

Findings

Hype v. Hope

Real Promise in Adult Stem Cells

By David Prentice, Ph. D



Stem cells continue to be an emotionally charged debate, heavy on emotion and light on the actual facts. Many claims and many promises have been made but most

people—the public and the policymakers alike—do not know the whole truth about stem cell research and its near cousin, cloning.

One of the first questions to ask when hearing a story about “stem cells” is: Which type? Many people are surprised to learn that there are actually many sources of stem cells, though they can generally be divided into two main types—embryonic or adult stem cells.

Unfortunately most of the media and political attention has focused on embryonic stem cells. Embryonic stem cells come from early embryos within the first few days of life. At that stage of our life, about one week after conception, we resemble a hollow ball with some cells inside, a stage of our developing life called the “blastocyst.” It is at that point that we can implant into the wall of the uterus and start obtaining our nutrition from our mother’s womb. This is also the point at which scientists obtain embryonic stem cells. Obtaining them requires breaking apart the embryo, resulting in his or her death. The cells are placed into a Petri dish to grow and for further study. The hope is that from the dish scientists may be able to produce tissues needed to repair damaged or diseased organs in the body.

Embryonic stem cells from mice were first successfully grown for an extended time in the laboratory in 1981, but it was only in 1998 that scientists were able to successfully keep human embryonic stem cells growing in the lab.

Embryonic Promise?

We often hear that embryonic stem cells have the “potential,” “promise,” “possibility,” and “hope” to treat millions of people for a wide range of diseases. But that hope has been wildly oversold by some politicians and scientists that want to do research on embryos.

Despite the emotional hype surrounding them, embryonic stem cells actually have little to offer for real treatment of

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disease. Their supposed advantages—unlimited growth, and the potential for forming most or all tissues of the body—are actually hindrances when it comes to transplants to repair tissue damage and disease.

When transplanted into experimental animals, embryonic stem cells often continue this untamed behavior, with a tendency to form tumors or various unwanted tissues. An attempt to treat diabetes in mice using embryonic stem cells showed that the cells did not even form true insulin-secreting cells, but they did form tumors. And a recent attempt, this time at treating rats with Parkinson’s disease, did show some improvement in some of the animals, but 100% of the animals started to form tumors caused by nerve cells made from embryonic stem cells.

The scientific literature is filled with similar results from animal studies using embryonic stem cells. Clearly, over 25

years of research with embryonic stem cells shows that any treatments will be problematic. To date, researchers have failed to provide even one successful treatment for human patients with embryonic stem cells.

Indeed, the National Institutes of Health has noted that: “Thus, at this stage, any therapies based on the use of human embryonic stem cells are still hypothetical and highly experimental.” Cries for the creation of more human embryonic stem cells and greater federal funding are unjustified, as research on the available embryonic stem cells shows insufficient evidence that they are either safe or effective. Even the claims that the available human embryonic stem cells are contaminated and so need to be replaced are misleading—leading embryonic stem cell researchers have already shown that the available cells can have any contamination removed and are still valuable for further research.

Empty Promises

In terms of the science, proponents of embryonic stem cell research are playing on the emotions of the vulnerable—lacking facts and making empty promises about possible treatment of diseases. The implication that embryonic stem cells will soon provide life saving cures is patently false, and cruelly deceives the patients and families who hope so much for cures. When asked why the claims persist, regarding Alzheimer’s disease, one noted scientist simply said, “People need a fairy tale.”

There is also the significant ethical question about embryonic stem cell research—should some human beings be sacrificed for the potential benefit of others? Embryonic stem cell research destroys the youngest, most vulnerable members of the species. We do not appear

now as we did earlier in our lives, but we were all embryos at one time. If you had been used for research when you were an embryo, you would not be here now to read these words. Is the remote possibility that medical treatments might arise from some research worth the cost of cannibalizing other human beings?

Similar promises are made about cloning. Cloning starts with creation of a new embryo. The process, termed “somatic cell nuclear transfer” or SCNT for short, involves removing the chromosomes from an egg cell, and transferring the chromosome-containing nucleus of a body cell (a somatic cell) into that egg cell. What results is a new embryo, containing the genetic information of the person who supplied the body cell.

The Cloning Connection

All human cloning is reproductive. It creates—reproduces—a new developing human intended to be virtually identical to the person who was cloned. Some proponents of embryo research try to distinguish between what has been termed “reproductive cloning” and “therapeutic cloning,” but these are not different types of cloning, simply different uses for the cloned embryo. Both use exactly the same SCNT technique to create the clone. The clone is created as a new embryo and grown in the laboratory for several days. Then it is either implanted in the womb of a surrogate mother in hopes of a live birth (“reproductive cloning”) or destroyed to harvest its embryonic stem cells for experiments (“therapeutic cloning”).

It is the same embryo, but used for different purposes. In fact, the cloned embryo at that stage of development cannot be distinguished under the microscope from an embryo created by the joining egg and sperm in fertilization. And “therapeutic cloning,” which has produced no therapies whatsoever, is obviously not therapeutic for the embryo—the new human is specifically created in order to be destroyed as a source of cells for experiments.

Cloning research also poses a significant health threat to women. The process requires a tremendous number of human eggs to create a single clone, one cloning scientist estimating that at least 100 eggs would be needed for each patient even if the process could ever be shown to work. A simple calculation reveals the staggering numbers—to treat just the 17 million diabetes patients in the United States would require at least 1.7 billion human eggs, and approximately 85 million women to “donate” eggs.

The harvesting of human eggs is not a simple process. It will subject huge numbers of women to significant health risks from high hormone doses and surgery required to harvest the eggs. The result will be that human eggs will become a commodity and poor women will be especially targeted for exploitation on a global scale.

This fact was highlighted in the cloning

scandal in South Korea. The scientist, Woo-Suk Hwang, received global accolades when he announced in 2004 and 2005 that he had produced cloned human embryos and harvested their embryonic stem cells. The shameful push for this unethical science was brought into public view when his discovery was uncovered as an outright fraud.

Stem Cell Myths

MYTH: Stem Cells can only come from embryos

- Stem Cells may come from a variety of sources: Umbilical cord, placenta, amniotic fluid, adult tissues/organs, (e.g., bone marrow, fat, even nasal neural), and a cadaver that is up to 20 hours post mortem.

MYTH: Embryonic Stem Cells have the greatest promise

- There has not been one clinical embryonic trial published in a peer reviewed journal
- There is a problem with rejection and tumors in those cells
- Adult stem cells are part of natural repair of body.
- Adult stem cells have successfully treated 70 diseases in thousands of patients: e.g., blood, heart, even spinal cord injury.

MYTH: Therapeutic cloning and reproductive cloning

are different from each other

- The only difference is that in reproductive cloning the embryo is allowed to develop into a baby.

MYTH: Somatic cell nuclear transfer (SCNT)

is different than cloning

- They are one and the same.

MYTH: The Catholic Church is opposed to Stem Cell research

- The church is only opposed to one of the many types: embryonic stem cell research.

MYTH: Somatic cell nuclear transfer can produce

tissues/organs without creating an embryo

- Not true at present.

MYTH: Every body cell (somatic cell) is somehow an embryo

- This would mean with each hand washing we were killing embryos. One must clone that body cell using a woman’s egg to create an embryo.

MYTH: Because cloning does not use sperm,

the resultant embryo is not a human being

- Dolly, was cloned, and really is a sheep.

MYTH: “Spare” frozen embryos will be discarded,

thus, it is laudable to destroy them for research

- These are someone’s children.
- Is it permissible to do research on, and in the process kill, terminally ill children?

Source: Dr. Marie T. Hilliard, “Ethical and Moral Implications of Embryonic Stem Cell Research.” A presentation delivered before the North Carolina House Select Committee on Stem Cell Research, 20 November 2006.

While he in fact did not produce any embryonic stem cells from cloned human embryos, he did use over 2,000 human eggs in the experiments, in some cases paying women for their eggs, in some cases coercing young students to donate to the experiments. A large number of the women experienced significant health problems in the attempts to harvest large numbers of their eggs for experiments.

Adult Stem Cell Success

The lack of success of cloning and embryonic stem cells should be compared with the real successes of “the other stem cells”—adult stem cells. Adult stem cells are found not only in adults, but in virtually every tissue of our body from birth onward, as well as in umbilical cord blood and placenta. Unlike destructive embryo research, harvesting adult stem cells does not require destruction of the donor from whom they are obtained. Hundreds of scientific studies over the last few years document that adult stem cells are much more promising for repair of diseased tissue. And at least two dozen studies now indicate that some adult stem cells can form virtually all tissues of the body. Previously, embryonic stem cells have been touted as unique among stem cells in this characteristic, termed pluripotent ability, which means the flexibility of a stem cell to form most or all tissues of the body.

Apparently that is not a characteristic unique to embryonic stem cells. Adult stem cells from bone marrow, umbilical cord blood, nasal tissue, and several other tissues also show this same flexibility. Most recently, scientists at Wake Forest announced that they had isolated stem cells from amniotic fluid and placenta that showed all the characteristics that most scientists claim they want in a stem cell—easily obtained, easily grown in the lab, with the ability to form the tissues of the body, yet these stem cells also did not produce any tumors. And numerous other adult-type stem cells have repeatedly shown the ability to form various other tissues of the body.

More importantly, adult stem cells have been shown repeatedly to be effective at treating disease. Studies in animals over the last several years have proven their ability to heal and repair damage from diseases such as diabetes, stroke, spinal cord injury, Parkinson’s disease, and retinal degeneration. But the biggest news, largely unreported, is that adult stem cells are already being used successfully to improve the health of human patients.

While still early in clinical studies,

we should not consider these all cures as yet. Still, thousands of patients have now benefited from adult stem cell treatments. These include as reparative treatments with various cancers, autoimmune diseases such as multiple sclerosis, lupus, and arthritis, and anemias including sickle cell anemia.

Adult stem cells are also being used to treat patients by growing new corneas to restore sight to blind patients, potential treatments for stroke, and studies using adult stem cells have helped large numbers of patients in repair of cardiac damage after heart attacks. Adult stem cells have grown new blood vessels to prevent limb amputation from gangrene, and stimulated growth of new cartilage and bone to replace that lost through accident or disease. Adult stem cells have also been used to prevent life-threatening problems from

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genetic diseases for children. Spinal cord injuries have also shown improvement, with patients regaining some movement and sensation, and some even walking again with the aid of braces.

British doctors have shown in early trials that bone marrow adult stem cells have potential to treat liver disease. And a Harvard Medical School team now has FDA approval to begin patient trials for juvenile diabetes, after they showed in mice that adult stem cells could achieve “permanent reversal” of diabetes.

Using Our Own Cells

An advantage of using adult stem cells is that in most cases the patient’s own stem cells can be used for the treatment, circumventing the problems of immune rejection, and adult stem cells do their repair work without causing tumor formation.

Interestingly, in some cases no stem cells are removed, cultured, or injected, but rather the patient’s own body stem cells are stimulated to begin the repair, by injecting various chemicals and growth signals. National Institutes of Health scientist Dr. Ron McKay notes that “Harnessing the body’s own stem cells could offer an enticing alternative to attempts to harvest them from other sources, such as

embryos. “This is where stem-cell biology needs to be.” Cardiologist Douglas Losordo at Tufts University said that bone marrow “is like a repair kit. Nature provided us with these tools to repair organ damage.” He also noted that “embryonic stem cells are going to fade in the rearview mirror of adult stem cells.”

These quiet successes, using the patients’ own adult stem cells, are advancing rapidly and producing the therapies about which embryonic stem cell advocates can only speculate. We don’t yet understand exactly how adult stem cells work their repair magic, but they continue to surprise even the scientists. As Robert Lanza, a proponent of embryonic stem cells and cloning has noted, “there is ample scientific evidence that adult stem cells can be used to repair damaged heart or brain tissue... if it works, it works, regardless of the mechanism.” That’s certainly the attitude of the patients who have experienced the real benefits of adult stem cells.

Conclusion

Overwhelmingly the evidence reveals that it is adult stem cell research that holds the promise of medical advancement, not the use of embryonic stem cells. The contrast between embryonic stem cells and adult stem cells is one of hype versus hope, empty promises versus real results. Adult stem cell research is daily proving itself capable of helping patients, without moral and political difficulties. If we truly care about suffering patients, we should put our resources behind that research which shows real promise, without crossing ethical lines.

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Stem Cell and Cloning Glossary

Adult Stem Cell: A stem cell from organs and tissues, usually after birth (including umbilical cord and placenta), that can renew itself and transform into other specialized cell types.

Assisted reproductive technology: Fertility treatments that involve a laboratory handling eggs or embryos, such as in vitro fertilization.

Blastocyst: Early stage of embryo, approximately 5-7 days after conception (50-250 cells.)

Cloning: The creation of an animal or person that derives its genes from a single other individual; “asexual reproduction”. Creating a copy that is virtually identical to the original (can be done with molecules, cells, and whole organisms.)

Chromosomes: Contain genes, working stretches of DNA that carry the genetic code for specific proteins. Normal human cells contain 46 chromosomes; mature normal human gametes have 23 chromosomes.

Differentiation: The process by which early unspecified cells acquire the features of specific cells such as heart, liver, muscle, or brain tissue.

DNA: Abbreviation for deoxyribonucleic acid. The genetic material that contains the instructions for making an entire organism.

Embryo: The earliest stage of human development, from the single cell zygote up to about 8 weeks.

Embryonic germ cell: A cell in the embryo/fetus that normally develops into mature gametes.

Embryonic stem cell: A cell from the inner group of cells of a blastocyst, with the potential to become most or all of the body tissues.

Fetus: The human being from 8 weeks after conception to birth.

Gamete: A mature germ cell (egg or

sperm), which unites with another in sexual reproduction.

Gene: A unit of heredity that is a segment of DNA located on a specific site on a chromosome.

Germ cell: Egg or sperm.

In vitro: Done outside of the body.

In vivo: Done within the living body.

Multipotent: Capable of giving rise to several specialized cells or tissues of an organism.

Nucleus: The core of a cell that contains the chromosomes (genetic material.)

Pluripotent: Capable of giving rise to most or all tissues of the adult body.

“Reproductive Cloning” (Live-Birth Cloning): All cloning is reproductive in that it creates – reproduces – a new developing human intended to be virtually identical to the cloned subject. The term “reproductive cloning” has been used to signify the implantation into a womb of a cloned embryo, in hopes of a live birth.

Somatic cell: Cell of the body other than a gamete (other than an egg or sperm.)

Somatic cell nuclear transfer: Cloning. The transfer of a cell nucleus from a body cell into an egg from which the chromosomes have been removed or inactivated; the method used for cloning of an organism. Once the transferred genome is within the egg cell, a one-cell embryo is created, the process of cloning is complete and further development of the clone can occur.

Stem cells: Non-specialized cells that have the capacity to self-renew and to transform into other mature cell and tissue types.

“Therapeutic Cloning” or (Experimental Cloning): Creating a cloned embryo for the purpose of destroying it to harvest embryonic stem cells or tissues, or for other experimental studies.

Tissue or cell culture: Growth of cells or tissues in a laboratory dish for experimental research.

Totipotent: Capable of giving rise to all tissues and organs, including placenta.

Zygote: A one-cell embryo. Even at this stage the embryo is a human being (species *Homo sapiens*).

Websites

[Ed Note]: Dr. Prentice has provided below several websites where you may find more information on stem cells and other issues related to the health industry. This list is not meant to be exhaustive.

Do No Harm: The Coalition of Americans for Research Ethics

www.stemcellresearch.org

Family Research Council

www.frc.org

Focus on the Family

www.family.org/socialissues/Sanctity

American.com

www.american.com/archive/2007/january-0107/an-easy-cell

Westchester Institute for Ethics and the Human Person

www.westchesterinstitute.net

Discovery Institute

www.discovery.org/bioethics

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