What Do We Make of the Stem Cell Debate? A Biblical Perspective

Heather Zieger looks at the stem cell debate from a biblical worldview perspective. This Christian perspective recognizes the true source of life and the difficulties with destroying many young lives for the hope of being able to save a few older lives.

What Are Stem Cells?

If science had a tabloid magazine, then stem cells would grace the cover. And much like the Hollywood celebrities, stem cells are at the center of controversy. How is a Christian to respond to conflicting reports and confusing science? In this article we will discuss the differences between adult and embryonic stem cells, look at some media myths, and evaluate the worldview issues behind the controversy.

First, let's define stem cells. Stem cells are cells that serve as the body's carpenters and mechanics to other cells. Their name comes from the stem of a plant. Think of a rose. From the stem grow the leaves, the thorns, and the flower. The flower does not produce leaves, nor do the thorns produce a flower, but the stem produces all of these things. However, the stem of the rose is still part of the plant. In the same way, stem cells are themselves cells and they produce other cells.

Stem cells can be found throughout our body. Think about when you give blood. Your body will resupply the blood that you lost. It does this by using blood stem cells. When your body needs more blood, signals tell the blood stem cells to make red blood cells, white blood cells and plasma cells. Another

example is our skin. We lose skin every day, but our body has very active skin stem cells that grow new layers. Keep skin stem cells in mind, because scientists have been able to do some amazing things with skin stem cells.

Blood and skin stem cells are examples of adult stem cells, which are different from another type of stem cell called embryonic stem cells. Embryonic stem cells are only found in the inner cell mass of a 5- to 8-day-old embryo. These cells end up making every cell in the human body and can divide indefinitely. They are believed to be much more versatile than adult stem cells. Because of this ability, scientists describe embryonic stem cells as *pluripotent*. Adult stem cells are programmed to only make certain types of cells (like our example of blood stem cells), and adult stem cells have a limited number of cell divisions. Because of this, they are described as *multipotent*.

As we look at some of the scientific research on stem cells, we will find that adult stem cells are more versatile than we once thought, and embryonic stem cells have limitations that scientists still need to overcome.{1}

Adult Stem Cells: The Underreported Medical Successes

Oneof the two main types of stem cells is adult stem cells. Adult stem cells are named for their abilities, not for their source. We find very helpful adult stem cells in umbilical cord blood and the placenta even though these sources are not from adults. One of the most studied adult stem cell sources is bone marrow. The first bone marrow transplant was performed in 1968. But it wasn’t until 1988 that scientists identified the stem cells within bone marrow that caused the transplants to work.{2}

Bone marrow transplants demonstrate one of the biggest

advantages of adult stem cells. Scientists did not know what a stem cell was, let alone how they worked, but the bone marrow transplants were still successful. The stem cells knew where to go in the body to repair the right tissues. This ability to automatically go to the location of repair is characteristic of all adult stem cells.

Bone marrow transplants also demonstrate one disadvantage to adult stem cell therapy. Just like an organ transplant, the stem cell donor must be an exact match to the patient. And the patient will need to take immuno-suppressant drugs for the rest of his life.

However, recent findings with umbilical cord blood have shown that the donor does not have to be an exact match when cord blood is used, meaning that a patient has a better chance of finding a donor. One of the first umbilical cord treatments was for sickle cell disease in a twelve-year-old boy.{3} He responded so well to treatment that a year later doctors declared him cured of sickle cell disease. He does have to take immune suppressant drugs, but does not display sickle cell symptoms.

One way around the donor problem is to use the patient's own healthy stem cells to repair other damaged cells. Parents now have the choice to bank their child's umbilical cord blood in the event that the child may need it. This technique was successfully used to help a child with her cerebral palsy symptoms.{4} Other adult stem cell successes include rebuilding bone, alleviating some cancers and auto-immune diseases, relieving Parkinson's symptoms, and treatments for Type I diabetes.{5}

All of these therapies have happened in real people using stem cells that do not involve the destruction of an embryo, and would be perfectly ethical within a Christian worldview.

What is the Promise of Embryonic Stem Cells?

The second type of stem cell is embryonic stem cells. Embryonic stem cells come from the inner cell mass of a 5- to 8-day-old embryo. Embryos are formed after the egg and sperm have united, which initiates a directional process that, given proper conditions, can eventually form a baby. At the 5- to 8-day stage, there are only a few cells within the embryo, but these cells are capable of making all of the cells in the human body. To obtain these cells, scientists penetrate the outer protective layer of the embryo and remove the cells. This procedure destroys the embryo.

It is still only a theoretical possibility that human embryonic stem cells can cure diseases. There is one FDA approved human trial that was announced in January 2009 for patients with a recent spinal cord injury.{6} We will have to wait to find out the results of this treatment. In other parts of the world, people have sought embryonic stem cell therapy as a desperate measure. One man in China had embryonic stem cells injected into his brain to relieve his Parkinson's symptoms. Unfortunately, the cells spun out of control and continued to make new cells of varying cell types. They eventually formed a large brain tumor consisting of different kinds of cells [a teratoma], such as skin cells, hair cells, and blood cells.{7} Another boy in Israel had a disease that attacked his spinal cord. His parents took him to Russia for several treatments with embryonic stem cells. Four years later, doctors found tumors in his spine that they confirmed came from the embryonic stem cell therapy.{8}

One of the most difficult hurdles for embryonic stem cell research is trying to program the stem cell to become the particular cell type that they need. The second hurdle is then telling the cell to stop multiplying before it forms a tumor. The signals and mechanisms for this are still being

researched; however, one recent study involving the rebuilding of mouse muscles using embryonic stem cells shows some progress in this area.{9}

While embryonic stem cells may theoretically have promise, they have not shown this in reality. Time will tell if they actually deliver. However, the ethical issue from a Christian perspective is not whether this research has a practical use, but whether we want to go down the path of using the parts of one human being, deemed less worthy of life, for another.

Media Myths

Unfortunately, the stem cell debate has turned into a media poster child for the next big scientific miracle. And stem cells have been hot science topics in the political realm. What is striking in all of this are the misconceptions that are repeated in the media.

Let's go over three media myths in the stem cell debate.

The first myth is that President Bush restricted stem cell research. Actually, President Bush was the first president to specifically allow federal funding for embryonic stem cell research.{10} However, he did put limits on how far they can take that funding. Furthermore, what is often omitted is that private companies have always been allowed to invest in embryonic stem cell research.

The second myth often repeated by the media is that embryonic stem cells have the potential to cure all types of diseases including spinal cord injuries,{11} Parkinson's and Alzheimer's. So far, the only successful stem cell treatments of spinal cord injuries or of Parkinson's symptoms{12} have been with adult stem cells.

I want to emphasize that *Alzheimer's will never be cured by stem cell therapy of any kind.* Alzheimer's causes the death of

many types of brain tissues. Stem cells might be able to replace some dead tissue, but tissue death is a symptom, not the cause. Alzheimer's affects the whole brain so deeply and quickly that it really isn't an issue of replacing cells. Therefore, scientists must look to other areas for cures for Alzheimer's.{13} The perpetuation of the myth that stem cells will cure Alzheimer's is either a cruel misrepresentation in order to sell a story, or else demonstrates a complete lack of understanding on the subject.

The third misrepresentation is the blatant lack of media coverage for adult stem cells. There have been over 70 different diseases, disorders, or injuries that have been helped or cured with adult stem cells in human trials,{14} yet this has hardly been covered by the media. We have discussed the successes of bone marrow and umbilical cord blood, but where is the media coverage of the latest findings with skin stem cells?{15} Scientists have found ways to coax a patient's own skin stem cells into acting just like an embryonic stem cell. In other words, these cells have the potential to become almost any cell in the body and they are from the patient's skin. No use of embryos, no immuno-suppressant drugs, and the technique has been refined for patient safety.{16}

Why this bias? There is a worldview issue at the heart of the matter.

Stem Cells from a Christian Worldview

We have looked at the differences between embryonic and adult stem cells. We have seen the double standard the media has in reporting these types. But the question remains, with all of the successes of adult stem cells, including the ability to create embryonic-like stem cells from the patient's own skin, why insist on continuing embryonic stem cell research? Why does the debate continue?

I believe a major part of the problem is the answer to the question, Who is in authority? There are two broad options: a God-centered authority or a man-centered authority. The man-centered authority in this case is called scientism. It is the idea that science will save us from our problems and tell what we need to know about life, including what is right and wrong.

Don't misunderstand me, I am trained as a scientist, and I think studying nature and pursuing scientific questions is important. But when we prioritize science as the only means of gaining knowledge and make it the guide for our lives and the decisions we make, we aren't studying the world around us, we have essentially invented a religion.

The other perspective is a God-centered authority. In this case all of nature, technology and our decisions are under God's authority. In other words, we determine what is right and wrong from the Bible because it is God's revealed word.

Scientists want to continue studying embryonic stem cells, because they want to explore all possibilities, and they see no reason why they shouldn't. From their worldview, they are in authority. There is no reason to put moral limitations on research. Many people latch onto this idea because they believe science will save them. They have faith in science. Some even believe this to the point of claiming stem cells will cure diseases and ailments that no stem cell therapy could ever do.{17}

Some scientists argue that we need to study embryos to better understand how a disease can develop in the earliest cells. These studies have been done in animals, but scientists would prefer to use humans because there are several developmental differences between humans and other animals.{18}

As Christians, we believe scientific study and finding cures for diseases is a great endeavor. But just because we *can* do something, doesn't always mean we *should*. We know what we

should do from God's word. He values the unborn, and values human beings as having inherent dignity because we are made in his image. We therefore cannot judge some humans less valuable than others, and we certainly cannot destroy them for research observations or for removal of their parts. From this perspective, adult stem cell research is ethical, but embryonic stem cell research is not.

Notes

1. An excellent documentary on the basics of stem cells and the controversy around embryonic and adult stem cells: *The Lines that Divide: The Great Stem Cell Debate*. Dir. Brian Godwana. The Center for Bioethics and Culture Network, 2009. See this link for a clip: www.thecbc.org/redesigned/research_display.php?id=373.
2. "Purification and characterization of mouse hematopoietic stem cells." GJ Spangrude, S Heimfild, IL Weissman, *Science* Vol. 241, Issue 4861, 58-62.
3. www.nationalcordbloodprogram.com
4. www.foxnews.com/story/0,2933,392061,00.html
5. www.stemcellresearch.org
6. www.geron.com/grnopc1clearance/
7. "Survival and proliferation of non neural tissues, with obstruction of cerebral ventricles in a Parkinsonian patient treated with fetal allografts." *Neurology*, Vol 46, Issue 5, May 1, 1996.
8. www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1000029
9. "Functional skeletal muscle regeneration from differentiating embryonic stem cells." *Nature Medicine* 14, 134-143, 2008.
10. See Executive Order 13435; for an excellent article on the politics of stem cell research from a Christian worldview, see "Responsible Science & ESCR" by Greg Koukl in *Solid Ground* May/June 2009 (a publication of Stand to Reason).

11. www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1864811 (*Journal of Spinal Cord Medicine* 29, 191-203, July 2006).
12. www.lifenews.com/bio2751.html; www.bio-medicine.org/medicine-technology-1/Groundbreaking-Paper-Publishes-Long-Term-Results-of-a-Successful-Phase-I-Clinical-Trial-Using-Autologous-Neural-Stem-Cells-to-Treat-Parkinsons-Disease-3848-1/; www.bentham-open.org/pages/content.php?TOSCJ/2009/00000001/00000001/20TOSCJ.PDF
13. For an excellent overview of Alzheimer's, see the Alzheimer's association website at www.alz.org; for their statement on stem cell research see: www.alz.org/national/documents/statements_stemcell.pdf.
14. "A 37-year-old-spinal-cord-injured female patient, transplanted of multipotent stem cells from hum UC blood, with improved sensory perception and mobility, both functionally and morphologically: a case study." *Cythotherapy* 7, Issue 4, 368-373, 2005.
15. One person in the popular media who did mention skin stem cells was Dr. Mehmet Oz on the Oprah Winfrey Show: www.youtube.com/watch?v=lDFJOzu9SyM.
16. K. Takahashi, et al., *Cell* doi: 10.1016/j.cell. 2007.11.019; 2007; J. Yu, et al., *Science* doi: 10.1126/Science. 1151526; 2007.
17. See Joseph Bottum and Ryan T. Anderson's article in *First Things* for an excellent reference on the history of stem cell research: www.firstthings.com/article.php?year=2008&month=10&title_link=001-stem-cells-a-political-history-27. Also see Anderson's article in the *Weekly Standard* for reasons scientists still want to study embryonic stem cell research: www.weeklystandard.com/Content/Public/Articles/000/000/016/258hdaij.asp?pg=1.
18. The scientists who conducted the research on skin stem cells that were coaxed into acting like embryonic stem cells did use knowledge from embryonic stem cell research to help identify the general markers for pluripotency. However, it is

unclear that it is necessary to use human embryonic stem cells for this, because the markers for pluripotency were first identified in mouse embryonic stem cells.

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Stem Cells for Everyone: A Breakthrough?

As far as dramas go, the stem cell saga contains all the elements of a juicy prime-time soap opera. The excitement, the promises, the characters, the politics, the lies, the scandal, the moneythe only thing missing is sex, but thats the point, isnt it?

On November 20, 2007, the journals *Science* and *Cell* announced a truly major discovery. It was a way to convert human skin cells taken from a simple skin biopsy into *stem cells* that behave like an *embryonic stem cell*but the byproduct is not an embryo and can in no way become one.{1} This has the effect, say many, of sidestepping the ethically troublesome practice of creating then destroying human embryos in order to treat diseases.

This new method is efficient. One biopsy can produce 20 stem cell lines, and can be taken from the patient himself, eliminating the risks associated with tissue rejection. We hear about stem cell breakthroughs all the time; how is this one different? Is this method ethical? Will it save as many lives as embryonic stem cells promise to? Is this the end of the stem cell controversy?

The Saga

Stem cells are simply cells that make other cells. Their job is to be a cell factory. By analogy, think of a rose. From the stem of the rose grows leaves, the flower, and thorns. The thorns dont produce flowers, the leaves dont produce thorns, and the flower doesnt produce leaves, but the stem does. The stem is versatile; it can make many parts of the plant. Stem cells operate the same way. Some stem cells are more versatile than others. In other words, some stem cells can make many types of cells and others can only make one type of cell.

The history of embryonic stem cells dates back to the 1950s when two scientists isolated a teratoma from a mouse. A teratoma is a tumor that is composed of various types of cells from hair cells to eye cells to teeth to nails, so the scientists aptly named it a *teratoma*, or monster. When investigating this tumor, the scientists found that the stem cells that produced this array of cell types had very similar properties of embryonic cells. Thus began the investigation into embryonic stem cells.{2}

Before the term stem cells had become popular, bone marrow transplants had been used to treat patients with leukemia. Whenever a patient receives a bone marrow transplant from a donor, they are really receiving a type of stem cell therapy. At this point, scientists could only use bone marrow stem cells for very specific cell replacement. These stem cells were not very versatileat least that was the theory at the time. Since then, bone marrow stem cells have been found to be quite versatile, and can be coaxed into becoming a variety of cells. Scientists have now found a variety of adult stem cells throughout the body and have been using them in humans to cure or alleviate a number of diseases or conditions (see www.stemcellresearch.org for a complete list).

Another breakthrough with stem cells arose from tissues such as umbilical cord blood, placental tissue, amniotic fluid and

even menstrual bloodall obtained without harming the life of the baby at any stage of development. Each of these stem cells are a little more versatile than the adult stem cells, meaning that they can become two or three different types of cells, and in many cases the donor/recipient need not be an exact match. The National Cord Blood Program is just one group that allows parents to put their babys umbilical cord blood in a bank so that he or she could use it for therapy sometime in the future, or they can donate the umbilical cord for others to use. See www.nationalcordbloodprogram.org for a list of patient success stories.{3}

If these are *adult* stem cells, then what are *embryonic* stem cells? These are cells removed from the eight-day-old embryo. When these cells are removed, the embryo dies. These cells produce almost all of the cells in the human body, and therefore are the most versatile stem cells. You may have heard of these cells as being pluripotent. That simply means that they are very versatile. Some scientists believed that embryonic stem cells (ESC) research was where time, money and resources should go since we know that these cells have the potential to become any cell type.

Numerous success stories of treatments with adult stem cells have been under-reported by the media, while the supposedly cure-all ESC were hypedeven though they have shown no actual success in humans. Ironically, adult stem cells have been saving patients lives for years (bone marrow transplants), while ESC scientists have yet to control the growth rate of the ESC. In what shouldnt be a surprise to anyone, ESC tended to form grotesque tumors (teratomas) composed of various cells found in the body.

Debate over the ethics of using embryos became heated within the political arena. The individuality and dignity of the embryo came into question. Scientists wanted unfettered research{4} so that all options can be explored to

cure diseases, while others considered the embryo a very vulnerable life that has the right to be protected from experimentation. Both sides claimed to be arguing for the good of humanity.

These debates, however, have taken a slightly different turn with the recent discovery of converting skin cells into pluripotent stem cells mentioned above.

Skin Cells

As mentioned, now scientists have isolated human stem cells that are as versatile as embryonic stem cells, but no embryos were used to obtain these stem cells. While more studies are needed to confirm that these cells act like ESCs in the human body, they behave just like ESCs in the lab.

There are a few concerns with this procedure. One of the biggest concerns is the way these stem cells are made. Both research groups had to use a type of virus to insert the right code into the skin cells to tell it to become a stem cell. This virus may be harmful to humans. However, both scientists are researching safer methods for coaxing the skin cells into stem cells.{5}

So is this method ethical? I strongly believe the answer is yes. As Leon Kass, former head of the Presidents Council on Bioethics, stated in a *National Review Online* symposium, Reprogramming of human somatic cells to pluripotency is an enormously significant achievement, one that boosters of medical progress and defenders of human dignity can celebrate without qualification.{6} Sanctity of life advocates can celebrate because no embryos are created or destroyed for research.

Both scientists who first published on this new discovery, Dr. James A. Thomson from the U.S. and Dr. Shinya Yamanaka from Japan, said that this research could not have been done

without the knowledge that we already had from embryonic stem cells. And Thomson, who was one of the first scientists to remove a stem cell from a human embryo,{7} has specifically stated that embryonic stem cell research should continue.{8} We must keep this point in mind, but we must also remember that, contrary to what some in the scientific community are saying, both scientists had more than just economic reservations about using embryos in their research:

> *Thomson: If human embryonic stem cell research does not make you at least a little bit uncomfortable, you have not thought about it enoughI thought long and hard about whether I would do it.{9}*

> *Yamanaka: When I saw the embryos, I suddenly realized there was such a small difference between it and my daughtersI thought, we cant keep destroying embryos for our research. There must be another way.{10}*

Is This Match Point?

Most people agree that this changes the political and scientific culture of the stem cell debate. Surprisingly, some major players have come around.

Jose Cibelli, research scientist whose successful primate cloning was overshadowed by the skin cell announcement states, If their method is as good as the oocyte (the cell that forms a human egg)we will be no longer in need of the oocytes, and the whole field is going to completely change. People working on ethics will have to find something new to worry about.{11} Even Ian Wilmut, the scientist famous for creating Dolly the Sheep [see Probe article], decided to abandon cloning and work with reprogramming cells instead. As the Britains *Telegraph* reports, The scientist who created Dolly the sheep, a breakthrough that provoked headlines around the world a decade

ago, is to abandon the cloning technique he pioneered to create her. I decided a few weeks ago not to pursue nuclear transfer, Prof Wilmut said.{12}

Several of the participants of *National Review Online* Symposium agree that this removes the ethical concerns from researching pluripotent cells, and, pragmatically, this seems to be significantly more efficient than cloning embryos to remove stem cells. Case closed? Not quite.

Not all agree that this is the end of using embryos to extract stem cells. As Wesley Smith, bioethicist, vocal ESC critic and Discovery Institute fellow, points out on his blog, www.bioethics.com:

> *If anyone thought that the pro-human cloners would fold up their tents and steal away after the news was released that patient-specific, pluripotent stem cells had been derived from normal skin cells, they just dont understand how fervently some scientists and their camp followers want to clone human lifeand how hopeful some are that the stem cell issue can be the vehicle that wins the culture war.{13}*

Recall that we are dealing with scientists careers and, for the most part, scientists with a utilitarian worldview. A scientist whose worldview is dictated by whatever is for the greater good and has built his entire career and reputation around embryonic stem cell research is not going to readily abandon it. To see the interplay of both career and worldview choices, Dr. Hans Keirstead, neurobiologist and stem cell researcher at the University of California-Irvine, had this to say in an interview for the *Arizona Daily Star*:

> *I do think a great deal of this work could be done with the skin-cell derived stem cells. But wed have to start completely over, from scratch, and we are not going to slow down to do that, not at this point.*

It is my personal feeling its a very ethical decision to use this tissue [Embryonic Stem Cells] to end human suffering, to better human life, than to destroy it.{14}

Conclusion:

As Christians, we operate within an ethical framework dictated by Gods word. Although the Bible does not mention stem cells, it *does* make clear that we are made in Gods image (Genesis 1:26, 27), that God knew us and knit us together within our mothers womb (Psalm 139: 13-16), and how God called prophets before they were even born (Isaiah 49:1; Jeremiah 1:4-5). God values the life of the unborn. We do not always have the privilege of seeing ethical decisions vindicated in our lifetime, but we can be confident that God is sovereign over all things.

Notes:

1. Takahashi, Kazutoshi, et al, Cell 131, 861-872, November 30, 2007; Yu, Junying, et al Sciencexpress, www.sciencexpress.org, (fee/registration to access full article) November 20, 2007.
2. From teratocarcinomas to embryonic stem cells and beyond: a history of embryonic stem cell research Solter, *Davor Nature Reviews* 326, vol. 7, April 2006.
3. See list of references from Family Research Council, www.frc.org/get.cfm?i=IS06H01. See also www.stemcellresearch.org/facts/asc-refs.pdf for a sampling of peer reviewed research articles.
4. This case history [of ESC research] again reinforces the old truism that unfettered basic research driven only by scientific curiosity is usually the best way to discover things of enormous practical value Solter, *Davor Nature Reviews* 326, vol. 7, April 2006.
5. Two Major Studies Show: Human Pluripotent Stem Cells without Cloning or Destroying Embryo analysis by Maureen Condic, Ph.D. from

www.stemcellresearch.org/statement/pptalkingpointsweb.pdf.
6. National Review Online NRO Symposium, nationalreview.com, Brave New Future.
7. Thompson, James A. et al, *Science* 282, 1998.
8. Standing in the Way of Stem Cell Research by Alan I. Leshner and James A. Thomson *Washington Post*, 12-0-07, pg. A17.
9. Man Who Helped Start the Stem Cell War May End It by Gina Kolata, *New York Times,* Nov. 22, 2007.
10. Risk Taking Is in His Genes by Martin Fackler, *New York Times*, 12-11-07.
11. Vogel, Gretchen, and Holden, Constance , Field Leaps Forward with New Stem Cell Advances *Science* 318, 23 November 2007, p. 1224.
12. Dolly creator Prof Ian Wilmut shuns cloning by Roger Highfield, *Telegraph* 11/16/07, www.telegraph.co.uk.
13. 'Lead Into Gold:' Stem Cell Counter-Attack by Wesley Smith. Posting for November 27, 2007 www.bioethics.com.
14. Human embryonic stem-cell work must go on, says researcher by Carla McClain, *Arizona Daily Star*, 11-28-2007.

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