Embryonic Stem Cell Research

We all start out life as one cell, a fertilized egg, or zygote. But as we grow, we develop a wide variety of different specialized cells: skin cells, muscle cells, bone cells, nerve cells. Normally, once differentiation has taken place, a specialized cell will only produce more of the same type of cell: skin cells produce only more skin cells. Some specialized cells, such as neurons, do not readily reproduce themselves at all. When a disease or injury causes the loss of certain specialized tissue, the body is not always able to replace the loss with new, healthy tissue. Stem cells offer the potential of creating new healthy tissue that could greatly improve bodily function for victims of spinal cord injury, stroke, burns, heart disease, arthritis, diabetes, and other diseases.

What are stem cells? Stem cells are cells that are capable of producing a variety of different, specialized cells. They have three defining characteristics: they can divide and renew themselves for long periods, they are themselves unspecialized, but can give rise to specialized cells. Stem cells are found both in embryos and in adult organisms. Embryonic stem cells are derived from embryos. In the process of in vitro fertilization, many embryos are created in the hopes that some will successfully implant in the mother's womb and mature to be born. Once the mother has either successfully born the number of children she desires, or gives up on the process, remaining embryos may be discarded, kept frozen, or donated to research. Or, embryos are created specifically for the purpose of harvesting stem cells (therapeutic cloning). When stem cells are harvested from the embryo, the embryo dies.

Embryonic stem cells are referred to as pluripotent (able to develop into almost any type of cell). Embryonic cell lines have been developed which continue to renew themselves in the laboratory, eliminating the need to repeatedly isolate stem cells from tissue.(1) However, there are some major difficulties which have prevented embryonic stem cells from being used successfully in treatment. First, there is the rejection of the new cells by the host body, requiring the use of immune-suppressing drugs. If only a few cell lines are being used to produce these embryonic stem cells, there is no genetic variety to produce a closer match to the host patient. The development of a multitude of cell lines will require the destruction of a multitude of embryos. Secondly, some studies have shown a risk that embryonic stem cells, when injected into the host body, can form tumors.(2)

Adult stem cells can be found in a variety of adult tissues. Adult stem cells tend to be less versatile than embryonic cells, and less able to maintain themselves as a stable cell line in the lab. Multipotent, rather than pluripotent stem cells can differentiate into a small number of different types of specialized cells. The bone marrow, for example, contains stem cells capable of producing a variety of specialized blood cell types (but not muscle or skin). Bone marrow transplants have been used for 40 years as a treatment for leukemia, after destruction of the patient's own cancerous marrow. It has recently been discovered that many types of tissues, including the brain and the heart, contain stem cells, which are capable of differentiating into different types of cells. The stem cells in the brain, for example, are able to differentiate into various kinds of cells found in the brain, although it had long been believed that it was impossible to replace damaged neurons. "Adult" stem cells can also be found in cord blood, the blood from the umbilical cord and placenta that is routinely discarded after birth. These cells seem to be less likely to be rejected by the host body than either bone marrow cells or peripheral blood stem cells.(3)

It has also recently been shown that some specialized adult cells can be re-programmed to become similar to embryonic stem cells. These cells are called induced pluripotent stem cells (iPSCs). These kinds of cells can be produced from a patient's own cells, giving the significant advantage that there would be no rejection of the cells by the patient's immune system.(1) One scientist has been quoted as stating that these cells fill all the criteria proposed for embryonic stem cells, with the exception that the iPSCs are not

derived from embryos.(4) The use of induced pluripotent stem cells (iPSCs) still have the same difficulties with tumor production as embryonic stem cells. An addition problem with iPSCs is that they are produced with the use viruses that may pose additional risks for patients. However, progress is already being made to produce iPSCs without the use of dangerous viruses.(5)

Is it Right? The ethical debate, then, focuses on the use of embryonic stem cells, which are obtained by killing embryonic human children. There is no objection to the use of adult stem cells (including those from cord blood), which in fact have been successfully used in several treatments, while embryonic stem cells have yet to be successfully used in any treatment. There is also no objection to the use of iPSCs, since no harm is done to anyone in the production of those cells. While the alleviation of suffering and the cure of disease are worthwhile objectives, the desire to benefit someone else cannot justify the killing of any human person. A human embryo, however small, however it came into being, is still a human person, created by God, in His image, and deserving of respect. Some argue that the "spare" embryos from in vitro fertilization would die anyway if not used for research, and therefore it is justified to use them. However, the fact that a person is likely to die, or has been abandoned by their parents, does not convey the right to kill them.(6)

References:

1. "Stem Cell Information" from the National Institutes of Health, 2009, retrieved November 22, 2010 from http://stemcells.nih.gov/info/basics/ .
2. "Stem Cells May Cause Brain Tumors", from MSN, 2006, retrieved 11 November 22, 2010 from http://www.msnbc.msn.com/id/15385500/. and "Stem Cell Tumor a Cautionary Reminder", from Wired Science, 2009, retrieved November 22, 2010 from http://www.wired.com/wiredscience/2009/02/stemcelltumor/.
3. "Stem Cell Therapies Today" from the University of Utah, retrieved November 22, 2010 from http://learn.genetics. utah.edu/content/tech/stemcells/sctoday/ .
4. James Thompson, in (*Science*, 21 December 2007).
5. The Company of Biologists (2009, March 3). New Safer Way Developed To Reprogram Stem Cells. *ScienceDaily*. Retrieved November 22, 2010, from http://www.sciencedaily.com /releases/2009/02/090227112303.htm
6. "On Embryonic Stem Cell Research", from the United States Conference of Catholic Bishops, 2008, retrieved November 22, 2010 from http://www.usccb.org/prolife/issues/bioethic/stemcell/index.shtml.

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