

ENGAGE YOUR CULTURE

Stem Cell Research 101

Celebrities tell you to support it. Politicians disagree about it. **But what is stem cell research?** The Center for Bioethics and Human Dignity gives you the basics.

What is an embryo?

A proper regard for the human embryo is essential for grappling with matters such as stem cell research. Confusion over the precise meaning of the term *human embryo* can lead to disagreement on these issues. It is therefore important to have as clear an understanding as possible regarding the nature of the human embryo before determinations of how to treat embryos can be made.

In the mid-1800s, the German anatomist Ernst Haeckel characterized the human embryo as a mere cell consisting of “homogeneous globules of plasm.” In this period of time, before the advent of molecular biology, scientists were not privy to the magnificent complexity of embryonic human life. Those who wished to value human embryos often had to appeal to religion or philosophy, rather than to scientific fact, in part because the intricate genetic makeup of the human species—already present in these very young members of the human family—was not yet known to researchers.

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As a result of increasing scientific sophistication, secular and religious institutions alike now acknowledge that the human embryo exists at an individual's very early stages of development. Even governmental bodies that support the destruction of embryos for research purposes (such as the National Bioethics Advisory Commission and the National Institutes of Health) agree that a human life is present at the time of fertilization. The National Academy of Sciences defines the human embryo as a “developing human from fertilization...until the end of the eighth week of gestation.” Thus, labels that refer to the embryo as a “pre-embryo” or a “potential human being” are scientifically invalid; this early life is presently an embryo and is actually human. Consequently, we should reject terms that seek to detract from the moral status and dignity of early human life and to desensitize us to the destruction of that life.

What is a stem cell?

The name for this type of cell may be traced to the stem of a plant. The different branches, leaves, and flowers on a plant all originate from the stem. Therefore, a “stem” cell is a type of cell from which other cells have their origin. In early human embryos, some stem cells are naturally capable of generating the more than two hundred types of tissue in the human body. In more mature human beings, stem cells give rise to new cells in order to replace old cells that have died or that no longer function properly.

Why is stem cell research controversial?

The current debate over stem cell research has been raging since two teams of U.S. scientists announced in November 1998 that they had successfully isolated and cultured human embryonic stem cells in the laboratory. This set off high hopes in patients and researchers alike that stem cells held the key to treating—and even curing—many of the most devastating human afflictions. The basis of this belief rests with the nature of an embryo's stem cells: since they are capable of generating all types of human tissue, having access to them in the lab would potentially provide scientists with the means to produce new heart tissue, liver tissue, brain tissue, lung tissue, or any other type of tissue that a patient might need.

The stem cell batches that sparked the ongoing ethical debate did so because they were derived from “surplus” human embryos (obtained from fertility clinics) who were destroyed in the process, as well as from fetal tissue obtained from electively aborted babies. Availability of these types of stem cells (referred to as “embryonic” or “fetal” stem cells) is primarily dependent upon intentional decisions to end the life of very young human beings. Proponents of research on such cells say that the research should proceed because of its allegedly great promise for medical benefit, whereas opponents deem it unethical—regardless of what benefits might emerge.

What are adult stem cells?

“Adult” stem cells are found in adults, teenagers, children, and even in the umbilical cords of newborn infants. These cells do not carry the same ethical concerns as do embryonic stem cells, since the individuals from whom the cells are obtained are not harmed in any way.

How do embryonic stem cells compare with adult stem cells?

Embryonic stem cell research has received the majority of media hype and public attention. The obstacles encountered in this research, however—combined with the unprecedented advances reported by scientists working on adult stem cells—may actually serve to underscore the therapeutic potential of adult stem cell research as being superior to embryonic. For example, in order for a single embryonic stem cell to develop into a desired tissue type, exposure to specific cellular cues may be required. Stem cell researchers have thus far been unable to decipher these cues.

Another difficulty encountered by scientists is the threat of rejection posed by embryonic stem cells. If an embryo's stem cells are not immunologically compatible with the patient into whom they are injected, rejection might occur (as is the case if the tissues of an organ donor and recipient are incompatible). Furthermore, embryonic stem cells have been associated with the undesirable consequence of tumor formation.

On the other hand, the scientific developments encountered in adult stem cell research have been much more favorable. While it was once believed that only embryonic stem cells had the capacity to develop into all types of tissue in the human body, adult stem cells have been demonstrated to be far more pliable than initially believed. For example, in mice, adult neural stem cells have reportedly been demonstrated to produce bone marrow cells that give rise to blood. Also, adult bone marrow stem cells can apparently develop into virtually any human tissue type and reproduce extensively without losing their broad developmental capacity. Such cells were not shown to form tumors and may be transplanted into a patient from whom they were obtained, thereby avoiding the risk of rejection. Adult stem cells may also in many cases carry the added advantage of requiring less intricate manipulation to induce them to produce the desired tissue.

Stem cells derived from adults have, in fact, already been used to benefit human patients suffering from a number of afflictions—including autoimmune diseases (multiple sclerosis, lupus, juvenile and rheumatoid arthritis), stroke, immunodeficiencies, anemia, Epstein-Barr virus infection, corneal damage (with full vision restored in most patients), blood and liver diseases, osteogenesis imperfecta, various cancers (in conjunction with chemotherapy and/or radiation), heart attack, and cartilage and bone damage. Although much of the public believes that embryonic stem cell research holds more medical promise than does adult stem cell research, no comparable list of treatments exists for the former.

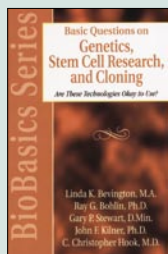
Should I be in favor of stem cell research?

Many scientists and patients believe that stem cell research holds the key to developing treatments or cures for

Alzheimer's, Parkinson's, brain and spinal cord injuries, heart disease, severe burns, and a host of other human diseases and injuries. We applaud the desire to heal people, as long as the means for doing so are ethical. Because embryonic stem cell research is (at least currently) dependent upon the destruction of human embryos, such research is unethical—regardless of its potential for improving human health. The human embryo is a member of the human species and is, therefore, a human being. Each of us was once an embryo—full of unrealized potential, but no less a human being. Painful lessons from U.S. and world history illustrate the horrors that result when human beings are used for medical experimentation without their consent. While we share the desire to relieve suffering and restore health, the intentional destruction of some human beings for the alleged good of other human beings is always wrong.

Those who support embryonic stem cell research often do so on the basis that the embryos involved “are going to die anyway.” However, if we do not permit persons on death row to be killed in order to obtain their organs for life-saving transplants, why should we allow “surplus” human embryos to be destroyed in research? Actually, “surplus” embryos are not necessarily destined to die, as they may be “adopted” and implanted into women who wish to raise them as their own children. Several babies have already been born as a result of embryo adoption. (For more information on a legally established embryo adoption program, visit www.snowflakes.org.)

By contrast, adult stem cell research—which does not require the destruction of embryos—is an ethical means of alleviating suffering that appears very promising and should be enthusiastically supported. ▲



Adapted from *Basic Questions on Genetics, Stem Cell Research, and Cloning: Are These Technologies OK to Use?* by Linda K. Bevington, Ray G. Bohlin, Gary P. Stewart, John F. Kilner, and C. Christopher Hook (Kregel Publications, 2002, pp. 78-88).

Located on Trinity's Deerfield campus, The Center for Bioethics and Human Dignity (CBHD) exists to help individuals and organizations address the pressing

bioethical challenges of our day, including managed care, end-of-life treatment, genetic intervention, euthanasia and suicide, and reproductive technologies. For more information about stem cell research or to purchase a copy of this or other resources, visit www.cbhd.org.

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