STEM CELL RESEARCH
IN WISCONSIN

A PRIMER ON SCIENCE, FUNDING, ETHICS & ADVOCACY

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Introduction

This weekend, Wisconsin will host the World Stem Cell Summit. This is a tremendous honor for our state, and a testament to the leadership and cutting edge work being done by scientists, students and community and business leaders on the stem cell front in the Badger State. Stem cell research holds tremendous promise to cure disease and to spur job creation, but it has also faced consistent opposition from a vocal minority since the moment that Dr. James Thomson first derived human stem cell lines, almost a decade ago.

Unfortunately, as has happened throughout human history, attacks on science have been bolstered by critics' lack of knowledge about the nature of the discovery, and by misrepresentations of the facts surrounding the activity in question. In addition, opponents of stem cell research often demonstrate a lack of respect for the personal faith of those who support medical research – a faith that provides comfort for families living everyday with disease, economic ruin and heartbreaking loss. It's sad to say, but some critics seemingly refuse to recognize the legitimacy of any faith other than their own.

For countless reasons, we must support medical research that has the potential to save human lives. It is the moral thing to do. And, thankfully, that is still the opinion of a majority of Americans. However, as we embark on the next phase of this journey, with new discoveries, methods, and knowledge about the human body coming seemingly daily, we in Wisconsin Stem Cell Now, the state's leading organization dedicated solely to advocacy in favor of medical research, believe that it is more important than ever to correct the record and to set forth the facts that inform the choices we make.

In the coming year, we hope to see fewer federal restrictions on stem cell research, increased funding for all types of stem cell research, and a renewed commitment to support the researchers working in our state. We put forward this primer in hope that the false debates of the past don't overwhelm the progress of the future.

And we hope that you will join us in our efforts.

Ed Fallone
President
Wisconsin Stem Cell Now

Whitefish Bay, Wisconsin
September 18, 2008

I. Science

A. What is regenerative medicine, and what role does it play in the field of medical research?

For centuries, medical research has sought to treat injuries and degenerative diseases that lead to organ failure and chronic health conditions. Many of these conditions are genetic, and have been a leading cause of pain, suffering, and even death for generations of Americans. From the time of the first blood transfusions in the eighteenth century, medical researchers have sought to replace diseased or damaged tissue through organ transplantation. Although some initially opposed the concept of organ transplantation on religious grounds, on the basis that it altered the human body as God had made it, nonetheless millions of lives have been saved by heart, lung, kidney and other organ transplant surgeries. Now, it is considered commonplace, and entirely moral, to alleviate suffering by replacing diseased human tissue with healthy donor tissue.

However, organ transplantation has been hampered by long waiting lists for donor organs, as well as difficulties in overcoming the human body's natural tendency to reject foreign tissue. As a result, researchers have developed mechanical and synthetic devices that can function as artificial organs and tissues. These advances were also criticized by a vocal minority on religious grounds, on the basis that the transplantation of artificial organs into patients diminished the dignity of the human body. However, most Americans hailed breakthroughs like artificial hearts and insulin pumps for the countless lives that they saved and for the human suffering that they alleviated.

Unfortunately, artificial medical devices are not a complete substitute for the healthy organs that they are designed to replace. In addition, despite advances in nanotechnology, researchers are still struggling to artificially replace human biological functions that occur at a cellular level. Today, the search continues for ways to completely cure damaged and diseased human organs and tissue through artificial replacements.

Meanwhile, beginning in the 1970s, significant progress was made in the field of **recombinant DNA**. Researchers used strands of human DNA inserted into bacteria to manufacture drugs, proteins and artificial hormones that exactly mimic their parallels in the human body. For example, for decades diabetics stayed alive by replacing the human insulin that their bodies no longer made with insulin harvested from slaughtered pigs. Scientists now insert strands of human DNA into bacteria in order to manufacture artificial insulin that is genetically identical to human insulin. The insulin must still be injected into the patient several times a day, so it is a poor, second best to replacing the patient's damaged pancreas. However, the genetically manufactured insulin is superior to pig insulin. Cancer-treating drugs, such as those that boost red blood cell production during chemotherapy, are also manufactured using recombinant DNA. Not surprisingly, some decried these advances on religious grounds at first, claiming that they would lead

to human cloning laboratories. In the 21st century, of course, this therapy is widely accepted.

The field of **regenerative medicine** could become the endpoint of this long history of medical research. "Regenerative medicine" applies tissue engineering, stem cell therapy, medical devices and other techniques in order to repair damaged or diseased tissues and organs. Stem cell research allows us to understand the process of human biology at a cellular level, and is therefore one way that researchers hope to learn how to repair or replace human organs and tissues. New cells can be created either through the transformation of one type of specialized cell into another, or through the growth of specialized cells out of undifferentiated stem cell lines. The creation of new human organs and tissues, if successful, would mean that seriously ill Americans could be treated with therapies that completely cure their conditions rather than merely treat their symptoms.

It is likely that, as with other medical advances over the centuries, there will still be some who react to these advances with a misplaced fear of the unknown, or by making claims that medical researchers are "playing God."[1] However, just as was the case with blood transfusions, organ transplantation and recombinant DNA, the majority fully supports these medical advances that have the potential to so greatly improve the quality of life for themselves and their loved ones.

B. What are "stem cells?"

Stem cells are "unspecialized" cells that can generate healthy new cells, tissues, and organs. They are the master cells of the human body that can transform themselves into more specialized cells, which in turn perform a specific bodily function, such as making the heart beat or secreting a particular hormone. In a human embryo, stem cells form four or five days after fertilization of an egg, and they are the precursor to all of the other cell types that will later be necessary for human development. After birth, stem cells remain in some of our organs, continuing to create specialized cells to replace cells that are damaged or wear out.

A "stem cell line" is comprised of a group of stem cells that are isolated from either an early stage embryo called a blastocyst, or from adult tissue. These stem cells are then placed into a growth culture in a Petri dish and induced to self-replicate, generating a colony of cells that continually replaces itself. Researchers then begin the hard work of learning what factors cause the stem cells to transform into one type of cell rather than another. Although a relatively new area of scientific inquiry, the study of stem cells has already greatly increased our understanding of human cell biology.

C. What is involved in "stem cell research?"

[1] For a discussion of the history of religious objection to medical advances, see Eve Herold, *STEM CELL WARS* 22-32 (2006).

Researchers engaged in stem cell research seek to learn how to obtain human stem cells and how to induce them to become more specialized cells. Goals of stem cell research include:

a) A better understanding of both healthy and diseased cell development;
b) The development of specialized human cell lines that can be used in clinical trials to test new drugs; and
c) The eventual ability to grow replacement cells intended for human transplantation.

People mean many different things when they use the term "stem cell research." Failure to differentiate between these different types of stem cell research often leads to confusion and unnecessary controversy – or to the confusion of politicians saying they support stem cell research, when they do not truly support the most promising forms. The different meanings ascribed to the phrase "stem cell research" involve how the stem cells are derived and how research involving the stem cells is funded.

Stem cell research includes:

a) Research using stem cell lines derived from adult cell tissue (*so-called* "**adult stem cell research**")
b) Research using stem cell lines derived from human embryos (*so-called* "**embryonic stem cell research**")
   It is critical to note that under (b),
   i. Embryonic stem cell lines *created prior to August 2001* receive federal funding.
   ii. Embryonic stem cell lines *created after August 2001* do not.
c) Research using stem cell lines derived from donated eggs obtained outside of the fertilization clinic process.
d) Research using stem cell lines derived from embryos "cloned" from adult donors (*so-called* "**therapeutic cloning**" *or* "**Somatic Cell Nuclear Transfer/SCNT**").
e) Research using stem cell lines derived from adult skin cells that are "re-programmed" to become stem cells (**induced Pluripotent Stem Cells** *or* **"iPS/iPSC"**)

In addition to the above categories of stem cells, researchers have begun to use the expanded knowledge of cell biology derived from stem cell research to experiment with ways to directly transform one type of specialized cell into another type of specialized cell, raising the prospect it may be unnecessary to create stem cells at all. This process has been labeled "**direct reprogramming**."

D. How are stem cell lines derived from adult stem cells?

Adult stem cells are found resident in many but not all body organs. An adult stem cell line is created by obtaining an adult stem cell from a donor and inducing it to self-replicate in a cultured Petri dish.

Researchers have long known that certain fully-developed organs and tissues contain stem cells that the body uses to generate more specialized replacement cells. These so-

called "adult" stem cells have also been found in umbilical cord blood, menstrual blood, and wisdom teeth. Adult stem cells have been used for over 40 years in such therapies as bone marrow transplantation. Adult stem cells are said to be **multipotent**, meaning that they can transform into a *limited* number of specialized cell types, usually limited to the cell types that reside in the tissue where the stem cells are found. In other words, adult stem cells derived from bone marrow may be able to produce different kinds of specialized blood cells, but it is unclear whether they can ever be used to produce nerve or muscle cells.

There are currently several concerns about the wisdom of focusing solely on adult stem cells for future research. Researchers have yet to find adult stem cells that can give rise to all of the various types of cells and tissues present in the human body. In addition, adult stem cells are often present in only minute quantities in mature tissues in the body and can therefore be difficult to isolate and purify. Unlike embryonic stem cells, which are relatively easy to grow in culture, adult stem cells do not appear to have the same capacity to multiply perfectly for long periods of time. This is an important drawback, as large numbers of cells would be needed for stem cell replacement therapies. Adult stem cell lines may contain more DNA abnormalities-caused by sunlight, toxins, and errors in making more DNA copies during the course of a cell's lifetime. Finally, any transplantation of cells derived using adult stem cell lines into non-donor patients would also require the use of immunosuppressive drugs.

While researchers may eventually overcome some or all of these limitations, adult stem cells cannot currently be considered a complete substitute for embryonic stem cells.

E. How are stem cell lines derived from embryos?

Embryonic stem cell lines are derived from embryos that are typically obtained from eggs that have been fertilized in vitro (at an in vitro fertilization clinic) and then donated for research purposes with informed consent of the donors. These donated embryos were not fertilized in a woman's body, but rather the sperm and egg are united in the laboratory. If not used for research purposes, most of these embryos would be destroyed. A 2004 study found that 84% of fertility clinics routinely destroyed unused embryos.[2] The embryos from which human embryonic stem cell lines can be derived are typically *four or five days old* and consist of a hollow microscopic ball of cells called a **blastocyst**.

At the time of the union of egg and sperm, the unified cell is said to be **totipotent**, meaning the cell can develop into any of the three types of tissue (endoderm, mesoderm, or ectoderm), as well as the placental tissues needed for the embryo to implant. As the cell development progresses to two cells, then four, eight, and so forth, it reaches a stage where it is called a morula ("berry," in Latin). At about day four, the solid ball of cells begins to transform from a compressed morula into a hollowed-out ball called a blastocyst. The blastocyst is about the size of the period at the end of this sentence, and it contains a thin ridge of cells. These are the embryonic stem cells. A stem cell line is

[2] Eve Herold, *STEM CELL WARS* 36 (2006).

created by removing the stem cells from the blastocyst and inducing them to reproduce in a cultured Petri dish.

These embryonic stem cells are said to be **pluripotent**. They can develop into *any* of the roughly 210 different cell types of a human body. As the blastocyst continues to develop, the cells become even more differentiated and specialized. Until about day 14, the cell mass could be divided in two and it would result in two viable identical cell masses. However, after day 14 the cells have become differentiated to the point that, if one were to attempt to divide them, the cell mass would arrest and stop developing. Also, by day 14, the cells have become so specialized that they are no longer pluripotent, but are merely multipotent.

Because human embryonic stem cells are able to differentiate into any cell type in the body, researchers believe that they hold enormous promise as either direct treatments for a host of chronic diseases – including diabetes, cancers, heart disease, and numerous neurodegenerative conditions – or as laboratory targets against which drugs could be screened to develop new pharmaceutical treatments for those same diseases. Their plasticity, and their durability as self-sustaining cell lines that self-replicate over long periods of time, comprise the primary advantages of embryonic stem cells. For example, researchers have been able to use embryonic stem cells to create large quantities of red blood cells, raising the prospect that one day blood drives may be unnecessary.

Self-perpetuating embryonic stem cell lines were first successfully isolated from humans and cultured by Dr. James Thomson at the University of Wisconsin in 1998.

F. What is the new technique for deriving stem cells from skin cells?

In November 2007, UW-Madison's Dr. Thomson, along with a second team under the direction of Dr. Yamanaka in Japan, announced that they could create cells that behave like embryonic stem cells by adding a cocktail of four genetic factors to an adult human skin cell. Their technique converts routine body cells, or somatic cells, into pluripotent stem cells (in scientific language, it "de-differentiates" them). The reprogrammed somatic cells are called "**induced pluripotent stem cells**" or **iPS** cells.

The breakthrough involves using four factors – including cancer genes – that are inserted into human adult skin cells using retroviruses as a vehicle. These factors "re-program" the skin cells with the result that they begin to behave like embryonic stem cells. These iPS cells appear to have a plasticity similar to embryonic stem cells, although it is still unknown whether they are an exact equivalent. Another potential advantage of using stem cells created via the iPS technique is that there would be no immune system issues should those cells be transplanted back into the patient that donated the skin cells. However, because this method involves the use of cancer genes and retroviruses to do the reprogramming – agents which can "switch on" cancer genes already present within the body – there is general agreement that such cells could not currently be used to treat patients. Additional research is necessary in order to find new ways to introduce these factors into host cells.

G. **What is "direct reprogramming" of cells?**

Dr. Douglas Melton at the Harvard Stem Cell Institute recently announced the successful transformation of normal pancreas cells into more specialized insulin-producing cells in experiments using mice. He achieved these results by using a "cocktail" of proteins to transform one type of adult cell into another. This process could potentially allow researchers to side-step the entire process of creating stem cell lines. If this technique can be replicated using human cells, it would also seem to avoid potential problems with transplantation and immune system rejection.

Potential problems with direct programming include the use of a virus as the vehicle for introducing the proteins into the cells. A non-viral approach may need to be developed to avoid the risk of inducing cancer. In addition, stem cell lines have the advantage of being self-sustaining and of generating large numbers of new cells. It is unclear whether this new technique will be capable of producing specialized cells in a sufficient number to be effective.

H. In light of these new discoveries, why is it necessary to continue research using embryonic stem cell lines?

While amazing progress has been made on multiple fronts, and all of the research discussed above is exciting, there is simply no way of knowing today which avenue of research will eventually prove to be the best for replacing damaged organs or for developing new drug treatments. Medical research does not advance by picking a favored approach and limiting resources to that approach – unless there is a sound scientific basis for the decision. Arguments that favor one form of stem cell research over another are ultimately premised upon religious or political agendas, not scientific data. It is simply premature to declare that any form of stem cell research is the only form that should receive public support. *All* types of stem cell research must continue, and all forms must be adequately funded.

It is striking that both the iPS and direct reprogramming advances were made by researchers applying knowledge that they obtained through their work with embryonic stem cell lines. All of these forms of research are related, and all contribute to a base of knowledge that is mutually beneficial. At the same time, we should pause before we automatically assume that all types of stem cells are identical. At this time we don't know enough about iPS cells to know whether they are exactly the same in behavior and potential to the embryonic cells that scientists have studied for nearly a decade.

Stem cell lines derived from donated embryos will continue to comprise an important part of the research agenda, even while researchers rush to explore other techniques for obtaining stem cells. In order to determine whether stem cell lines derived from skin cells are an adequate substitute for embryonic lines derived from embryos, parallel experiments will need to be conducted comparing the longevity and malleability of these two types of stem cell lines. Funding comparative research requires continued funding for research that uses embryonic lines.

Nor should we abandon experiments that are already well underway using existing stem cell lines derived from embryos. Important knowledge is being gained every day that will

be lost or delayed for decades if researchers start from scratch using new lines. While promising, the iPS and direct reprogramming techniques should not cause us to abandon other efforts. It would be unnecessary and counterproductive to abandon research that uses stem cell lines derived from embryos, just it would be unnecessary and counterproductive to abandon research already underway using stem cell lines derived from adult tissue or umbilical cords.

I. What Do People Mean When They Say That They "Oppose the Creation of Embryos Specifically for Research"?

This is a phrase that apparently means different things to different people. Some people understand this phrase to signal opposition to any form of embryonic stem cell research. This opposition is usually premised upon the religious belief that "personhood" begins at the moment of the union of the sperm and the egg, and that any destruction of the embryo prior to a stage capable of implantation in the womb is tantamount to murder. It is not possible to reconcile this view with support for in vitro fertilization (IVF). If embryos can be created in the laboratory as part of the process of helping infertile couples to conceive – embryos that are typically discarded after a couple decides to have no more children – then it is not immoral to create embryos as part of the process of curing disease.

Other people appear to use the phrase to signal their acceptance of using embryos obtained from in vitro fertilization clinics but their opposition to the use of embryos obtained outside of the in vitro fertilization process. A possible alternative source of embryos from IVF clinics is simply to use donated eggs and sperm to create the embryos in the laboratory. To date, this type of embryonic stem cell research has been limited in the United States. The United States imposes strict ethical guidelines on the payment of donors for tissue or organs. Without financial compensation, egg donation may still occur but it is relatively uncommon. It should be noted that without the transparency and oversight that accompanies federal funding through the National Institutes of Health (NIH), there is little hard information concerning the source of the embryos currently being utilized in privately funded research. Foreign countries do not have the same strict policies against compensating donors as the United States.

It is also possible that some people use the above phrase to signal that they support the use of embryos left over from the in vitro fertilization process, but that they oppose therapeutic cloning, which uses eggs obtained from fertility clinics and creates an embryo through the introduction of donor DNA. Some people equate the word "cloning" with the creation of a child being brought fully to term, despite the fact that stem cell research has nothing to do with the implantation of embryos into wombs or with the birth of children.

Opponents of stem cell research should be challenged to make clear the basis of their opposition. It is not possible to have a reasoned debate on health care policy unless the issues surrounding stem cell research are clearly and fairly presented to the public. Each of these various meanings of the phrase above can be shown to have logical flaws.

J. Why Do Stem Cell Researchers Want to Create Stem Cells Using "Therapeutic Cloning?

In therapeutic cloning, also called Somatic Cell Nuclear Transfer ("SCNT"), an embryo is created by combining an unfertilized egg with the DNA of a patient. The egg is given a charge of electric current to induce cell division and an embryonic stem cell line is then created through the normal process. The result is to create a stem cell line that shares the patient's DNA.

The benefit of this process is twofold. First, any specialized cells created through this process would share the patient's DNA and could therefore be transplanted into the patient without fear of rejection by the immune system. Second, researchers can create stem cell lines with known genetic predispositions. This allows researchers to observe the formation of disease at the cellular level, increasing our knowledge of both possible preventive therapies and also possible drug treatments.

Therapeutic cloning is perhaps the most controversial form of stem cell research in the United States, because some people fear that the embryos created via this process will not be used for research but rather will be implanted in a women's uterus and brought to term (so-called "**reproductive cloning**"). The creation of cloned children will not advance any of the goals of stem cell researchers, and is considered highly unethical by scientists. Supporters of embryonic stem cell research favor a ban on reproductive cloning, but oppose attempts to use broad definitions of the word "cloning" as a means of banning therapeutic cloning.

To date, only private dollars have been used to fund this kind of research in the United States, although some foreign countries do support this research with public dollars.[3] Under current guidelines at the NIH, no federal dollars are available to fund research using stem cell lines derived through therapeutic cloning.

K. What are the potential uses of stem cell research?

Many diseases and injuries result from the destruction, damage, or depletion of essential groups of cells within our bodies. For example, diabetes can result from the destruction of insulin-producing cells in the pancreas. Heart disease can damage the muscle cells that pump blood through the body.

Stem cells are useful in treating these conditions in at least three ways. Medical researchers believe that stem cells might someday be used to replace diseased cell populations within patients, effectively reversing the symptoms of a disease and perhaps even curing it. In the shorter term, stem cells could be used to create colonies of cells bearing illness-promoting genes that can be observed in a Petri dish so that scientists might uncover the root cause of medical conditions. Finally, stem cells could be used to screen potential medicines quickly and safely in the laboratory, without exposing human volunteers to experimental drugs.

[3] For example, Great Britain, Australia, and Japan do not place any restrictions on the manner in which embryonic stem cell lines may be derived. Source: *Journal of Life Sciences* 30 (September 2007).

Stem cell research could lead to treatments and cures for many diseases and injuries, including cancer, heart disease, diabetes, Alzheimer's, Parkinson's, multiple sclerosis, ALS, spinal cord injuries, stroke, and more than 70 other diseases and conditions. These diseases and medical conditions inflict pain and suffering upon millions of Americans, their families, and their loved ones. It has been estimated that the number of chronically ill Americans who can benefit from stem cell research "surpasses 128 million."[4]

While stem cell research may be costly to fund, paying for the long-term care and treatment of chronic diseases is even more expensive. Medical costs for treating the symptoms of chronic conditions are skyrocketing, and an aging population means more persons affected by disease. For example, diabetics often develop kidney failure and require expensive and frequent dialysis treatments. Alzheimer's and stroke patients may be unable to care for themselves, necessitating costly nursing home admissions or home health aides.

Treating the symptoms, effects, and conditions of diseases raises the cost of health care. Stem cell research holds the promise of uncovering the causes, cures, therapies, and preventative strategies of diseases, which will reduce health care costs over the long term.

[4] Eve Herold, *STEM CELL WARS* 10 (2006).

II. Funding

A. Is embryonic stem cell research eligible for federal funding?

The National Institutes of Health funds research using adult stem cells, a limited universe of embryonic stem cells, stem cells obtained from umbilical cord blood, and stem cells derived from non-human tissue.

The Bush administration has only approved the use of federal dollars to fund research using embryonic stem cell lines created prior to an arbitrary date – August 9, 2001. Although at the time of this decision President Bush claimed that approximately 64 stem cell lines would be eligible for federal funding, it soon became apparent that far fewer stem cell lines were actually viable and available to researchers. Currently, 21 stem cell lines derived from human embryos are available to researchers who wish to obtain federal funding of their work. The National Stem Cell Bank is the national repository of these embryonic stem cell lines (and also three iPS stem cell lines). Established by WiCell, a private, not-for-profit supporting organization to the University of Wisconsin-Madison, the National Stem Cell Bank is funded through a federal grant.

Meanwhile, researchers have continued to produce hundreds, if not thousands, of new embryonic stem cell lines since August 9, 2001. In most cases, these post-2001 stem cell lines were derived with embryos that were created during the process of in vitro fertilization and that were subsequently donated to researchers in lieu of destruction. As laboratory techniques have improved since 2001, and as researchers learn more about cell biology, it is not surprising that the quality of these newer embryonic stem cell lines has improved over stem cell lines created seven or more years ago. Congress has twice passed legislation seeking to extend federal funding to these post-2001 embryonic stem cell lines. In both cases, President Bush vetoed the bill and supporters failed to override the veto.

The current restrictions on federal funding for embryonic stem cell research place significant limits on researchers. The embryonic stem cell lines eligible to receive federal funding are of a lesser quality, and are therefore less useful to researchers. Research institutions that wish to conduct research using both pre-2001 and post-2001 embryonic stem cell lines must either set up elaborate accounting systems or else construct completely separate facilities in order to assure that no federal dollars are indirectly used to support research outside of NIH guidelines. In addition, collaboration between institutions, which often leads to faster progress, becomes more difficult when different funding rules apply to different institutions.

Several states have moved to fill this gap by directly funding research using embryonic stem cell lines created *after* 2001. While some privately funded research is underway in Wisconsin using these types of stem cell lines, no Wisconsin tax dollars are currently used to directly support this research.

B. Do the National Institutes of Health provide adequate funding for stem cell research?

Medical research is extremely costly. While private fundraising will always be essential, public dollars have made up an increasing proportion of the funds devoted to supporting medical research. The budget of the NIH, which funds basic medical research, grew at a 15% annual rate in the latter half of the 1990s but it has seen a decline in recent years. Tight budgets at both the federal and state level have worked to create more competition among interest groups for government dollars. The total level of public funding currently devoted to medical research does not reflect the priority that should be placed on curing disease and reducing human suffering.

Within the NIH budget, the current levels of federal funding for stem cell research in general is extremely low in comparison to the amount devoted to funding for other types of medical research. For fiscal year 2008, the NIH estimates a total of $656 million will be awarded to fund all forms of stem cell research.[5] This compares to over $1 billion to study the human genome. In addition, within the entire 2008 NIH budget for stem cell research, only $42 million is available to fund human embryonic stem cell research (less than 6.5% of the total).

Stem cell researchers in Wisconsin do receive a fair proportion of the NIH grants available for stem cell research. This is undoubtedly because Wisconsin researchers created many of the pre-2001 stem cell lines that are eligible for federal funding. One doctor engaged in stem cell research in Wisconsin describes efforts in our state as "overly reliant" on federal funding, which he described as too small to support the research agenda that many feel is necessary in order to advance the science.

C. Does the State of Wisconsin currently provide funding for stem cell research?

Stem cell researchers in Wisconsin currently get financial support from NIH grants, from charitable foundations, from money donated by patient advocacy groups, and from the general University of Wisconsin budget (in which they compete with other faculty and researchers for resources). Even embryonic stem cell research eligible for NIH funding under the guidelines adopted by the Bush administration does not receive any direct financial support from the state budget.

The Wisconsin Alumni Research Foundation (WARF) is the primary funder of stem cell research in Wisconsin. WARF is a private, non-profit organization. A WARF subsidiary, the WiCell Research Institute, has also contributed funding. Other private sources of research funding include the UW Foundation and patient advocacy organizations dedicated to curing specific diseases.

In contrast, the Wisconsin state government has not budgeted any public dollars to support stem cell research. The state currently funds a venture capital tax credit that is

[5] http://www.nih.gov/news/fundingresearchareas.htm.

available to *private companies* engaged in stem cell research efforts as an incentive for conducting such research in Wisconsin. The state has provided a total of $10.4 million in competitive grants and loans to stem-cell companies, which private sources matched by contributing an additional $50 million.

The primary focus of financial support for stem cell research using Wisconsin tax dollars has been the Wisconsin Institute for Discovery (WID), a new research facility being built on the University of Wisconsin-Madison campus. The WID, announced by Governor Jim Doyle in 2004, is a complex designed to house biotechnology researchers across several fields in one location, including stem cell researchers. The multi-year, $750 million building budget is comprised of a combination of state and private funds. So far, the State of Wisconsin has contributed $50 million, WARF has contributed $50 million, private donors contributed $50 million, and some of the proceeds from the sale of Wisconsin BlueCross-Blue Shield to the public have been allocated to construction. It is true that an improved physical environment will eventually benefit researchers.

However, while "bricks and mortar" are critically helpful, it is what happens *inside* the Wisconsin Institute for Discovery building that truly matters. None of the seed grants to researchers that have been announced so far in connection with the WID has been directed towards stem cell research.

Wisconsin currently does *not* award any grants directly funding research by any of the researchers engaged in stem cell research at the University of Wisconsin or at the Medical College of Wisconsin. Other than the general University of Wisconsin budget, the state awards no money to directly pay the costs of research assistant salaries or specialized mechanical equipment. As one Wisconsin researcher put it: "there is simply no state money available." Researchers could particularly use "seed money" grants that allow them to perform smaller demonstration projects that can subsequently be used as the basis for larger grant proposals to NIH, the Juvenile Diabetes Research Foundation, or other private funders.

It should be noted that Wisconsin does not have any legislative or administrative prohibition that would prevent ongoing embryonic stem cell research, despite efforts by legislators to "ban cloning," and the like. Governor Doyle has vetoed legislation that has reached his desk, and the current Legislature does not seem inclined to move forward any such bill.

D. Are other states funding stem cell research?

Ten states currently have structures in place for the direct funding of stem cell research.[6] In 2004, California voters approved a bond measure that promises to eventually provide $3 billion for stem cell research in their state through a grant application process. Litigation delayed the onset of funding, but a $151 million grant program was finally announced this past summer, and more than $30 million was recently awarded.

In addition,

[6] Information on state legislation can be obtained at www.ncsl.org/programs/health/Genetics/embfet.htm.

- New York has pledged to make $600 million in grants available over the next ten years.
- The Massachusetts legislature created a Life Sciences Investment Fund and allocated money to be used for grants to researchers.
- Maryland recently approved the funding of stem cell research taking place at the University of Maryland.
- Connecticut and New Jersey have also passed laws allocating money from their state budgets to directly support stem cell research.
- The Illinois Governor used an executive order to provide grants totaling $5 million out of its 2007 state budget to stem cell researchers.
- Arizona, North Carolina, and Virginia have formed groups to study the issue.

As long as a comprehensive federal policy to support all forms of stem cell research is lacking, the devolution of funding for medical research from the federal to the state level will continue. However, there are significant downsides to this process. States will compete against one another to attract top researchers and to attract private business development.

More worrisome, the legal and funding rules applicable to research are becoming increasingly Balkanized. This patchwork of inconsistent regulation is precluding collaboration across state lines, and creating massive barriers of red tape as states attempt to re-create regulation that was formerly the exclusive domain of the federal government.

In addition, research results may not be fully shared, slowing progress and wasting resources. In this chaotic regulatory environment, there is a danger that states may seek to limit out-of-state access to therapies developed using state dollars, or alternatively might attempt to prevent their residents from traveling elsewhere to seek therapies that are prohibited at home. Progress towards achieving the promise of stem cell research will be far slower than it should be, and the opportunity to save millions of lives or help millions of people will be missed.

E. Why isn't private funding of stem cell research the answer?

Fundamental principles of economics tell us that not every good or service will be optimized by reliance on the "free market." We know that the optimal amount of basic medical research will not take place without government subsidy – most major medical advances over the last century have taken place as a result of government-funded efforts. Indeed, the private sector spends more than $59 billion on biomedical research each year, but only 10-15% of that total is devoted to basic research that doesn't immediately translate into marketable products. In contrast, the publicly-funded NIH devotes 55-60% of its budget to basic research.[7]

The high risk involved in medical research means that many private companies will either forgo many promising avenues of research or else face financial failure. Basic

[7] Interview with Dr. Elias Zerhouni, Director of the National Institutes of Health, *Journal of Life Sciences* 18 (September 2007).

medical research is extremely expensive in the near term, has a low probability of resulting in a marketable drug or therapy, and even then will not generate a profit against the up-front investment until many years in the future. In addition, many diseases and chronic health conditions do not afflict sufficient numbers of people to create a viable "market" for any cure.

It is right and appropriate for government to use the tax dollars of *all* citizens to help subsidize basic research into cures, and to compensate for less-than-optimal free market incentives to conduct medical research. The primary function of government is to provide every citizen with the essentials of health and safety, especially where private sector alternatives are too expensive for most people.

Government-funded research is better coordinated and subject to better oversight than privately-funded research. Publicly-funded research grants can be awarded so as to avoid duplication of efforts, to encourage collaboration, to promote the publication of results, and to condition the receipt of public funds on the observance of ethical guidelines. In contrast, private research is conducted out of the public eye, where research methods may not be publicly shared, intellectual property rights are zealously guarded, government oversight and accountability is limited, and pursuit of a comprehensive research strategy is impossible. This is why government leadership has historically been critical to rapid advances in medical knowledge (i.e., the swift development of AIDS drugs).

F. Why is it important for Wisconsin to fund stem cell research?

The State of Wisconsin should provide additional financial support to researchers conducting all forms of stem cell research because:

1) the state is currently a leader in the field;
2) the lack of adequate federal funding means that state funding is necessary to accelerate the pace of progress;
3) the failure to adequately support researchers will increase the likelihood that other states will attract researchers away from Wisconsin; and
4) the emerging field of regenerative medicine will provide an economic boost to a Wisconsin economy that still remains heavily reliant on manufacturing and agriculture.

Wisconsin is the leading pioneer in stem cell research. A University of Wisconsin scientist, Dr. James Thomson, was the first researcher to isolate and culture human embryonic stem cells and also made the initial breakthrough in the creation of iPS cell lines. As a result, the Wisconsin Alumni Research Foundation holds several key patents related to stem cell research. These patents have been licensed to biotech companies, and access to stem cell lines and trained researchers has attracted start-up companies to locate in Wisconsin. It is estimated that Wisconsin's biotechnology industry employs some 30,000 people and contributes over $7 billion to the state's economy.

However, since implementing its ambitious stem cell research initiative, the State of California has lured 24 leading scientists to relocate, along with 33 younger researchers. California has announced that its new regenerative medicine laboratories will eventually

employ 2,200 researchers. In a decade, there will be only a handful of world class centers for economic activity associated with stem cell research. Thanks to a group of talented and dedicated researchers, Wisconsin has a head start in this process. Now, Wisconsin needs to do all that it can so that in ten years our state continues to be the economic center for this important research.

III. Ethics

A. Is embryonic stem cell research ethical?

Opponents of embryonic stem cell research are consistent in their refrain that such research is "unethical." Their use of this word is misplaced and a deliberate attempt to turn public perception against this life-saving research.

By definition, "ethical" medical research complies with a system of right or good conduct, especially as defined by professionals. By any measure, embryonic stem cell research is conducted in accordance with rigorous "ethical" standards. Embryonic stem cell research projects typically undergo several layers of ethical review before they can obtain public funding. Academic and research institutions that perform medical research have ethics review boards that must approve proposed research projects, with special attention given to the review of projects that use human tissue.

In addition, federal and state funding sources such as the National Institutes of Health perform an ethical review before approving any funding of research projects. The medical profession has strict guidelines that cover appropriate handling of human tissue, the way that human tissue is obtained, and a prohibition on paying the donors of human tissue, among other subjects.

Health care professionals throughout the medical research field are devoted to following the highest ethical guidelines of the profession. The use of the word "unethical" to describe embryonic stem cell research casts unwarranted aspersions upon the motivations of the doctors and scientists doing this work. This is unfortunate, because these researchers are motivated by noble purposes.

Many of the doctors engaged in embryonic stem cell research, such as Dr. Douglas Melton, have family members and loved ones with diseases like diabetes and Alzheimer's. These doctors are dedicated because they have been personally touched by disease, and they know first-hand the toll that it takes on families.

While opponents of embryonic stem cell research are fond of promoting horror stories about the immoral purposes that some evil scientist might pursue using the knowledge gained from stem cell research, such arguments do not make it "unethical" to use stem cell research to cure disease. Knowledge is not "ethical" or "unethical" in and of itself. It is by our actions that humans are judged. Medical advances throughout history, from transplant surgery to recombinant DNA, all have been theoretically susceptible to abuse, but they have benefitted the lives of countless people without these fears coming to pass.

What opponents mean when they call embryonic stem cell "unethical" is that their religion views such research as "immoral."

B. Is embryonic stem cell research moral?

The use of the word "unethical" obscures the fact that this debate is about morals. While medical professionals police the ethics of their members, our society does not dictate our morals. What is moral for one religious faith might be immoral for another. Some people believe that it is immoral for a woman to be seen in public with her head uncovered. Others believe that is it immoral for a couple to engage in sexual relations outside of marriage. Even within religious faiths, people might disagree about the morality of eating meat, or eating certain kinds of animals. Religious plurality is one of the strengths of our nation – so long as one faith does not seek to impose its beliefs on the rest of us.

When opponents of embryonic stem cell research call it "unethical," what they really mean is that they consider any research that involves a human embryo to be "immoral." Their moral theology considers a human embryo prior to implantation in the womb – whether located in a woman's fallopian tubes or located in a lab's Petri dish – to be a "person" entitled to the same moral status as you or I. For this reason, opponents also consider it immoral to undergo in vitro fertilization, because the procedure typically involves the creation of more embryos than are used to create a pregnancy. Opponents also consider certain forms of contraception immoral, such as the birth control pill, because they believe that these types of contraception prevent an embryo from implanting in the womb.

Most people in our society do not share these moral views. Many Protestants, Jews, Muslims, and Hindus do not believe that an embryo outside of the womb is a "person," and they would be quite surprised that learn that their religious beliefs make them "immoral."

People of all faiths believe that in vitro fertilization is perfectly moral and that it has enriched the lives of millions of childless couples. Few people equate a method of contraception that allows the fertilized egg to pass through the womb – an event that happens in nature more than 50% of the time that fertilization occurs[8] – with an abortion that terminates a pregnancy post-implantation. For this reason, many religious denominations support embryonic stem cell research. The Episcopal Church USA, Presbyterian Church USA, United Church of Christ, United Methodist Church, and Unitarian Universalists have all issued national policy statements supporting embryonic stem cell research, as have national Jewish and Islamic organizations.[9]

In the meantime, many Catholics and evangelicals break ranks with opponents of embryonic stem cell research because they believe that it is a mistake to seek to impose their faith's moral values on the rest of the population, or simply refuse to believe that their faith requires them to forgo pregnancy or potential cures. They recall that there was a time in American history when Catholics were prohibited from serving in public office, and when many Protestants feared that a Catholic President would put faith ahead of country. For these reasons they reject efforts to interject religious litmus tests into public policy.

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[8] Eve Herold, *STEM CELL WARS* 123-124 (2006).
[9] See Appendix A.

It is deeply understood in the country that embryonic stem cell research is not abortion. The embryos used to derive publicly-funded stem cell lines would be destroyed by fertility clinics if they were not used for medical research. These embryos are not fetuses, they are not babies, they do not have nerve cells or organs, and they will never be implanted into a human womb and brought to term. The stem cell research being conducted in Wisconsin is not human cloning and will never result in the creation of cloned fetuses. The search for cures is in itself a moral and noble purpose. The fact that the minority holds sincere religious beliefs contrary to these does not mean that they are entitled to a veto over the moral views of the majority.

Opponents of embryonic stem cell research are well aware that the majority of the public does not share their moral views. Therefore, they persistently repeat the refrain that this research is "immoral and unethical." Opponents hope that if they repeat these words often enough they can make the public uncomfortable with the idea of embryonic stem cell research – all the while obscuring the fact that most people consider this research to be perfectly moral.

C. Is an embryo a "person?"

Opponents of embryonic stem cell research hold the theological view that personhood begins the moment that a sperm unites with an egg in the fallopian tubes. This is one theological view, but it is not the only one. Different religious traditions hold that personhood arrives at a later time in fetal development, typically after the embryo implants in the womb, and for some faiths, much later in the process. The diversity of religious views on the subject of personhood is often obscured during discussions of stem cell research.

The Reverend Peter Nord was quoted as saying, "What troubles me is that the current Catholic understanding regarding the beginning of life seems to somehow have become the gold standard by which everything is judged. That is one perspective, but there are others."[10]

The theological view held by supporters of stem cell research supporters is consistent with the medical definition of "conception." Scientists define conception to occur no earlier than the moment when the human blastocyst, the early ball of approximately 100 cells, implants in the mother's uterus (womb). Therefore, under this alternative view of personhood, the time between actual fertilization in the fallopian tubes and implantation in the womb – a period of about 7-10 days – occurs before the blastocyst has developed into a person. Instead, personhood is viewed as emerging gradually and coming into being at a later stage of development.

It is important to remember that embryonic stem cell lines are formed using embryos in a Petri dish that are at the same stage of development as a newly fertilized egg in a woman's fallopian tubes. An embryo at this stage of development has not yet traveled to the womb and has not yet implanted in the womb. Indeed, biologists estimate more than

[10] Eve Herold, *STEM CELL WARS* 132 (2006).

50% of fertilized eggs fail to implant in the woman's body, and that for the remaining eggs, which do implant in a womb and result in pregnancy, the spontaneous miscarriage rate is about 10%. Therefore, fertilization might lead to a viable fetus approximately 45% of the time. Equating fertilization with the beginning of personhood does not correspond with human biology.

In addition, some forms of birth control operate by preventing implantation of the embryo in the womb. Many religious faiths consider artificial birth control to be perfectly moral. Americans of all faiths have rejected the argument that the birth control pill, the IUD, the patch or other forms of contraception are immoral.

They also reject the attempt to define the word "abortion" so broadly that it refers to any procedure after fertilization if it prevents implantation. This is not the accepted medical meaning of the word "abortion," nor is it the commonplace understanding of the word's meaning. Such a re-definition of the word would include within its meaning not only many forms of birth control, but also in vitro fertilization.

D. Why is it wrong to use religious criteria to decide whether to publicly fund medical research?

The stem cell debate is part and parcel of a larger debate over undue religious influence in determining health care policy. This influence affects all of us, and it is keeping our nation from applying the resources and coordination necessary to make medical advances. The lack of a national policy supporting all forms of stem cell research has resulted in a duplicative and inconsistent patchwork of state and private funding, which wastes time and resources.

John Danforth, an ordained Episcopal priest and the former Republican Senator from Missouri, argues in support of embryonic stem cell research in his book *Faith and Politics*. He notes:

> What distinguishes the opposition to embryonic stem cell research and SCNT [somatic cell nuclear transfer] is that it is based solely on a religious belief that life begins before implantation in the uterus. This religious concept is in opposition to the convictions of other people of faith who do not share this definition of the beginning of life, and who believe that it is their own religious obligation to discover the cures for disease, to heal the sick, to relieve suffering and to save lives.[11]

Similarly, as summarized by Dr. George Dailey, "the policy to restrict federal funding for embryonic stem cell research is a political decision imposed by politicians who wish to advocate the rights of embryos."[12]

One religious faith believes that the origin of sin comes from man playing God, and that scientific inquiry should not challenge religious doctrine. A different faith believes that

[11] John Danforth, *FAITH AND POLITICS* 97 (2006).
[12] Dr. George Daily, Forward, *STEM CELL WARS* xvii (2006).

scientific knowledge allows man to "see the face of God," and that scientific progress is part of God's plan.

One religious faith points to interpretations of scripture and the infallibility of church leaders to support the belief that personhood begins at fertilization. A different faith has a contrary scriptural interpretation and does not follow the same leaders.

Which faith is the correct faith? We cannot know. It is precisely because we cannot know that the government must not endorse one faith over another. It is wrong for elected officials to use religious or political considerations to dictate the preferred areas of inquiry in medical research. It is wrong for a minority of the population to be granted veto power over how public dollars are used in health related spending that affects us all. Why should one religious belief that a human being is fully formed at the moment that a sperm unites with an egg be given preference over a different Methodist belief, or the Jewish faith, or a Presbyterian belief?

E. Why should taxpayers be forced to financially support medical research that they find morally objectionable?

Federal tax dollars support many activities that do not receive unanimous moral support from the public. The federal government spends tax dollars enforcing the death penalty for certain crimes, despite the fact that many people are morally opposed to the death penalty. The federal government spends tax dollars on research using animal subjects, despite the fact that many people are morally opposed to all forms of animal research. The federal government spends tax dollars on foreign wars and military interventions, despite the fact that many people believe that the only morally just war is a war of self-defense. If the federal government had to wait for a moral consensus to develop before it could act, it would never act at all. There is no legal or historical support for the proposition that our democratic government should not act without the unanimous consent of the people when religious or moral objections are raised.

IV. Advocacy

A. How was Wisconsin Stem Cell Now, Inc. formed?

Wisconsin Stem Cell Now, Inc. was incorporated in December 2004. We are a nonprofit corporation organized under the laws of Wisconsin. We are governed under the direction of an all-volunteer Board of Directors.

Our mission is twofold: 1) to educate the public concerning the promising scientific advances in the field of stem cell research; and 2) to advocate on behalf of the public funding of all forms of stem cell research in Wisconsin and elsewhere.

In addition, we have a sister organization, the Wisconsin Stem Cell Now Foundation, with a separate Board of Directors, that focuses entirely on public education around stem cell research.

B. Why is public education necessary?

There are many public misconceptions about stem cell research and a great deal of confusion (some of it deliberately generated) concerning the science and ethics of the research. Many people do not understand the difference between adult stem cell lines, embryonic stem cell lines, and iPS lines. For these persons, fear of the unknown may be sufficient to cause them to oppose this important research. Other people continue to mistakenly believe that aborted fetuses are used in stem cell research, if not confusing stem cell research with abortion in general. Finally, some people do not understand that accepting the "personhood" of a blastocyst has implications for the continued legality of in vitro fertilization and certain types of birth control.

We believe that in a democracy the public should have accurate information when making vital decisions about the future of health care in our country. Scientists and researchers are not public educators, and to force them into this role distracts them from their work and slows the pace of progress. Therefore, Wisconsin Stem Cell Now seeks to educate the public through public speeches, media interviews, opinion pieces, and the operation of our website.

C. Are there other organizations like Wisconsin Stem Cell Now that advocate in support of stem cell research?

National groups that advocate in favor of increased support for all forms of stem cell research include:

- Americans For Cures Foundation
- Coalition For the Advancement of Medical Research
- The Genetics Policy Institute

- The International Society For Stem Cell Research
- The Stem Cell Action Network
- The Student Society For Stem Cell Research
- StemPAC

Other state organizations, similar to Wisconsin Stem Cell Now, include:

- Cures For Tomorrow (A Wisconsin-based group of which WSCN is a member)
- Californians For Cures
- Nebraska Coalition For Life Saving Cures
- Nebraskans For Research
- The New York Stem Cell Foundation
- Texans For the Advancement of Medical Research
- Missouri Coalition For Life Saving Cures

D. What role do patient advocacy groups play in the stem cell debate?

Large, well-funded groups can be remarkably successful in obtaining public monies for medical research into specific diseases. For example, advocates for autism research have had success in obtaining millions of dollars in federal funding to support researchers.

However, the amount of funding for cures should not depend on the size of a group or the success of a group's lobbyist. Patient advocacy groups should not compete against one another for scarce public funds. Rather, they should work together to advance an agenda that benefits *all* such groups.

Because stem cell research promises to increase our knowledge about all of the cells in the human body, it will yield advances in the treatment of numerous diseases and injuries. There may be many issues where different patient advocacy groups can join together in support of common objectives, and stem cell research is just one example.

E. Does the majority of the public support embryonic stem cell research?

There is widespread public support for embryonic stem cell research. Polls demonstrate that a broad segment of the public consistently supports all forms of stem cell research, including embryonic stem cell research, without regard to age, education, income, race, religion, or political affiliation of the persons polled.

Consider the following polling results:[13]

1. **Time Poll** conducted by Abt SRBI. June 18-25, 2008. N=805 likely voters nationwide. MoE ± 3.

   "There is a type of medical research that involves using special cells, called embryonic

[13] These and other similar polling results can be viewed at www.pollingreport.com/science.htm#Stem.

stem cells, that might be used in the future to treat or cure many diseases, such as Alzheimer's, Parkinson's, diabetes, and spinal cord injury. It involves using human embryos discarded from fertility clinics that no longer need them. Some people say that using human embryos for research is wrong. Do you favor or oppose using discarded embryos to conduct stem cell research to try to find cures for the diseases I mentioned?"

	Favor	Oppose	Unsure
	%	%	%
6/18-25/08	73	19	8

2. **Pew Research Center for the People & the Press and Pew Forum on Religion & Public Life survey** conducted by Schulman, Ronca & Bucuvalas. Aug. 1-18, 2007. N=3,002 adults nationwide. MoE ± 2.

"All in all, which is more important: conducting stem cell research that might result in new medical cures, or not destroying the potential life of human embryos involved in this research?"

	Stem Cell Research	Not Destroying Potential Life	Unsure
	%	%	%
8/1-18/07	51	35	14

3. **CNN/Opinion Research Corporation Poll**. May 4-6, 2007, and earlier dates. N=1,028 adults nationwide. MoE ± 3.

"Do you think the federal government should or should not fund research that would use newly created stem cells obtained from human embryos?"

	Should	Should Not	Unsure
	%	%	%
5/4-6/07	53	41	6
10/27-29/06	54	39	7
8/2-3/06	51	41	8

Wisconsin residents have expressed similarly high levels of support for embryonic stem cell research. A May 2005 poll conducted by Cures for Tomorrow, a pro-stem cell organization in Wisconsin, showed that out of 500 polled Wisconsinites:[14]

- 69% of those polled support embryonic stem-cell research
- 59% of those polled support state funding of embryonic stem cell research
- 41% of supporters indicated that they *strongly support* continued research

The medical and scientific establishment strongly supports embryonic stem cell research as well. Supporting organizations are too numerous to list, but include:

[14] Poll results available at www.staterelations.wisc.edu/images/stemCellSurvey.pdf.

1. American Medical Association
2. American Association for the Advancement of Science
3. American Diabetes Association
4. Association of American Medical Colleges
5. Juvenile Diabetes Research Foundation
6. National Health Council
7. The National Coalition for Cancer Research
8. Christopher Reeve Paralysis Foundation

F. Where do the candidates for President stand on the issue of embryonic stem cell research?

Senator Barack Obama has issued a statement strongly supporting embryonic stem cell research using excess embryos obtained from fertility clinics, urging that such research continue along other developing types of stem cell research, and that the restrictions on federal funding of such research be lifted.

Senator John McCain has supported embryonic stem cell research as well, although he has recently expressed views that raise questions about whether that position has changed. Prior to the 2008 campaign, he voted in favor of bills that would have expanded federal funding to stem cell research using embryos obtained from fertility clinics, and he issued statements of support for embryonic stem cell research that utilized embryos that would otherwise be discarded.

However, during the 2008 presidential campaign he has stated his belief that "life begins at the moment of conception." Senator McCain has not elaborated whether he has altered his prior support for embryonic stem cell research.

You can see both Obama's and McCain's statements from "Science Debate" in Appendix B.

In addition, both the Democratic and Republican national parties have platform language addressing stem cell research. The Democratic Party of Wisconsin addresses stem cell research directly, while the state Republican Party only addresses their view on when life begins and ends. Those links are provided in Appendix C.

G. What are the policy goals of Wisconsin Stem Cell Now?

1. We OPPOSE efforts to ban embryonic stem cell research that uses embryos obtained from in vitro fertilization clinics that would otherwise be destroyed.

2. We SUPPORT increased Wisconsin state funding of all forms of stem cell research.

3. We OPPOSE efforts to ban funding of stem cell research under the guise of banning human cloning.

4. We SUPPORT efforts to increase federal funding of all forms of stem cell research.

5. We SUPPORT efforts to eliminate federal restrictions on stem cell research that utilize an arbitrary date to determine which stem cell lines are available for federal funding.

6. We OPPOSE efforts to prematurely end funding of embryonic stem cell research, in light of progress that has been made to develop induced pluripotent stem cells.

APPENDIX A

Citations to the referenced policy statements by religious denominations:

1. General Convention Resolution in Support of Embryonic Stem Cell Research Resolution 2003-A014, 74th General Convention of The Episcopal Church, www.episcopalchurch.org/3654_75220_ENG_HTM.htm.

2. Statement on the Ethical and Moral Implications of Stem Cell and Fetal Tissue Research, 213th General Assembly of the Presbyterian Church USA, www.scienceblog.com/community/older/2001/D/200114185.html.

3. Support for Federally Funded Research of Embryonic Stem Cells, United Church of Christ, http://www.ucc.org/synod/resolutions/SUPPORT-FOR-FEDERALLY-FUNDED-RESEARCH-ON-EMBRYONIC-STEM-CELLS.pdf.

4. The Social Community, United Methodist Church General Board of Church and Society, http://archives.umc.org/interior.asp?ptid=4&mid=6560.

5. Islamic Institute Supports Embryonic Stem-Cell Research and Releases Poll Showing Muslim American Support, Islamic Free Market Institute Foundation, www.islamicinstitute.org/pressr/news-stem-cell.htm.

6. Embryonic Stem Cell Research: Religious Views, Religious Coalition for Reproductive Choice, www.rcrc.org/news/views/stemcells.cfm.

7. Statement Regarding Stem Cell Research, Rabbi Michael J. Broyde, Beth Din of America, www.jlaw.com/PressReleases/01-08-21.html.

8. Resolution on Educational and Political Support of Stem Cell Research, Reconstructionist Rabbinical Association, www.therra.org/members/conv2005/Res-StemCell-2005.pdf.

9. Letter to President Bush, Union of Orthodox Jewish Congregations of America Institute for Public Affairs, www.ou.org/public/statements/2001/nate34.htm.

10. Resolution on Stem Cell Research, Union for Reform Judaism, www.urj.org/Articles/index.cfm?id=7152&pge_prg_id=30698&pge_id=1625.

11. Statement by the Rev. William G. Sinkford, Unitarian Universalist Association of Congregations, www.uua.org/news/011114.html.

APPENDIX B

Senator Barack Obama's statement on stem cell research:

Stem cell research holds the promise of improving our lives in at least three ways—by substituting normal cells for damaged cells to treat diabetes, Parkinson's disease, spinal cord injury, heart failure and other disorders; by providing scientists with safe and convenient models of disease for drug development; and by helping to understand fundamental aspects of normal development and cell dysfunction.

For these reasons, I strongly support expanding research on stem cells. I believe that the restrictions that President Bush has placed on funding of human embryonic stem cell research have handcuffed our scientists and hindered our ability to compete with other nations. As president, I will lift the current administration's ban on federal funding of research on embryonic stem cell lines created after August 9, 2001 through executive order, and I will ensure that all research on stem cells is conducted ethically and with rigorous oversight.

I recognize that some people object to government support of research that requires cells to be harvested from human embryos. However, hundreds of thousands of embryos stored in the U.S. in in-vitro fertilization clinics will not be used for reproductive purposes, and will eventually be destroyed. I believe that it is ethical to use these extra embryos for research that could save lives when they are freely donated for that express purpose.

I am also aware that there have been suggestions that human stem cells of various types, derived from sources other than embryos, make the use of embryonic stem cells unnecessary. I don't agree. While adult stem cells, such as those harvested from blood or bone marrow, are already used for treatment of some diseases, they do not have the versatility of embryonic stem cells and cannot replace them. Recent discoveries indicate that adult skin cells can be reprogrammed to behave like stem cells; these are exciting findings that might in the future lead to an alternate source of highly versatile stem cells. However, embryonic stem cells remain the "gold standard," and studies of all types of stem cells should continue in parallel for the foreseeable future.

Rather than restrict the funding of such research, I favor responsible oversight of it, in accord with recent reports from the National Research Council. Recommendations from the NRC reports are already being followed by institutions that conduct human embryonic stem cell research with funds from a variety of sources. An expanded, federally-supported stem cell research program will encourage talented U.S. scientists to engage in this important new field, will allow more effective oversight, and will signal to other countries our commitment to compete in this exciting area of medical research.

Senator McCain's statement on stem cell research:

While I support federal funding for embryonic stem cell research, I believe clear lines should be drawn that reflect a refusal to sacrifice moral values and ethical principles for

the sake of scientific progress. Moreover, I believe that recent scientific breakthroughs raise the hope that one day this debate will be rendered academic. I also support funding for other research programs, including amniotic fluid and adult stem cell research which hold much scientific promise and do not involve the use of embryos. I oppose the intentional creation of human embryos for research purposes and I voted to ban the practice of "fetal farming," making it a federal crime for researchers to use cells or fetal tissue from an embryo created for research purposes.

SOURCE: http://www.sciencedebate2008.com/www/index.php?id=42

APPENDIX C

Democratic National Committee Platform
http://tinyurl.com/DNCPlatform2008

Democratic Party of Wisconsin Platform
http://tinyurl.com/DPW2008Platform

Republican National Committee Platform
http://www.gop.com/2008Platform/

Republican Party of Wisconsin Platform
http://tinyurl.com/2008RPWPlatform