by extracting cells from human embryos. But the real allure of iPS cells was the promise of genetically matched tissues. Adult cells taken from a patient could be used to create stem cells that would, in turn, generate perfectly matched specialized tissues — replacement neurons, say — for cell therapy. Although the number of published papers from iPS-cell research has not yet caught up with that of ES-cell work (see 'Inducing a juggernaut'), US funding for each approach is now roughly matched at about US$120 million a year.

But, as iPS cells crop up in ever more labs, ES cells — generally cheaper, better behaved and backed by an extra decade's worth of data — promise to have an important supporting role. Ever since iPS cells were described, researchers have been trying to understand just how similar they are to ES cells. iPS cells begin with different patterns of gene expression, and they can also acquire mutations during the reprogramming process, which means that every iPS cell must be thoroughly evaluated before it can be used in any study. "Human ES cells will always be the standard to which other cells will be compared," says Roger Pedersen, who studies how stem cells retain embryo-like states at the University of Cambridge, UK.

INDUCING A JUGGERNAUT

The proportion of stem-cell publications and posters featuring induced pluripotent stem (iPS) cells rose rapidly in the years after their 2006 discovery.



C. T. SCOTT *ET AL. CELL* **145**, 820–826 (2011):

Federally supported ES-cell research was shut down in the United States on 23 August 2010, a year after a lawsuit was filed by two opponents of human ES-cell research, and remained frozen for more than two weeks. Many investigators shied away from the field for fear of having to shut down again. The Supreme Court's move has reassured investigators such as Candace Kerr, who studies early development of the brain at the University of Maryland School of Medicine in Baltimore. As a young scientist working towards tenure, she felt particularly vulnerable to the threat of ES-cell funding being stopped. So she switched to iPS cells in 2010, while the lawsuit was working its way through the US court system. With the litigation over, she says she need not "hesitate or fear" adding to her work with experiments using ES cells, which she finds much easier to prompt into neurons than iPS cells. "I am excited and relieved by this decision," she says.

ES cells do, however, have a head start in the clinic. Former heads of the biotech company Geron, based in Menlo Park, California, last week announced an agreement to acquire stem-cell assets including the company's flagship human ES-cell trial, in which precursors of neural support cells grown from human ES cells were injected into people with spinal-cord injuries. In 2011, Geron had shut down the $25-million-a-year effort, after the trial had gone on long enough to show that an ES-cell-based product could be safe. However, it had not shown signs of benefiting patients.

If revived, the spinal-cord trial would double the number of companies sponsoring human clinical trials for ES-cell therapies. At present, the only active trials are those sponsored by Advanced Cell Technology of Santa Monica, California: these are showing early evidence that a product made from human ES cells can help to rebuild the layer of cells that support photoreceptors in the eyes of people with certain types of blindness.

But iPS cells are edging towards the clinic too. Advanced Cell Technology says that it will begin talking to the US Food and Drug Administration this March about the safety studies required to test platelets derived from iPS cells in humans, and Japan is setting up a stem-cell bank of some 75 iPS-cell lines intended for future therapies. Even James Thomson at the University of Wisconsin–Madison, who isolated the first human ES cells in 1998, says that the future belongs to induced stem cells. His lab hasn't bothered to derive a single human ES-cell line since iPS cells were reported. "But we've derived dozens if not hundreds of human induced pluripotent stem cells," he says. ■

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For more about the lawsuit, see:
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