

BIOTECHNOLOGY

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States fund stem cell research

As a result of federal financing limits, several states have stepped in.

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EVEN IF YOU'RE not a Californian, it is difficult to avoid stem cells in the news. Reports on the promise of stem cell research and its ethical and moral dilemmas appear daily. On May 24, the U.S. House of Representatives passed a bill to expand federal financing for embryonic stem cell research in defiance of a veto threat by President George W. Bush. An identical bill is pending in the Senate. Sheryl Gay Stolberg, "House Approves a Stem Cell Bill Fought by Bush," N.Y. Times, May 25, 2005, at A1.

The news is noteworthy as cures for Parkinson's, Alzheimer's, Lou Gehrig's and heart disease are the expected results of stem cell therapy. The hope is, although many differ on how long it will take, that the war against those, as well as many other, diseases will be won with stem cell therapy.

As a result of an August 2001 severe limitation on federal funding for stem cell research, the states and their citizens stepped in. After all, cures for devastating diseases and keeping the United States on the cutting edge of such research are important common goals that could not be achieved with private funding alone. Challenges facing states funding

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stem cell research include realizing a return on taxpayer investment, and staying competitive with other states having stem cell research programs and foreign countries where stem cell research is rapidly progressing.

Our bodies are made up of millions of different types of specialized cells. Brain cells, heart cells, skin cells, blood cells and so on are specialized or differentiated cells. All of these cells stem from a special kind of cell that has the unique ability to renew itself and give rise to every type of differentiated cell. National Institutes of Health, "Stem Cells: Scientific Progress and Future Research Directions," at <http://stemcells.nih.gov/info/scireport/> (June 17, 2001). The mother of all cells, a totipotent cell, forms when sperm fertilizes an egg. The fertilized egg divides and eventually forms a hollow sphere of cells called a blastocyst or embryo. The inner layer of a blastocyst contains pluripotent stem cells. Pluripotent cells give rise to all remaining cells necessary for fetal development. Such totipotent and pluripotent stem cells are called embryonic stem cells. Renewable cells have also been found in developed tissues of adults (adult stem cells).

The greatest hope for stem cells is that they can renew or replace diseased cells that cause devastating diseases like multiple sclerosis, diabetes, spinal cord injury and cancer. Stem cells can also be used to study diseases, how they occur and how they might be treated with traditional or new drugs.

Understandably, the majority of research interest, and ethical controversy, lies in obtaining and using stem cells from human embryos. Human embryonic stem cells are harvested most commonly from embryos that exist as a result of in vitro fertilization, hence the controversy. On Aug. 9, 2001, President George W. Bush announced his decision to limit federal

funding to existing embryonic stem cell lines. See www.whitehouse.gov/news/release/2001/08/20010809-2.html (Aug. 9, 2001). At best, 26 embryonic stem cell lines existed at the time; however, many critics say that of these, fewer than 12 are useful. Adult stem cell and other nonhuman embryonic stem cell research are not subject to federal funding restrictions.

Recognizing that private research funding could not fuel the fervor for this important scientific endeavor and prevent the loss of critical research capabilities to less restrictive countries such as South Korea, California and New Jersey took action. (The two most significant embryonic stem cell research breakthroughs, including the first creation of human embryonic stem cells line via cloning, have come from Dr. Woo Suk Hwang of Seoul National University. See Gina Kolata, "Koreans Report Ease in Cloning Stem Calls," N.Y. Times, May 20, 2005, at A1.)

California, N.J. and other states

On Nov. 2, 2004, California became a leader in stem cell research funding by approving Proposition 71. Under Prop. 71, California seeks to establish the California Institute for Regenerative Medicine, governed by the Independent Citizen's Oversight Committee, to regulate stem cell research and to dole out \$3 billion in research grants and loans over the next 10 years. Prop. 71 has recently been bogged down in litigation. See Megan Garvey, "California's Stem Cell Bid Stuck in Neutral," Los Angeles Times, May 23, 2005, at A1, at www.latimes.com/news/local/la-me-stemcell23-May23,0,2768941.story.

Prop. 71 contains a provision intended to protect California's interests in intellectual property developed with state funding. It reads: "The [Independent Citizen's Oversight

Committee] shall establish standards that require that all grants and loan awards be subject to intellectual property agreements that balance the opportunity of the State of California to benefit from the patents, royalties, and licenses that result from basic research, therapy development, and clinical trials with the need to assure that essential medical research is not unreasonably hindered by the intellectual property agreements." Part 5 of Division 106 of the Health and Safety Code, § 125290.30, subsection (h).

A number of other states have either passed or are mulling the enactment of laws expressly permitting human stem cell research, and many are considering a form of public funding. States with established life science communities are fighting to avoid a "brain drain," while other states are seeking to create life science communities based upon the availability of stem cell dollars.

Like California, New Jersey sanctions research using embryonic stem cells. N.J. Stat. Ann. §§ 26:2Z-1-2Z-2. The New Jersey bill, signed into law on Jan. 2, 2004, formally authorizes human embryonic stem cell research and outlaws reproductive cloning of humans, but does not provide funding. *Id.* Following California's lead, however, in January 2005, the acting governor of New Jersey, Richard Codey, proposed providing \$380 million in public funding for stem cell research.

Under Codey's proposal, New Jersey would earmark \$150 million in existing, unspent bond money to build and equip a New Jersey stem cell institute and attempt to get voters to approve a \$230 million bond referendum in November 2005 to fund stem cell research grants over the next 10 years. See New Jersey Commission on Science & Technology, *The Stem Cell Institute of New Jersey*, Governor Codey's Initiative, www.state.nj.us/scitech/stem_gci2.html. Codey has also proposed that New Jersey, Pennsylvania and Delaware work together to keep their region competitive in the field of stem cell research. The governors of these three states propose to raise \$1 billion for a joint stem cell initiative. Juvenile Diabetes Research Foundation International, "States Scramble to Fill Stem Cell Void," at www.jdrf.org/files/legislative_action/2005_Stem_Cell_Facts_Sheets/3.StateLaws.pdf.

Wisconsin's governor proposed spending \$750 million to promote and invest in biotechnology and stem cell research, including \$375 million in public and private funds to build a Wisconsin Institute for Discovery. Office of the Governor Jim Doyle, press release, "Governor Doyle Outlines Wisconsin's Strategy to Remain at the Forefront of Biotechnology, Health Sciences, and Stem Cell Research," Nov. 17, 2004, at www.wis.gov.state.wi.us/journal_media_detail.asp?prid=832.

On May 31, the Massachusetts Legislature overrode the veto of Governor Mitt Romney and enacted legislation authorizing human embryonic stem cell research. A companion bill is expected to be introduced in the coming months to appropriate as much as \$100 million in public funds for stem cell research. Raphael Lewis, "Stem Cell Bill Override Turns Talk to Research Support," *Boston Globe*, June 1, 2005, at [www.boston.com/news/local/massachusetts/articles/2005/06/01/stem\)cell_bill_override_turns_talk_to_research_support/](http://www.boston.com/news/local/massachusetts/articles/2005/06/01/stem)cell_bill_override_turns_talk_to_research_support/).

In February 2005, Maryland lawmakers introduced legislation providing \$23 million per year of state money received from the state's portion of the national tobacco settlement for funding adult and embryonic stem cell research. The bill only permitted the use of surplus embryos from fertility clinics, not the use of embryos produced through therapeutic cloning. Maryland Stem Cell Research Act of 2005, unofficial copy of House Bill 1183, at <http://mlis.state.md.us/2005rs/bills/hb/hb1183f.pdf>. The bill died in the state Senate.

A \$1 billion bond referendum has been introduced in Illinois for the 2006 ballot to fund the creation of a research institute to support stem cell research at Illinois universities and other advanced medical research facilities in the state and to fund stem cell research over a 10-year period. Daniel W. Hynes, comptroller, press release, "Hynes Proposes Creation of Stem Cell Research Institute," Nov. 23, 2004, at www.ioc.state.il.us/office/IOCNews/ViewNewsRelease.cfm?ID=2070837170.

New York lawmakers have also introduced,

but not yet passed, legislation to permit human embryonic stem cell research, excluding reproductive cloning, and provide \$100 million annually in public money to fund the research through a newly formed New York State Institute for Stem Cell Research. Assembly Speaker Sheldon Silver, press conference, "Unveiling of Legislation Creating the New York State Institute for Stem Cell Research," March 1, 2005, at <http://assembly.state.ny.us/Press/20050301a/>.

Pennsylvania forbids allocating state funds for stem cell research. Susan E. Lindt, "Stem-Cell Bill Draws Fire from Lawmakers," *Lancaster Online*, May 11, 2005, at www.lancasteronline.com/pages/news/local/4/14243. The Legislature is now trying to remove that prohibition and create a dedicated \$500 million fund to be overseen by a 15-member Pennsylvania Stem Cell Research Council. *Id.*; State Representative Mike Veon, press release, "Lawmakers Call for Investment in Stem Cell Research," Feb. 3, 2005, at www.pahouse.com/pr/veon/014020305.htm.

On May 31, Connecticut lawmakers enacted legislation allocating \$100 million of state money over the next 10 years to fund adult and embryonic stem cell research. The law only permits the use of surplus embryos from fertility clinics, not the use of embryos produced through therapeutic cloning. Connecticut Governor M.

Jodi Rell has announced her intention to sign the legislation into law. Ken Dixon, "100m to boost stem cell research," *Connecticut Post*, June 1, 2005, at www.connpost.com/news/ci_2773049.

Return on investment

The shift from federal to state-funded research is a dramatic precedent. Public

scrutiny and ethical and political considerations have forced states to articulate the medical, social and economic justifications for funding stem cell research.

The widespread acceptance by the scientific community that stem cell research has the potential for resulting in significant public health benefits has provided every state with compelling medical and social justifications for its investment. Each state envisions that the economic benefits resulting from such funding include, among others, creating new

Two states passed legislation as recently as May 31.

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employment opportunities by attracting research activities and related industries to enhance its economy. They also expect to remain competitive in biotechnology—recognized by many experts as the future of innovative medicine.

California is one state that expects a direct revenue return, such as requiring payment of royalties from the licensing of state-funded technologies. See Victoria Slind-Flor, "Will California's Stem Cell Initiative Reap Royalties?," IP Law & Business, available at www.law.com (Feb. 22, 2005). Whether California and other states that adopt similar requirements will actually receive royalties or grant repayments is debatable. Joyce E. Cutler, "Little Guidance Yet on IP Systems for California Stem Cell Initiative," Patent, Trademark & Copyright Law Daily, March 16, 2005. It will be interesting to see, in what will likely be a very competitive environment, whether the requirement for royalty revenue will be implemented.

To create a successful funding program, states will have to establish administrative controls, implement a variety of regulatory policies and make some difficult decisions including determining whether only in-state entities receive state money; who are appropriate grantees; and what criteria will be applied to determine which research proposals get funded. States must also impose unambiguous regulations on intellectual property ownership, licensing or other transfer of rights in state-funded technology; mandate standardized reporting requirements for tracking funded research projects and any resulting products and treatments; and establish clear criteria to ensure that research initiatives comply with ethical, legal and state policy requirements and objectives.

The ultimate success of any state stem cell initiative will require the state to foster collaboration among state organizations, universities and research institutions and to attract development and commercialization collaborations with private industry.

With no federal money and limited private funds available, states feel the need to act now to compete effectively with one another and with foreign countries in stem cell research. States can establish and implement their own individualized approaches or instead follow the federal government's well-established Bayh-Dole Act. As non-U.S. researchers continue to forge ahead on stem cell research, states may be pushed to adopt a Bayh-Dole-like system as it is a well-developed model

that should be easy to get up and running.

The Bayh-Dole Act

Unlike the states, the U.S. government has for decades been funding basic research to bring new technologies to private industry for the public benefit. Early federal funding programs failed to achieve these objectives. Hopeful grantees confronted a hopeless morass of rules and regulations. Additionally, the government retained ownership of inventions made with federal funds, and technology transfer to businesses was limited to readily available nonexclusive licenses. Without at least the possibility of exclusivity, the private sector simply was not interested in investing precious resources for technology it did not control. See Council On Governmental Regulations, *The Bayh-Dole Act, A Guide to the Law and Implementing Regulations* dated October 1999; U.S. Government Accounting Office Report to Congressional Committees entitled "Technology Transfer, Administration of the Bayh-Dole Act by Research Universities," May 7, 1998.

In 1980, however, enactment of the Bayh-Dole Act ushered in a new era of government programs providing funding to universities, nonprofits and small businesses. Government grantees could elect to retain ownership of inventions made with government funding. And such grantees could offer exclusive licenses. Under the Bayh-Dole Act, universities rapidly established proficient technology transfer groups and gained expertise in patenting inventions and licensing them to private industry. New technologies became available to private enterprises and through them to the public.

For approximately 25 years, government-funded research has been performed under the Bayh-Dole Act. Universities continue to be actively involved in licensing federally funded inventions to private industries. Life sciences companies obtain a majority of the licenses granted by universities receiving federal monies and are thus significant beneficiaries. *Id.* Although there are a few detractors (see, e.g., Judith Gorman, "Golden Fleece: Tax-paid research gives companies new drugs; they sell drugs back to us at exorbitant prices," at www-populist.com/00.13.golden.fleece.html), most believe that the Bayh-Dole Act succeeded in introducing new technologies to the public.

What are the key features of the Bayh-Dole Act that make it work so well? One factor is that the federal government asks for little in return

for grants. No repayment, royalty payment or any other payment to the government is required under the act. The government, however, does insist that it receive fully paid nonexclusive licenses, known as march-in rights, to use government-sponsored inventions for specified governmental purposes.

Another reason is that there is no centralized federal agency to administer it. The Bayh-Dole Act is virtually self-regulating. Grantees are expected to comply voluntarily with the acts, rules and procedures. For example, when an invention is made using federal money, a grantee must notify the government. To retain ownership of any such invention, the grantee must elect to do so, notify the government and share revenues with inventors. Apart from making certain that it has received the march-in rights, the government does very little to monitor a grantee's activities and compliance. See Council On Governmental Regulations and Government Accounting Office publications, *supra*.

The apparent success of the Bayh-Dole Act, and actual success of South Korea's scientists, provides strong motivation for states to follow the lead of the federal government so that they can get dollars into the hands of researchers as fast as possible. Although Congress, as evidenced by the House passing of the bill, recognizes the need to circumvent the four-year-old federal funding restrictions on stem cell research (see the Stem Cell Research Enhancement Act of 2005), the White House recently announced that it remains firm on its opposition. As to the Senate, the outcome is uncertain. While confident proponents suggest there are enough votes to overcome a White House veto, equally confident opponents state the bill will never pass.

Clearly, the landscape is continually changing as stem cell breakthroughs are reported daily from abroad, additional states consider funding proposals and private entities provide much needed, but not enough, money to researchers eager to stay in the stem cell game. There is much interest in how all this will unfold. **NLJ**

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