

EMBRYONIC STEM CELLS: THE GOOD, THE BAD, THE NEBULOUS

The debate over the use of stem cells—particularly those derived from embryos—in research and medicine has seeped into our everyday lives, affecting such fields as politics, science, and ethics, and alternately causing hope and despair for millions of people desperately awaiting cures for devastating diseases. Two types of stem cells exist, those called “adult stem cells,” or “somatic stem cells,” which “exist in many tissues and organs” within our bodies (“What are adult...” 13), and those called



Embryonic stem cells, shown here, have immense potential, but also face intense opposition.

“embryonic stem cells,” which exist at the earliest stages of embryonic formation, in five-day-old embryos (Weiss 10). In his Scientific American article entitled, “Mother of All Cells,” Clive Cookson asserts, “[adult] stem cell therapies have been used for decades,” most notably in bone marrow transplants (A6). However, the recent sensationalizing of the stem cell matter is due to the fact that now, rather than utilize solely somatic stem cells, scientists have unearthed the potential of human embryonic stem cells. Once the first embryonic stem cell line was created in 1998 by James Thomson, the scientific, religious, and political communities have been in somewhat of an uproar, imagining the myriad medical and ethical implications of such a science.

Currently, the embryonic stem cell research debate focuses on two main points: a) whether embryonic stem cell research should be performed at all; and b) whether the United States government should fund such research. As with all controversial issues, there are many facets to consider, including alternatives to ESC research, legal issues, conservative religious opposition, and the incredible suffering of millions afflicted with degenerative diseases such as Alzheimer’s and Parkinson’s.

Clashing Perspectives

Proponents of embryonic stem cell (ESC) research believe that embryonic stem cells have virtually limitless potential to alleviate suffering and improve lives in the future—though most agree that additional research is needed before scientists find cures. In addition, they believe that federal funding should be designated for ESC research in America—the decision to prohibit government support for embryonic stem cell research was made by President George W. Bush, in August 2001. Opponents of ESC research argue that the source of embryonic stem cells—human embryos—presents an “ethical dilemma” (Kleffman); in addition, they point to the proven benefits of “adult stem cells” and other alternatives as an argument against the scientifically unproven potential of embryonic stem cells (Prentice 71). With an issue as complex as embryonic stem cell research, no one compromise can satisfy all involved parties. However, an agreement may be reached if: a) strict guidelines are introduced and enforced for ESC research and embryo obtainment; b) scientists receive federal funding for only ESC research not involving destruction of embryos; or c) the current legislation to loosen federal funding restrictions is debated, with a scientific education program conducted to elucidate the stem cell research controversy for lawmakers.

Support for Embryonic Stem Cell Research

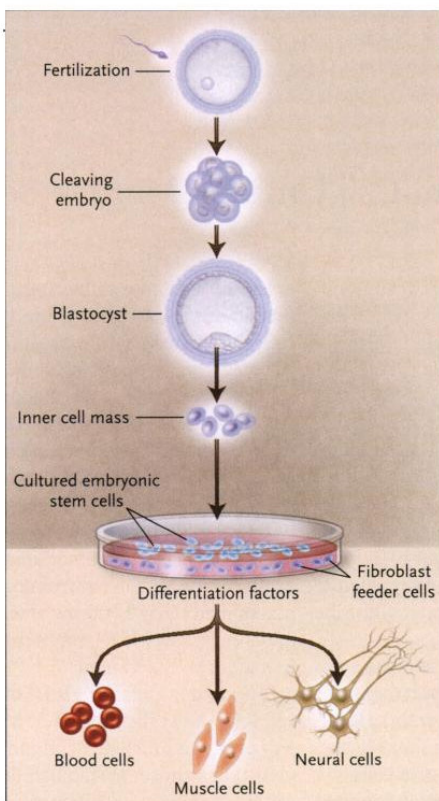
Supporters of embryonic stem cell research come from all walks of life, from the Alzheimer’s patient hoping for a cure, to the politician lobbying for federal funding, to the scientist researching in a laboratory. Although the use of embryonic stem cells faces “ethical challenges from society” (Alvarez), proponents argue that only embryonic stem cells can, through a “complex combination of growth factors and chemical and genetic signals” (“What are embryonic...” 12), “produce the full range of cell types” in the body (Weiss 7). Although thus far, embryonic stem cells have not produced any treatments for human diseases they have the *potential* to “create healthy tissues and organs to cure deadly diseases” (Holland 10). The “creator of Dolly the cloned sheep” (Wilmut A35), Ian Wilmut, in his July 2005 article, “The Search for Cells that Heal,” states:



2 Ian Wilmut, creator of Dolly the cloned sheep, supports embryonic stem cell research.

Extraordinary opportunities to study and to treat human diseases are provided by the recently acquired ability to derive stem cells from human embryos. Because these cells form all of the tissues that make up an adult, they afford a chance to study normal human development in the laboratory, to define the abnormalities associated with inherited disease and, in time, perhaps to treat diseases, many of which have no effective treatment at present. (A35)

As part of his argument, Wilmut refers to the pluripotency, or the potential to develop into “any cell type in the body” (Cookson A9). If embryonic stem cell research is advanced, scientists may be able to use this pluripotency to create any number of “therapeutic cells to treat...[diseases such as] diabetes or spinal cord injuries” (Vogel 1534). In fact, a company called Geron has already announced plans to use embryonic stem cells in human trials, to treat spinal cord injuries. The “trials...based on work led by Hans Keirstead” (Vogel 1534) would use embryonic stem cells that have been differentiated into



3 Embryonic stem cells, derived from the inner cell mass of blastocysts, are cultured on a bed of “feeder cells” to produce myriad cell types.

“oligodendrocyte precursors” (Vogel 1534), which would “encourage the natural healing process” (Vogel 1534) of the spinal cord. When confronted with the possibility of the formation of teratoma—benign tumors of various cells, sometimes including teeth and hair, formed by the injection of undifferentiated stem cells—Geron scientists replied that they had “solved those problems” (Vogel 1535).

Though controversial, embryonic stem cells can be obtained from frozen excess embryos, destined to be discarded by fertility clinics. Embryonic stem cells develop from the inner cell mass of these early-stage embryos, also called blastocysts; from the inner cell mass, stem cells can be cultured into various cell types. Many different views exist about the beginning of human life, and thus, the idea of utilizing blastocysts remains

highly contentious; while some scientists claim that early-stage embryos cannot be defined as life, others fervently believe that life begins at conception.

To Fund or Not To Fund?

While most current embryonic stem cell research must be funded privately, through companies such as Geron and Advanced Cell Technology, the question of federal funding for the research is currently moot in U.S. Congress—in the form of a bill, H.R. 810 and its Senate counterpart, S.471. The bill has been passed in the House of Representatives, but awaits consideration in the Senate. Recently, the Republican Senate majority leader, Senator Bill Frist, announced his support for the bill—whereas Frist originally supported President Bush’s 2001 decision to ban federal funding for ESC research, he now believes that “the president’s policy should be modified” (qtd. in Holden and Kaiser 858). Another Republican



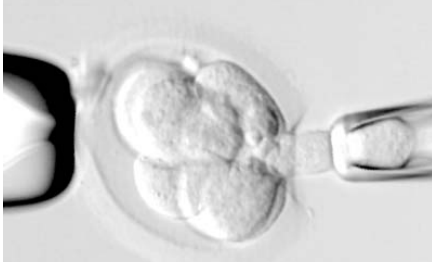
4 Senator Bill Frist’s decision to support embryonic stem cell research may affect the Senate’s decision on the S.471 bill.

leader, Senator Arlen Specter of Pennsylvania, also supports federal funding for ESC research, asserting that the stem cell lines approved by Bush in 2001 are “inadequate” (Specter and Coburn 28). Frist’s decision “raised [the] odds for the passage of [the] stem cell bill” (Holden and Kaiser 858) and earned him praise from the scientific community.

Some states have taken funding into their own hands—most notably California, where an initiative called Proposition 71 passed in November 2004, authorizing \$3 billion to be used for ESC research. However, researchers such as “John Gearheart of Johns Hopkins University” (Heath, par. 2) contend, “such [state] efforts cannot replace federal support” (Heath, par. 9). Now, the decision rests in the hands of the U.S. Senate, who must “garner the 67 votes necessary to override a [promised] presidential veto” in order for federal funding restrictions to be lifted (Holden and Kaiser 858).

Embryonic Stem Cells...Without the Embryos?

Because of the controversy surrounding the practice of acquiring embryonic stem cells from set-to-be-discarded embryos, as well as the lack of federal funding in the U.S., scientists have explored “less



5 Pre-implantation genetic diagnosis offers an alternative method of extracting embryonic stem cells.

divisive [embryonic] stem cell sources” (Holland 10). For example, researchers at the Whitehead Institute for Biomedical Research and the Massachusetts Institute of Technology have devised new methods “to obtain the cells without destroying embryos” (Ritter, pars. 4 and 13). Researchers used a method commonly utilized by fertility clinics, “pre-implantation genetic diagnosis or PGD”

(Ritter, par. 8), in which one cell from an early mouse embryo was extracted without harming the embryo (Ritter, par. 9). This cell was “cultured...and found [to] behave like embryonic stem cells” (Ritter, par. 9), while the “embryos...went on to produce mice” (Ritter, par. 9). The second alternative method, a “modified form of therapeutic cloning” (Ritter, par. 12), involves scientifically blocking the egg’s ability to “produce an embryo that can implant in a uterus” (Ritter, par. 14). This method, also called “altered nuclear transfer” (Ritter, par. 15), creates what Dr. William Hurlbut of Stanford University calls a “non-embryonic entity” (qtd. in Ritter, par. 15). Of course, these methods are not without opponents, as some religious groups—such as the U.S. Conference of Catholic Bishops (Ritter, par. 6)—still consider these methods unethical.

Another promising method, discovered at the Harvard Stem Cell Institute in August 2005, “could lead to creation of stem cells without having to use human eggs or make new human embryos in the process” (Assoc. Press, pars. 5 and 7). This process involves the fusion of “adult skin cells with embryonic stem cells” (Assoc. Press, par. 1), which does not require the controversial creation or destruction of human embryos. These new methods demonstrate that embryonic stem cells *can* be created without the “fiery moral anger” (Holland 10) that traditional stem cell obtainment incites.

The argument in favor of embryonic stem cell research focuses on the remarkable potential benefits of ESC research—significant progress in the study of degenerative diseases, potential creation of replacement tissue and even organs for ailing patients, and important research on myriad medical conditions—benefits that will affect all Americans for the better (Wilmut, A35).

Opposition to Embryonic Stem Cell Research

On the other hand, embryonic stem cell research also faces fierce opposition, with conservative religious groups, pro-life activists, politicians, and even some scientists joining the crusade against the controversial science. In addition to asserting their opinion that embryos represent “human life with potential, not just potential human life” (Specter and Coburn 28), opponents of ESC research urge scientists to focus on alternative sources of stem cells, such as umbilical cord blood and adult stem cells within the body, among others. Opponents also contend that there are “a great many problems...to be solved in order to use embryonic stem cells” (Sugaya), which will probably “take 15-20 years at least” (Sugaya). Clinical problems, such as the formation of teratoma, and the production of “foreign antigens,” can “potentially...compromise the health of the patient” (Alvarez). Also, there are individuals like Republican Senator Tom Coburn, who affirm that federal funding should not be used to “support destructive embryonic stem-cell research” (Specter and Coburn 28), which he deems “both unethical and unnecessary” (Specter and Coburn 28).

Christian pro-life authors Guthrie, Tennant, Henderson Blunt, and James assert that “most...of society has a hard time grasping the human value of this tiny life [embryos]” (Guthrie et al. 61), and as a result, “are eager to reap the potential scientific benefits...without asking too many uncomfortable questions” (Guthrie et al. 61). These authors, in an article in Christianity Today, contend, “many who support ESC research don’t understand that it destroys human embryos” (Guthrie et al. 61). In addition, these authors hope that “a sufficient number of Americans have moral qualms about ESC research...and that scientists and biotech firms will have to look for alternatives” (Guthrie et al. 65). Such views are common among the pro-life religious conservatives, although the authors admit that their stance “appears to be increasingly unpopular” (Guthrie et al. 61).



“Many opponents of embryonic stem cell research argue that early-stage embryos, such as this one, should be considered human life.”

Into the Clinical Maelstrom

In addition to ethical dilemmas, embryonic stem cells face clinical problems as well. In personal interviews with a University of Central Florida professor and a PhD student—Dr. Kiminobu Sugaya and Mr. Angel Alvarez, respectively—both asserted that stem cells are not yet the “miracle cure” that the media portray them to be, and that significant roadblocks (i.e., the aforementioned teratoma production and harmful immune response) currently hinder the medical use of embryonic stem cells.

Also, many of the government-approved embryonic stem cell lines, grown on a bed of “mouse feeder cells” (Fauber, par. 3) are now “so contaminated by animal

cells that they never [will] be usable for human research” (Fauber, par. 1). The dangerous medical implications of embryonic stem cells, as well as the uncertain condition of the existing cells, have convinced some science-minded citizens to oppose ESC research and support alternatives.



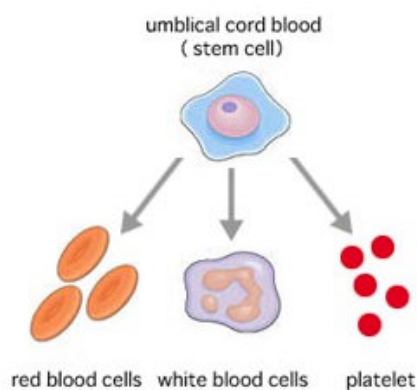
7 Dr. Kiminobu Sugaya, professor at the University of Central Florida, asserts that embryonic stem cells are not yet a “miracle cure.”

Alternatives to Embryonic Stem Cells

One such alternative, adult stem cells, also called “somatic stem cells,” (Cookson A6) can be described as already differentiated yet “immature” cells (Weiss 7), which “do not have the same developmental potential of embryonic stem cells” (Alvarez). Adult stem cells, though supposedly lacking

the “plasticity” of embryonic stem cells, have nevertheless “helped patients with at least 65 different human diseases” (Prentice 71). According to Prentice, adult stem cells can be obtained from a variety of sources—“bone marrow, blood, amniotic fluid, umbilical cord blood, and nasal tissue” (71)—and provide “real help for real patients” (71). Prentice claims that some types of adult stem cells are just as pluripotent as embryonic stem cells, and that adult stem cells have “quietly progressed in treating human patients” (71) while embryonic stem cells have accomplished

nothing. For example, treatments using umbilical cord blood, which contain “the same kind of stem cells



8 Umbilical cord blood is a source of adult stem cells, which can then develop into red blood cells, white blood cells, or platelets, to be used to treat blood diseases.

found in adult bone marrow” (Mcvicar, par. 9), “can be used to treat patients with leukemia, lymphoma, sickle-cell disease and some rare genetic diseases by replacing diseased cells with healthy ones” (Mcvicar, par. 9). According to Lauren Neergaard, reporter for the Sun-Sentinel, “100,000 donations from pregnant women in the next few years would be required to set up [a national cord blood] bank,” which “could help treat about 11,700 Americans a year.” Government support in the coming years for this national cord blood bank would facilitate cord-blood stem cell transplants, which are “much easier than traditional bone-marrow donation” (Neergaard, par. 2). Besides simply using adult stem cells to treat diseases, scientists are also exploring the possibility of “revers[ing] some of the memory in adult stem cells, making them more like embryonic cells” (Van). A notable benefit of this kind of research is that the use of a patient’s own adult stem cells would “avoid triggering a tissue rejection reaction” (Van). Opponents of embryonic stem cell research depend on facts like these to prove their point: the feasibility and results of alternative stem cell methods currently overshadow those of embryonic stem cells.

Opposition in the U.S. Government

The United States government is currently on the opposing side in the embryonic stem cell debate, a position epitomized by President Bush’s August 2001 decision to ban federal funding for embryonic stem cell research. In Bush’s “Remarks by the President on Stem Cell Research,” he states:

Embryonic stem cell research is at the leading edge of a series of moral hazards.... I’m a strong supporter of science and technology, and believe they have the potential for incredible good—to improve lives, to save life, to conquer disease. Research offers hope that millions of our loved ones may be cured of a disease and rid of their suffering...[but] I also believe human life is a sacred gift from our Creator. I worry about a culture that devalues life...Embryonic stem cell research offers both great promise and great peril. So I have decided we must proceed with great care (pars. 19,21,22,23).

Later in this address, Bush delineates his plan to expand federal funding on alternative research, and to “name a President’s council to monitor stem cell research, to recommend appropriate guidelines and regulations, and to consider all of the medical and ethical ramifications of biomedical innovation”

(Bush, pars. 26, 27). In a more recent “Statement of Administration Policy” from the Executive Office of the President, it is made clear that the Bush Administration “strongly opposes...federal taxpayer dollars to be used to encourage the ongoing destruction of nascent human life” (United States, par. 1). The Statement was issued in response to the H.R. 810 bill, called “Stem Cell Research Enhancement Act of 2005,” which the Bush administration calls



President George W. Bush strongly opposes embryonic stem cell research.

“seriously flawed legislation” (United States, par.7) and accuses of “relying on unsupported scientific assertions to promote morally troubling and socially controversial research” (United States, par. 4). For many of the same reasons other opponent decry embryonic stem cell research, the U.S. government has taken a firm stance against the science.

Is A Compromise At All Possible?

The multifaceted matter of embryonic stem cell research, with ethical, medical, political, and economic factors to consider, seems like an issue destined to be unresolved. However, a type of compromise may be achieved in a number of ways. First, the existing stem cell lines—those approved by President Bush in 2001— should be examined for animal contamination, and those deemed tainted, discarded. Then, the new methods of obtaining embryonic stem cells without destroying embryos—which are significantly less ethically abominable to opponents of ESC research— should be utilized in expanded research, preferably federally funded. If, using this system, significant advances are not made, the issue should be reconsidered. Another possible compromise benefits proponents more than opponents, and involves federally funding specific research projects that utilize embryonic stem cells. Strict scientific and ethical guidelines, such as those currently being considered by the National Academy of Sciences (Wade, par. 1), could be developed by an unbiased committee to regulate this research. A third option would involve new legislation to update President Bush’s 2001 rules on embryonic stem cell research, in relation to federal funding, which is already taking place with the H.R. 810 bill. Senators should be extensively educated on the advantages and disadvantages of the issue, so as to make a well-informed decision.

As of now, there is no end in sight to the debate concerning embryonic stem cell research, as its intricacy does not lend itself to simple compromises. The views of the scientific, religious, and political communities must all be taken into account, as must the potential benefits or harmful consequences of proceeding with embryonic stem cell research. The lives of millions of Americans hang in the balance, as embryonic stem cell research advances, haltingly, toward potentially miraculous results; however, formidable roadblocks stand in the way of such a utopian, disease-free future.

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