STEM CELLS: WHAT’S NEXT?

By Michael J. Werner
Studies indicate that nearly three-quarters of Americans support embryonic stem cell research. This landmark and sometimes controversial research has been greatly influenced by the one generation of Americans that has impacted the cultural landscape as none other before them.

As the oldest of this generation turn 60 this year, Baby Boomers continue to demand answers from medical science in an effort to lessen their own concerns of growing older and the potential of illness or disability that come with the natural aging process. No one can guarantee when and what science will deliver as a result of stem cell research. Nonetheless, Baby Boomers seek the satisfaction of knowing that their generation has served as a significant catalyst in the research that many hope will lead to cures, treatments, and key steps toward improving the quality of life for cancer patients, survivors, and their families.

Some years ago, scientists made an amazing discovery: they found a way to so effectively manage the mechanisms of cellular biology that they could change the genes in an organism according to their own will.

The technology was controversial. The City Council of Cambridge, Massachusetts enacted an ordinance banning its use within city limits. The specters of Frankenstein’s monster, the hatcheries of Brave New World, and perils of eugenics were invoked. People called on Congress to ban this research.

But the research was not banned. The scientific community stood up to these arguments and described the vast potential of this work—and took steps to make sure the technology was used under an appropriate ethical framework.

Tens of millions of people are now healthier because of this action.

The technology involved was recombinant DNA. Invented in the mid-1970s, it invoked a storm of controversy, but because it proceeded, products such as human insulin for diabetes, trastuzumab (Herceptin®) for breast cancer, epoetin alfa (Procrit®) for anemia, and etanercept (Enbrel®) for patients with rheumatoid arthritis were developed.

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What’s All the Fuss About?
Now a new debate over advanced biomedical technology has captured the political, public, and media agenda: human embryonic stem cells (hESC). This technology has been at the top of the list of most promising biotechnology research since 1998, when researchers at the University of Wisconsin isolated the hESC. Since then, scientists have shown over and over again that hESCs have the potential to lead to cures and treatments for many of our society’s most devastating diseases and disabilities, such as cancer, diabetes, Parkinson’s disease, Alzheimer’s disease, and spinal cord injuries.

The fields of cellular therapy and regenerative medicine will advance as scientists learn how to generate healthy cells of all tissue types. We will learn more about cell differentiation and use that understanding for controlled use of stem cells as a potential therapeutic. The lengthy time required for drug discovery and development may be drastically reduced because new chemical or biological compounds meant to treat diseases could be tested in specific human cells prior to their use in live human beings.

For these reasons, embryonic stem cell research is widely—and profoundly—popular. A recent poll found that 72 percent of Americans support embryonic stem cell research.¹
With that strong political support, Congress voted to embrace this important research by expanding the federal government’s funding commitment. After passage in both the House and Senate, President Bush stopped this legislation with his first veto. As a result, our nation missed an important opportunity to help suffering patients and assert biomedical leadership across the globe.

The President’s veto was based on the administration’s ethical objection to the expanded use of embryonic stem cells derived from three-to-five day old embryos from in vitro fertilization (IVF) clinics. It is estimated that there are about 400,000 of these embryos currently in IVF clinics.

The destruction of embryos for research purposes causes concern for some who believe that it is equivalent to the taking of a human life. Others argue that using stem cells from other sources such as umbilical cord and adult tissue is equally promising.

Back in 2001, President Bush issued an executive order in an attempt to balance these competing concerns. That order authorized federal funding of hESC research but only on embryonic cell lines that had already been derived. Research with private funds was allowed to continue without restriction.

From a scientific point of view, it is now clear that existing federal policy is insufficient. The existing stem cell lines are fewer in number and less valuable than originally believed. Unfortunately, they have been contaminated by the animal cells used in the culture that keeps them alive and are not genetically diverse.

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Moreover, while so-called “adult stem cells” have shown value, scientists have found they are no substitute for embryonic stem cells. In a recent letter to the journal Science, three researchers point out that while these cells—and cells from umbilical cord—show promise for certain blood diseases, claims that these cells have demonstrated success in treating other diseases “remain unproven” or “are simply untenable.”

The Response

As the limitations inherent in federal policy became clear, state and private funders have stepped into the vacuum. In general, states had two objectives: to fund this important area of work; and in so doing, to create economic incentives for biotech companies and academic institutions to establish or expand facilities within their borders.

California led the way with its 10 year, $3 billion ballot initiative. While litigation has slowed implementation, Governor Arnold Schwarzenegger recently pledged $150 million in state funds to jump-start the effort. Other states have followed California’s lead and have made public monies available for embryonic stem cell research including Maryland, Connecticut, New Jersey, and Illinois.

Private funding has also continued. Companies such as Geron Corp. of Menlo Park, California, have pressed ahead with their work, while academic institutions from Minnesota to Massachusetts have increased their commitment to stem cell research using private dollars. While these efforts are all important, they are not a substitute for a full commitment from the federal government through the National Institutes of Health (NIH). NIH funding would accelerate the

At the time that this issue of Oncologistics was in final production, CNN ran a story entitled, “Stem cells created without harming embryos, company says” (Wednesday, August 23, 2006). The article indicated that scientists at Advanced Cell Technology, based in Alameda, CA, have devised a means of piggybacking on existing fertility treatments to avoid the creation, manipulation, or destruction of embryos specifically for the production of stem cells. The fertility procedure, known as pre-implantation genetic diagnosis, or PGD, begins with in vitro fertilization to produce numerous embryos. The new stem cell production method takes a cell extracted during PGD and allows it to divide. One of the two resulting cells is genetically tested as in normal PGD; the other is cultured to encourage the development of stem cells.

The new method has sparked responses from proponents and opponents alike. Currently, U.S. law bans federal funding of any research that harms human embryos. A White House spokeswoman said the method’s eligibility for funding could not yet be determined, “but it is encouraging to see scientists at least making serious efforts to move away from research that involves the destruction of embryos.”

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field tremendously by dramatically increasing monies available to researchers. In addition, NIH policies regarding the mechanics of translating research into commercial products—such as intellectual property rules—are national in scope and have long been settled. Thus, rather than state-specific regulations, researchers and corporate entities have a familiar national oversight scheme under which to operate.

With all this in mind, a bipartisan group of Senators and U.S. Representatives introduced HR 810, the Stem Cell Research Enhancement Act, last year. HR 810 removes the current restriction on federal funding of hESC research, and allows NIH to fund research using hESCs regardless of when they were derived.

Importantly, the bill creates—for the first time—an ethical framework for the research. It requires that cells come from embryos at IVF clinics that are in excess of clinical need (and therefore would be discarded) and with informed consent from the donor. It also prohibits any financial inducement to donate. The bill passed the House last May with a bipartisan majority and similarly passed the Senate in July of 2006.

However, just one day after Senate passage, President Bush vetoed the bill. When a House veto override vote fell short of the necessary two-thirds needed, the bill was defeated.

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What’s Next?
Like water flowing downhill, this research can only be diverted—it cannot be stopped. Three actions are likely to occur in the coming months. And, as befits a professionally- and politically-active generation, it is likely that Baby Boomers will be prominent in all of them:

■ hESC research will continue despite the limiting federal policy. Private funding will be available as will dollars from states. The science is moving forward and it is likely we will see steady—if slow—progress. This will, in turn, generate more funding, helping the field to advance. This cycle will repeat itself until federal policy is changed.

States will be looking for economic benefits from sponsoring research. More than 40 states currently have life sciences economic development programs, and clearly hESC research will be a major component in certain regions.

Research also will continue in other countries. China, Singapore, Israel, and the United Kingdom are all venues for increased work in embryonic stem cells. Already we have seen that the percentage of scientific publications about stem cell research from American scientists is dropping compared to other countries. Those countries are well-positioned to be leaders in this field and could gain the attending economic and patient care benefits.

■ The united front of patients, physicians, and researchers will continue to advocate for stem cell research both in Congress and state-wide. The coalition of research advocates pushing for an expanded federal policy now contains close to 100 organizations. A letter to the Senate urging passage of HR 810 received almost 600 organizational signatures. These groups will clearly continue to press Congress to expand existing federal policy. We can expect another showdown on Capitol Hill next year. These organizations are also likely to lobby state governments to loosen restrictions on research and provide state funding.

■ Stem cell research will be an important issue in upcoming elections. Stem cell research is already an issue in Missouri which has a statewide ballot initiative and a hotly contested U.S. Senate race. It is also shaping up as an important issue in the Senate race in Maryland. Just how important the issue is nationwide or in any particular race will depend on the actions of research advocates.

While polls have consistently showed that Americans support stem cell research, it has never been an issue that affects voting behavior. This has made it easier for elected officials at the state and federal level to vote against research expansions. Opponents of stem cell research are counting on that trend continuing.

Your Role as Advocates
If the U.S. is to lead the world in this important area of science and ethics, and if we as a nation want to speed the development of new treatments for diseases like cancer, diabetes, and Alzheimer’s, it will take more than great science. The scientific, research, and patient communities need to stand up and be counted. Patients, researchers, physicians, nurses, and other health care providers who believe in scientific discovery and its potential to cure disease must be more vocal in the political process than they have been in the past. If hESC research is to advance at full speed in the U.S., the volume of patient and physician voices must be as powerful as the potential of the science.

Those collective voices are powerful; they can ultimately win the debate, and they can change the political landscape for hESC—and all future biomedical research.