

Iowa opens new debate over use of stem cells

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Iowa City, Ia. - Iowa scientists have used embryonic stem cell technology with animals to eliminate diseases such as diabetes and blindness caused by macular degeneration. They hope to use the technology with humans in the next five to 10 years.

If successful, even foes agree that regenerative research breakthroughs would likely lead to revolutionary advances in treating cancer, heart disease and Alzheimer's.

But Iowa's scientists face a possible roadblock: politics.

On the campaign trail last fall, Gov. Terry Branstad said he wants Iowa to reinstate a 2002 state law that limited the use of human embryonic stem cells in research. The law specifically prohibited human cloning and the creation of stem cells through a process called somatic cell nuclear transfer.

Supporters of Branstad's stance say reintroduction of the ban would reclaim the moral high ground while doing nothing to stymie science in Iowa. No known Iowa researcher is using human cloning or somatic cell nuclear transfer in their research. And the federal government specifically prohibits its tax dollars from being used for human cloning.

But medical officials strongly disagree with reintroducing the ban. They say it would open the door to further restrictions that could halt lifesaving research. And they warn that a ban would send a worldwide message that Iowa is an unfriendly place for science.

Late last month, Branstad said he still needs to consider the issue to determine how far he believes such legislation should go.

The emotional debate over embryonic stem cell research centers on the most fundamental of questions: when life begins.

Opponents of embryonic stem cell research believe life begins at conception. Harvesting stem cells destroys an embryo. That act, they believe, is murder.

Supporters argue that the cells being used for research would be destroyed anyway, and that the greater good is to use cells destined for destruction to improve or save lives.

Four states prohibit human embryonic stem cell research - Arkansas, Indiana, North Dakota and South Dakota, according to the International Society for Stem Cell Research, a nonprofit based in Deerfield, Ill.

Iowa is believed to be the only state where lawmakers have signaled they might take up such legislation, according to the Coalition for the Advancement of Medical Research, a group based in Washington, D.C., that bills itself as the nation's leading bipartisan pro-cures group.

"I think if Iowa wants to assure it will have second-class research facilities and no role to play in the burgeoning American biotech industry, the best thing they could do is prohibit embryonic stem cell research," said Sean Tipton, past president of the coalition and public affairs director for the American Society for Reproductive Medicine.

Debate point 1: Is use of embryos necessary?

Many scientists view use of embryonic stem cells as critically important in regenerative research because embryonic stem cells can become all cell types of the body, and scientists can easily grow them.

But that view is changing.

Researchers in 2006 developed a technology in which adult cells derived from such areas as the skin can be reprogrammed to assume the qualities of embryonic stem cells.

The cells, known as induced pluripotent stem cells, are already being used for drug development and disease modeling. Scientists also hope to use them in transplantation medicine.

Partly because of the advances with induced pluripotent stem cells, some scientists say research using embryonic stem cells is unnecessary.

"The question is what is the benefit of using embryonic stem cells as treatments," said Alan Moy, a scientist who started Coralville's John Paul II Stem Cell Research Institute, a nonprofit group opposed to the use of embryonic stem cell research. "There is no convincing evidence that embryonic stem cells will lead to a viable clinical treatment or regenerative medicine treatment."

Nicholas Zavazava, a professor of internal medicine at the University of Iowa, has participated in research teams that have used embryonic stem cells to cure diabetes in mice. He's also collaborated on research where a rat's blood was replaced through a process using embryonic stem cells from a donor rat's blood. The research gave the original rat the same blood as the donor and protected it against organ transplant rejection without the use of drugs.

It remains unknown whether induced pluripotent stem cells and embryonic stem cells differ enough to alter clinical research, according to information from the National Institutes of Health, a congressionally funded organization based in Maryland. One cause for concern: Viruses used to reprogram the nonembryonic cells have sometimes caused cancer in animal test studies, the institutes reports.

Zavazava said the use of embryonic stem cells might not be needed for research in the future once more thorough tests are conducted on induced pluripotent stem cells. However, he remains opposed to legislative restrictions on embryonic stem cell science.

Bills to limit specific research would be "very damaging to the investigators at the institutions that work on embryonic stem cells, and it will discourage those individuals who potentially might be recruited to Iowa, that's for sure," Zavazava said.

Iowa is well respected in the scientific community but isn't a powerhouse in embryonic stem cell research, at least not to the degree of places like California or New York, said Larry Goldstein, director of the University of California-San Diego Stem Cell Program and a board member of the International Society for Stem Cell Research.

California voters in 2004 approved a 10-year, \$3 billion organization to support human stem cell research.

The vast majority of regenerative research in Iowa is conducted at the University of Iowa, but the university devoted only about \$100,000 in the past year to embryonic stem cell research, said Tom Moore, a university spokesman. The university's total research budget is \$466.5 million.

However, the relatively small sum isn't an adequate measure of whether Iowa is an important player in embryonic

stem cell research, Goldstein said. The quality of research must be judged, not just size of program, he said.

Restrictions on embryonic stem cell research would create a chilling effect on Iowa's entire scientific community, Goldstein predicted.

"It would be a pity if some of Iowa's best scientists were unable to move into this field and make important contributions," Goldstein said. "The problems are so hard that no one country, state or city can do this on their own."

Nationwide, two clinical trials, both in California, are under way using cells derived from human embryonic stem cells. One is using the cells to restore spinal cord function. The other is treating patients who suffer from an eye disease known as macular dystrophy, which can cause blindness.

Debate point 2: Is the research ethical?

Human embryonic stem cells are taken from eggs that were fertilized in vitro and later discarded by donors who donate them for scientific purposes. They do not come from eggs that have been fertilized in a woman's body.

Groups like Iowa Right to Life believes such research is a step toward creating a human life simply to save another.

"From the moral aspect, it will turn humans into a commodity that will create cloning farms to kill the embryos for research," the group's website says. "From a practical standpoint, embryonic stem cell research is unsuccessful, curing no one - not even a mouse."

The group, the largest anti-abortion organization in the state, directed questions to Moy, the scientist who started the John Paul II Research Institute, as well as Kim Lehman, its past president. Lehman, who now works as a lobbyist for the institute, did not return phone calls seeking comment.

Moy finds fault with the argument that the eggs would be destroyed anyway. Some countries prevent fertilization clinics from creating excess embryos, which he believes is a more ethical approach.

"The only reason why those embryos are being discarded is because nobody wants to pay for the freezing costs to maintain those," Moy said. "You could make a legitimate argument to say, 'Let's pay for the costs to maintain those embryos until society can find an ethical way to try to deal with them.' Destroying them because nobody wants to pay for maintenance costs is a weak argument."

Other scientists insist it's a fact that the eggs would be destroyed anyway and say the argument is merely a political tactic from some elected officials.

"They say, 'You can't let the scientists do this. They're going to kill your babies.' It's insane," said Budd Tucker, an assistant professor at the University of Iowa who is working to cure macular degeneration.

The direct impact on economy is small here

Thirty states received more federal money than Iowa to conduct stem cell research during the fiscal year that ended June 30, 2009, according to the National Institutes of Health. Iowa received about \$4.5 million. California, the leader, received \$207.4 million.

Iowa lawmakers have not directly appropriated money for embryonic stem cell research. However, the state has spent \$30 million to help start the Pappajohn Biomedical Institute at the University of Iowa, a facility that includes the

university's regenerative medicine team.

Advocacy groups such as the Biotechnology Industry Organization or the Pharmaceutical Research and Manufacturers of America don't keep track of how much private money is spent on stem cell research but they acknowledge that private funding is significant.

The research already plays an important role in economic development in some areas of the nation, said Michael Werner, executive director of the Alliance for Regenerative Medicine, a nonprofit group based in Washington, D.C., that advocates for stem cell research.

California's \$3 billion effort, for example, is expected to create thousands of jobs and between \$2.2 billion and \$4.4 billion in sales and tax revenue for the state from private investments associated with the research, according to an economic impact report the alliance released in March 2010.

"Investments in regenerative medicine absolutely lead to jobs," Werner said.

Politics shifted with November elections

When Chet Culver ran for governor in 2006, he campaigned on repealing the 2002 ban. Culver won, and Democrats also assumed majorities in the Iowa House and Senate.

In early 2007, lawmakers followed through on Culver's promise and repealed the ban. The House passed the repeal, Senate File 162, 52-46. The Senate barely passed it, 26-24.

"Today, thousands of Iowans who have been affected by serious illness and disease now have hope," Culver said when he signed the repeal into law.

Culver also signed a bill to create the Pappajohn research institute.

But the political makeup of state government changed dramatically with the November 2010 elections. Branstad defeated Culver, and Republicans took 60 of 100 seats in the House and 24 of 50 seats in the Senate.

Both advocates and opponents of embryonic stem cell research expect the Legislature to take up so-called pro-life legislation in the session that began last week. Driving that belief: the new makeup of the Legislature, Branstad's campaign comments favoring restrictions on abortion and embryonic stem cell research, and the anxieties stirred by a Nebraska doctor's plans to open a late-term abortion clinic in Council Bluffs.

A state law went into effect in Nebraska last fall that bans abortions after 20 weeks of gestation except in narrowly defined cases when the mother's life is in jeopardy. The law is based on some studies that conclude a fetus can feel pain after 20 weeks.

Dr. LeRoy Carhart spoke of his plans for the Council Bluffs clinic in November after the Nebraska law took effect.

Rep. Matt Windschitl, R-Missouri Valley, a board member of Iowa Right to Life, said he's drafting legislation similar to Nebraska's in an attempt to keep Carhart from operating in Iowa. He's also reviewing options to reinstate restrictions on human embryonic stem cell research.

"As a state right now, are we going to look at that? Yes. I am looking at it and what options we have," Windschitl said.

"It is on my personal agenda."

House Speaker Craig Paulsen, R-Hiawatha, would make no predictions about the possibility that the Legislature this session will again restrict embryonic stem cell research.

However, he said, "When you do research on adult stem cells, the science is such that positive outcomes and opportunities for health care exists, but I've yet to see a helpful outcome on embryonic stem cells."

Senate Majority Leader Michael Gronstal, D-Council Bluffs, has the ability to block debate in the Senate. He voted in favor of the 2007 law that restricted embryonic stem cell research. He said he's "sure it will be a subject of discussion."

"We will certainly look at what they come up with and make a judgment about whether or not it makes sense," he said. "I don't think anything is guaranteed to fail, and I don't think anything is guaranteed to succeed."

Sen. David Johnson, R-Ocheyedan, has vowed to help assist House Republicans in trying to move such bills forward in the Senate.

"There are legislators who believe it's still important to push some of these issues forward, even when jobs and the economy are dominating," Johnson said.

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For researcher at U of I, stem cell study is personal

Iowa City, Ia. — Budd Tucker is on a personal crusade to end retinal degeneration.

His wife was diagnosed at age 10 with a congenital eye disease that could eventually rob her of sight.

Tucker, 32, chose to study vision research because of her. They've been together for about 16 years.

"And this is genetic," Tucker said. "I have a son and another on the way. It's quite possible that one of those could get the same disease. If you're going to be curing something, you just as well cure something that's in your own family."

The University of Iowa recruited Tucker, a postdoctoral fellow at Harvard University, this year. He's involved in research using pigs as test subjects.

He came to Iowa for several reasons, including the reputation of the school's ophthalmology program and the ease of finding pigs for test subjects.

Tucker works with both animal embryonic stem cells and induced pluripotent stem cells, which are skin cells transformed to mimic embryonic stem cells.

Some of the diseases Tucker focuses on strike people before they are 20, leaving them blind by the age of 40 and with little hope of sight restoration because nerves have been permanently damaged.

The only way to restore sight is to replace cells. His program is focused on using stem cells to replace retinal neurons.

Tucker and two of his peers have used stem cells to restore vision in a mouse. He's now in the process of publishing a paper about the work.

Tucker is also part of a team that this year was awarded a \$2.25 million grant from the National Institutes of Health to study the process in larger animals over the next five years. His team, which will work with researchers from the University of Missouri, will use pigs because their eyes are similar to humans'. The goal is to begin human clinical trials within the next five years.

Tucker, who earned his doctorate degree from Memorial University in Newfoundland, Canada, said restricting embryonic stem cell research would do little but drive scientists and, potentially, jobs to other states or countries.

"I tend not to worry myself over politics," Tucker said of Branstad's comments during the campaign. "There's no way in my mind he could do something this idiotic and the people of Iowa would stand behind him."

Tucker continued: "I just don't think people who have so much vested in this — meaning their families are dying of cancer or going blind — that we could have some politician up on the pulpit saying embryonic stem cell research is bad, we're going to stop it."

An intellectual freedom issue

Iowa City, Ia. — Nicholas Zavazava has cured diabetes in mice using embryonic stem cells.

He's also been part of research teams that have replaced the blood in a rat to match that of a donor rat, allowing organ donation without the use of drugs to prohibit rejection. His hope is to develop the technique to help humans, too.

Such accomplishments would represent major medical breakthroughs. Almost 24 million Americans suffer from diabetes, according to the American Diabetes Association, and more than 110,000 people are on transplant waiting lists, according to the United Network for Organ Sharing.

Many transplant patients die while waiting for an appropriate match. Deaths could be reduced dramatically by using advances discovered through embryonic stem cell research, said Zavazava, director of transplantation research at the University of Iowa.

Additionally, many transplant recipients' new organs last only about 10 years. The research could greatly lengthen that span, Zavazava said.

The Coalition for the Advancement of Medical Research doesn't believe any scientist in Iowa is conducting research using the human cloning technique that Iowa once banned. Still, Zavazava believes returning such a restriction to the books would thwart advances.

"Forbidding intellectual freedom in science has never been good at any time in history," Zavazava said. "That is why these restrictions hurt more than they help."

Zavazava grew up in Zimbabwe, earned his medial and doctorate degrees in Germany and completed additional training in the United Kingdom. He came to the University of Iowa in 2001, a year before the state enacted restrictions on embryonic stem cell research.

A report on the diabetic mouse work was published in November by Transplantation, a journal that reviews such breakthroughs. Other scientists have conducted similar research.

Discussing efforts to renew restrictions on embryonic stem cell research, Zavazava said, "I take this very seriously because it hurts us. We are in a state that already has a very bad record with the previous law. I can assure you that this would be a sure way for us to lose faculty."

Non-embryonic cells are option

Alan Moy believes that embryonic stem cells are not necessary to advance regenerative medical research.

The former University of Iowa scientist has a lot riding on that belief: In 2000, he launched his own business that specializes in stem cell research without using embryonic cells.

He also heads a nonprofit group whose mission is to advance stem cell research "in a manner consistent with pro-life bioethics."

"I look at it from different levels, one of which is an ethical issue," Moy said. I'm pro-life. But I also look at it from a strategic perspective. ... It's very concerning that government is not looking at this from a global competitive economy perspective."

Moy believes governments have blindly poured resources into embryonic stem cell research. Money would be better spent on pumping up the private sector's regenerative medicine industry that uses cells derived by alternative methods to the destruction of a human embryo, he said.

Moy employs six people at his Coralville business, Cellular Engineering Technologies. Part of his work is to mass produce what is known as induced pluripotent stem cells, which are sold to researchers.

The pluripotent cells are derived from areas such as the skin of human volunteers and are reprogrammed to assume an embryonic stem cell-like state by forcing the expression of certain genes.

Scientists are still conducting research to determine whether the pluripotent cells differ significantly from embryonic stem cells.

In the meantime, Moy's business continues to develop what he says will soon be the nation's largest repository of disease-specific pluripotent cells to help other researchers conquer or treat cancers, autism, Alzheimer's and other diseases.

Think of his business as a pluripotent megastore.

"It's a very exciting time, and it is working on things that potentially have cures for patients while also providing economic development for the state," Moy said.