

EMBRYONIC STEM CELLS VS. ADULT STEM CELLS

Stem cells can be divided into 2 major types: embryonic and adult. The goals of stem cell research are similar, no matter where the stem cells come from. In some respects, adult stem cell research and embryonic stem cell research are competing technologies.

What are the pros and cons of these 2 types?

Embryonic stem cells are obtained from embryos at about 5-7 days of age at the time they would be ready to implant in a uterus. Cloned embryos or noncloned embryos such as those leftover from in vitro fertilization can be dissected for their embryonic stem cells. The embryo must be killed to obtain these cells. The stem cells obtained from one embryo can sometimes be induced to divide and grow in a Petri dish for an extended time—these cells are called an embryonic stem cell line. Production of an embryonic stem cell line is very inefficient. For example, last spring Harvard scientists destroyed over 340 human embryos to produce only 17 human embryonic stem cell lines. *Scientists have been working with embryonic stem cells in animals for about 20 years, and with human embryonic stem cells since 1998.*

- Embryonic stem cells...
 - Can turn into virtually all tissue types
 - But it is difficult to control what these cells turn into; they can form tumors
 - May be rejected
 - Can have genetic or other abnormalities after being grown in a culture
 - In spite of the 20 years these cells have been used in animal research, there have been few successes --it would be unsafe and unconscionable to proceed with human trials
 - They have not been used for one single human clinical study
- Cloned embryonic stem cells (*used in the process of “therapeutic” cloning*) have additional problems when compared to their uncloned counterparts. They...
 - Are diseased; current health standards would not allow their use in patients
 - Can also be rejected (explanation complex)

Adult stem cells can be obtained from umbilical cord blood, placenta, infants, children, and adults. No significant harm is done to the human from which adult stem cells are obtained. Until recently, it was thought that adult stem cells were only in bone marrow. Now they have been found in many different tissue types. There is also evidence that these cells may be able to turn into other tissue types or induce damaged tissue to regenerate.

ADULT STEM CELL (ASC) RESEARCH....

- Is **safe**--Usually involves use of a patient's own cells
- **Does not harm human embryos**
- Is **successful**--Has been used in **over 50 human clinical applications** for a wide range of disorders (heart failure, stroke, immune disorders, cancers, spinal cord injury, diabetes, Parkinson's disease, many more.....)
 - Has also been successful in the lab, although more research is still necessary to develop repeatable methods of working with these cells
 - ASCs are found not only in bone marrow, but in other tissues like fat and heart
 - ASCs have been shown to turn into different tissue types in the lab
 - Bone marrow stem cells from human patients have been found to repair damaged tissue in organs outside the bone marrow. Whether they are actually turning into other cell types in vivo or simply inducing repair of native tissue may not be clear, but studies are showing success and some controlled trials have been done

On both scientific and ethical grounds, adult stem cell research is clearly the best choice. If limited resource dollars are put into human embryonic stem cell research and “therapeutic” cloning, money will be diverted from much more promising research like that being done with adult stem cells. When ethical concerns conflict with scientific possibilities, the ethics must always prevail, or society risks losing human dignity in an attempt to refine it.

Websites to explore for further information:

www.stemcellresearch.org

www.cloninginformation.org

Example of adult stem cell research working better than that with ESCs in animals: 2 experiments with diabetic mice, one using ESCs, the other ASCs

- 1. ESC experiment: ESCs obtained from mice and stimulated to form insulin-producing cells. These cells were transplanted into diabetic mice; unfortunately, not enough insulin was produced and the mice died¹*
- 2. ASC experiment: Pancreatic stem cells obtained from adult mice and form insulin-producing cells. These cells are transplanted into the diabetic mouse; 100% of the needed insulin is produced and the mouse is cured²²*