

REBUILDING THE BODY: Embryonic vs. Adult Stem Cells

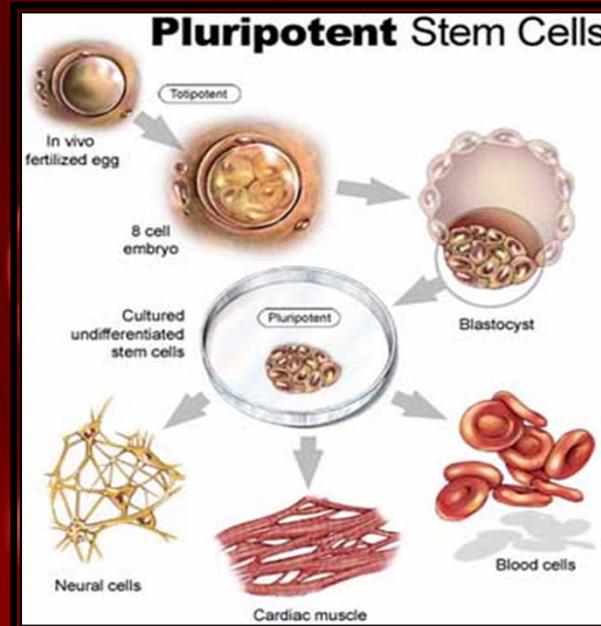
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Background

Stem cells are cells that have the ability to function as any type of body cell. These cells have been found to be very helpful in replacing and repairing failed organs. As scientists began studying the embryo, they realized that embryos had cells with no specific task. These cells are now known as embryonic stem (ES) cells. These stem cells have been proven to repair damaged organs. However, many people find it unethical to use human embryonic tissue for science. Recent research found that adult stem cells can be used as an alternative to ES cells, but their effectiveness is still unknown. These cells are found in places such as the bone marrow and the skin. Hopefully, adult stem cells will play an instrumental role to bring about remarkable improvements in the medical field.

Embryonic Stem Cells

- Stem cells can be derived outside the body by fertilizing the donated sperm and egg in a lab culture and preserved for later use (in-vitro fertilization).
- An ES cell has a greater scope to transform itself into a specific cell and hence has an increased potential to cure diseases.
- Since the ES cell is new, there is almost no chance of mutation due to DNA abnormalities.
- The embryo develops quickly, producing cells at a greater rate.
- Anti-rejection drugs are often used for ES cell therapy.



Source: "The Basics of Stem Cells Biomedical Engineering Blog." Amy Shah / Biomedical Engineering Blog. <<http://www.amyshah.com/stem-cells>>

The ethical debate over the use of embryonic stem cells

The history of embryo research which now includes stem cells has been closely intertwined with the abortion debate for the last 30 years. Both debates include the argument over the Loss of Future Human Life, the idea that destroying an embryo is destroying the possible life of another human being. On one side of the debate, the blastocyst is considered potential human life because it has genetic information. On the other side of the debate, a sperm and an egg alone have no potential for human life so fertilizing them in a lab culture does not impact the Loss of Future Life. In recent studies, scientists have been looking to end this ethical debate with the new findings of turning adult cells into induced pluripotent stem cells.[1,2]

Adult Stem Cells

- Adult cells that have been genetically reprogrammed to an embryonic stem cell-like state by altering the genes to acquire the properties of embryonic stem cells are called induced pluripotent stem cells.
- The tissue transplanted into the organism is produced by its own body, increasing the chances of acceptance while making harmful drugs unnecessary.
- The adult stem cell is developed through multiple methods starting with a specified cell working backwards to make a cell that can perform the functions of another cell. [3]
- Because the cell previously had a specific function, its capabilities are limited.
- It is possible for the DNA of the cell to have developed mutations throughout its life.
- Adult stem cells take a longer time than embryonic stem cells to reproduce.

Pros	Cons
Can be cultured (IVF)	Possible rejection
Greater differentiation	Drug side-effects
No abnormalities	Is it ethical?[3]
Quick growth rate	

Pros	Cons
Greater chance to be accepted.	Must be produced
No need for drugs.	Less versatile
No ethical opposition	Possible abnormalities
	Slow growth rate

References

- [1]: Philip J .Nickel, "Ethical issues in human embryonic stem cell research." *Fundamentals of stem cell debate: The scientific, religious, ethical and political issues*. Kristen Renwick Monroe, Ronald B. Miller & Jerome Tobis, editors. University of California Press; 1st edition (December 11, 2007), pp. 62-78.
- [2]:D C Wertz. "Embryo and stem cell research in United States: History and politics." *Gene Therapy* Vol. 9: Issue 11 (June 2002), pp. 674-678.
- [3]:Hiroshi Yukawa, Hirofumi Noguchi, and Shuji Hayashi. "Embryonic body formation using the tapered soft stencil for cluster culture device." *Biomaterial* Vol. 32: Issue 15 (February 2011), pp. 2729-2738.

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