

SNC2D1-02 – Mr. Vincent & Mrs. Chab



# Embryonic Stem Cells

An Analysis of embryonic stem cell research and use

By: Taslimul , Muid, Asiah , Shifah

2010-11-25

# Table of Content

Abstract	2
What is a stem cell?	2
What is an embryonic stem cell?	3
Facts about embryonic stem cell	4
Application of embryonic stem cell	5
Ethical and Societal Implication	6
Pros & Cons of embryonic stem cell	6
Conclusion	7
Refrence	8-9

## Abstract

*“Science... never solves a problem without creating ten more.”*

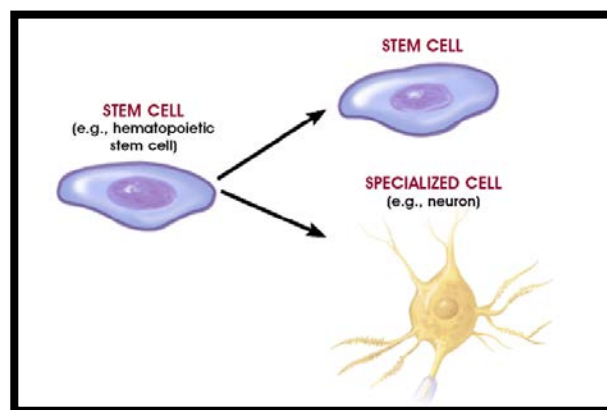
(George Bernard Shaw, an Irish literary Critic and a Literacy Nobel Laureate).

Embryonic Stem Cells have been a medical breakthrough and often coined “The Medical Revolution”. The Embryonic stem cells have been the reason of much excitement in the globe of science, yet it has brought a host of ethical and societal apprehension and concern. George Shaw’s words remain true and embryonic stem cells are of no exception. Stem cells have plenty of potential and boast the capability to resolve a great deal of medical concern.

Stems cells have the ability to differentiate into specialized cells and these specialized cells run our entire human body by performing different functions and serving different purposes, particularly embryonic stem cells which can differentiate into any type of specialized cells unlike adult stem cells. The possibilities are endless with embryonic stem cells, but at the same time the concerns are of significant.

### **What is a stem cell?**

Stem cells are cells that are found in all multi cellular organisms. Stems cells are also unspecialized cells that have two defining properties: 1) **The ability to differentiate into other cells and** 2) The ability to self-regenerate. The ability to differentiate is the potential to develop into other cell cell types. The ability to differentiate is the potential to develop into other cell types. A totipotent stem cell (e.g. fertilized egg) can develop into all cell types including the embryonic membranes. A pleuripotent stem cell can develop into cells from all three germinal layers (e.g cells from the inner cell mass). Self-regeneration is the ability to of stem cells to divide and produce more stem cells.

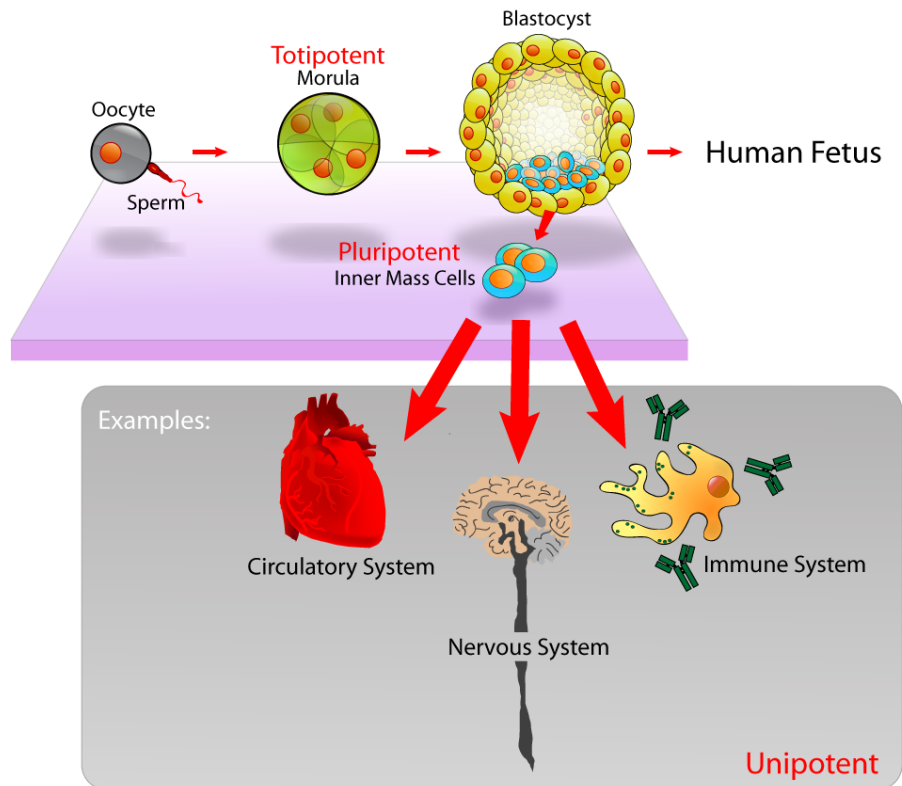


*Stem Cell Differentiation*

During early development, the cell division is symmetrical i.e. each cell divides to gives rise to daughter cells each with the same potential. Later in development, the cell divides asymmetrically with one of the daughter cells produced also a stem cell and the other a more differentiated cell. Three processes in which stem cells play a central role in an organism, development, repair of damaged tissue, and cancer resulting from stem cell division going awry.

## What is an embryonic stem cells?

Embryonic Stem Cells are cells derived from the inner cell mass of the early embryo, which are harvested from the donor mother animal. Most of these cells are derived from embryos that develop from eggs that have been fertilized invitro (in a glass). They are not derived from eggs fertilized in a womans body. Embryonic stem cells are noted by two properties: their pluripotency and their ability to bend back on it. Embryonic stem cells are pluripotent, they are able to differentiate into all three primary germ layers: ectoderm, endoderm and mesoderm. In other words, they can develop into each of the more than 200 cell types of the adult body.



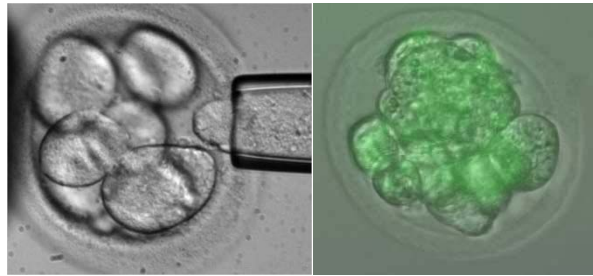
Pluripotency distinguishes embryonic stem cells from adult stem cells found in adults; while embryonic stem cells can generate all cell types in the body, adult stem cells are multipotent and can only produce a limited number of cell types. Embryonic stem cells are able to reproduce indefinitely. This allows embryonic stem cells to be employed as useful tools for both research and regenerative medicine, because they can produce unlimited numbers of themselves for continued research or clinical use.

## Facts about embryonic Stem Cells

There are two types of stem cells. One is an adult stem cell and the other type is embryonic stem cells. Adult's stem cells often replace the tissues in the bone and muscles.. Embryonic stem cells are able to become and form into any type of cell and repair tissues in the different parts of the body.

A list of diseases and Ailment that embryonic cells could potentially be able to treat:

- Parkinson's disease
- Spinal cord injuries
- Alzheimer's diseases
- Stroke
- Skin burns
- Arthritis
- Birth defects
- Diabetes
- Heart disease



*Embryonic Stem Cells*

Embryonic stem cells renew themselves through cell division for longer periods of time, unlike specialized cells such as muscle cells or bone cells. Because embryonic stem cells reproduce easily, they can offer an almost unlimited basis of cells essential in medical research.

- ◆ Embryonic stem cells can be used to test drugs and in medical treatments(organ donor). This will help the even out the organ donor to supply ration because currently the number of organ donors are few compared to the number that need organ supplies.
- ◆ Embryonic stem cells are derived from eggs fertilized in the laboratory. This process does not occur in the body of a woman.
- ◆ People against embryonic stem cells argue that these cells are unborn child and therefore should not be used for the purpose of research. This is one of the main arguments of the opposition

*Interesting Fact: The isolation of an embryonic stem cell from human was made possible in 1998.*

## Application of Embryonic stem cells

Since embryonic stem cells are the pluripotent cells, they have the ability to differentiate into any type of cell. Embryonic stem cells have a tremendous potential to change the life of people affected by Alzheimer's disease, Parkinson's disease, cancer also many other chronic and heretic disorder and diseases. This can be done thru creating drugs using cultured embryonic stem cells to target specific conditions found in the patients. With stem cells you can create identical organs for patients (preventing rejection from the body) who need an organ transplant using somatic cell nuclear transplant.



*Artificial heart created thru embryonic stem cell culture*

Embryonic stem cells also have the ability to repair damaged tissues of vital organs of our body, like the heart. Another major implication of embryonic stem cells is to be used as a solution to cancer, which is one of the leading causes of death in North America. Embryonic stem cells are also much easier to use compared to adult stem cells.

### ***Method of Embryonic stem cell culture and use:***

The two most known way of culturing embryonic stem cell is In vitro Fertilization, which is a simply fertilization done in a controlled environment, and Somatic Cell Nuclear Transplant (SCNT) which allows for duplication or cloning of identical organs and tissues.

***In vitro Fertilization*** - In vitro fertilization is the method in which stem cells are harvested. Once the fertilization of an egg is complete and the cells start to divide, a blastocyst is formed. There are two layers in a blastocyst. The trophoblast and the inner cell mass which ultimately becomes the embryo. These embryos are moved to Petri dishes where it multiplies and colonizes. These embryos can now be specialized by adding appropriate signalling molecules. These stem cells go on to develop specific properties and can be turned into bone cells, pancreatic cells, etc.

***SCNT*** –First the nucleus of the egg is removed from the donor. Then using a biopsy one cell containing a nucleus is taken from them. For example skin cells. Then the nucleus containing the patient's genetic material is put into the enucleated egg. Now these cells go thru In vitro Fertilization and later are used for transplants for the patients. SCNT prevents organ and tissue rejection since the organs and tissues have the same genetic make-up.

## Ethical and Societal Implication

Embryonic stem cells have been an ethical problem from the beginning. When the Inner cell mass is extracted from the cell, the embryo dies. The ironic matter is that a potential life has to be killed to save someone else's life.



Embryonic Stem Cells	
Pros	Cons
<ul style="list-style-type: none"> <li>• Could be the solution to many diseases such as Parkinson's, Alzheimer's, etc.</li> <li>• May proved a possible cure for cancer that is permanent</li> <li>• Million of potential patients who can largely benefit from this technology</li> <li>• Much easier to use than an adult stem cells</li> <li>• An embryonic stem cell is not really considered a life form as it is a clump of cells.</li> </ul>	<ul style="list-style-type: none"> <li>• It is an activity which requires the deliberate killing of potential human life.</li> <li>• Killing of an embryo is not justifiable to many.</li> <li>• Religious stand points consider it a life and therefore are against it.</li> <li>• May go into the hands of private company who may use the technology in even more unethical ways and forms.</li> <li>• Faces strong challenges on moral and ethical ground.</li> </ul>

From the religious perspective it is seen that life is in the hands of god and many believe that life begins as soon as conception occurs or the fertilization of the egg occurs. For them this is unethical and morally intolerable. The blastocyte is considered a life by many and ending it is an inhuman act as it is a potential life that never got the change to live. So ethics is a big compromise when it comes to embryonic stem cells although technology seems to outweigh that factor.

## **Conclusion**

Overall, despite embryonic stem cells strong ethical and moral challenges, it is a great technology. This technology could revolutionize the medical world and for that fact our entire world. The embryonic stem cells contain answers to many issues our world is plagued with today, like cancer. It can be used for the betterment of our society and open doors to even more discovery. Although the ethical stand point tells us that a life is a life, with this technology we may find different ways of producing stem cells and eliminate the ethical and societal impacts.

This technology is capable of widening our world, our perception, our ability to understand and pave the way to a better future for our children and generations to come!





## Resource

- ResearchChannel. (n.d.). YouTube - Understanding Embryonic Stem Cells . YouTube - Broadcast Yourself. . Retrieved November 24, 2010, from <http://www.youtube.com/watch?v=nYBNZJ8Xck&feature=related>
- witfnewmedia. (n.d.). YouTube - Embryonic stem cell animation . YouTube - Broadcast Yourself. . Retrieved November 24, 2010, from [http://www.youtube.com/watch?v=-FfO\\_3xymU&feature=related](http://www.youtube.com/watch?v=-FfO_3xymU&feature=related)
- Human Embryonic Stem Cells. (n.d.). *Sumanasinc*. Retrieved November 10, 2010, from [www.sumanasinc.com/webcontent/animations/content/stemcells\\_scnt.html](http://www.sumanasinc.com/webcontent/animations/content/stemcells_scnt.html)
- teams, t. s., Japan, o. i., America, o. i., scientifically, b., & ethically.. (n.d.). Key Moments in the Stem-Cell Debate : NPR. NPR : National Public Radio : News & Analysis, World, US, Music & Arts : NPR. Retrieved November 2, 2010, from <http://www.npr.org/templates/story/story.php?storyId=5252449>
- Discover8 - News for Life Science - heart transplants. (n.d.). Discover8 - News for Life Science. Retrieved November 17, 2010, from <http://discover8.com/keyword/heart%20transplants>
- What are embryonic stem cells? [Stem Cell Information]. (n.d.). NIH Stem Cell Information Home Page. Retrieved November 20, 2010, from <http://stemcells.nih.gov/info/basics/basics3.asp>
- Embryonic stem cell - Wikipedia, the free encyclopedia. (n.d.). Wikipedia, the free encyclopedia. Retrieved November 22, 2010, from [http://en.wikipedia.org/wiki/Embryonic\\_stem\\_cell](http://en.wikipedia.org/wiki/Embryonic_stem_cell)
- Kochar, P. (n.d.). What ar Stem Cells?. Pro Quest. Retrieved November 18, 2010, from [www.csa.com/discoveryguides/stemcell/overview.php](http://www.csa.com/discoveryguides/stemcell/overview.php)
- Fast Facts on Stem Cells - ABC News. (n.d.). ABCNews.com - ABCNews.com: Breaking News, Politics, World News, Good Morning America, Exclusive Interviews - ABC News. Retrieved November 22, 2010, from <http://abcnews.go.com/Health/US/story?id=785936>

## **Pictures**

- <http://medicineworld.org/images/blogs/6-2008/embryonic-stem-cell-6660.jpg>
- <http://thenewsoftoday.com/wp-content/uploads/2010/08/embryonic-stem-cell-research.jpg>
- [http://www.mbm.med.uni-goettingen.de/bilder\\_artikel/Bild\\_BioT-0759-UMG\\_SSC.jpg](http://www.mbm.med.uni-goettingen.de/bilder_artikel/Bild_BioT-0759-UMG_SSC.jpg)
- <http://www.brown.edu/Courses/BI0032/adltstem/stem-cell.gif>
- <http://discover8.com/keyword/heart%20transplants>
- <http://www.memebox.com/futureblogger/show/93-77-years-of-technology-wonders-and-the-future-looks-even-brighter>
- <http://hummersandcigarettes.blogspot.com/2010/10/stem-cell-research-new-breakthroughs.html>
- <http://makemorestemcellsinfo.com/tag/stem-cell-research/>