

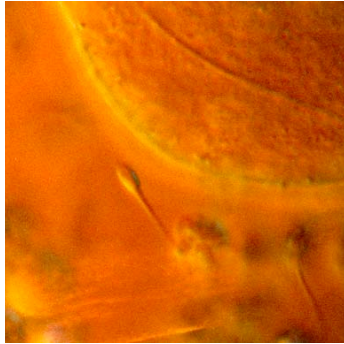
Stem Cell Science: Embryonic Stem Cells

US275 Scientific Ethics
John R. Hoffman
Arcadia University



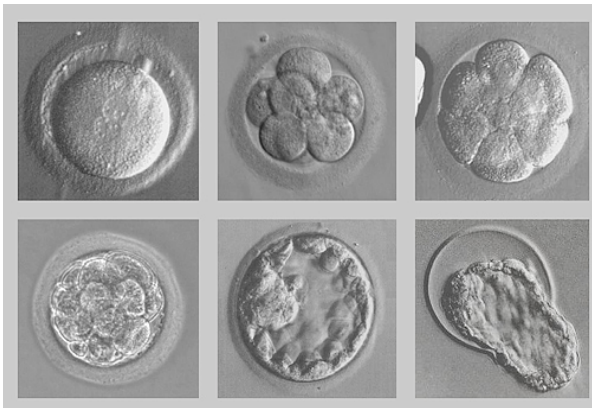
In vitro fertilization is a method of treating infertility.

- in a laboratory setting
 - combine egg and sperm
 - outside of the body
- if necessary, can use donor eggs or donor sperm



A light micrograph image showing the encounter between sperm and ovum during in vivo fertilization
http://www.nobelprize.org/nobel_prizes/medicine/laureates/2010/edwards-photo.html.

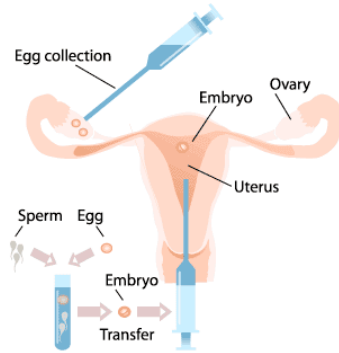
Human embryos developing *in vitro*



The photos show a fertilized egg, 8-cell stage, cell adhesion, a compacted morula, a blastocyst and zona hatching. Wikimedia Commons

The zygote develops and can be tested prior to implantation

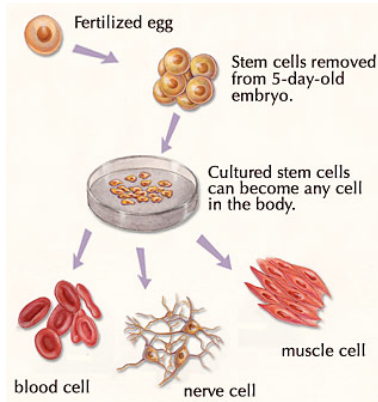
- zygotes
 - can be tested
 - can be frozen until needed
- implanted into uterus
- allowed to develop into an embryo and fetus.



<http://defeatinfertility.com/quality-ivf-information/>

Embryonic stem cells are isolated from embryos that would not be implanted.

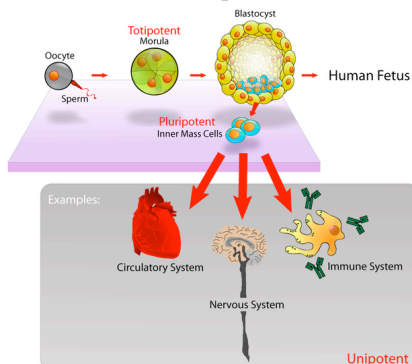
- in vitro fertilization produces many embryos
- extra embryos are stored in liquid nitrogen
 - to be used for later implantations



http://www.exploratorium.edu/imaging_station/gal_media/story_assets/stem_cells_sidebar_images/cultivation-ig.jpg

Embryonic stem cells are isolated from embryos.

- inner cell mass
- pluripotent
 - ability to produce many different cell types

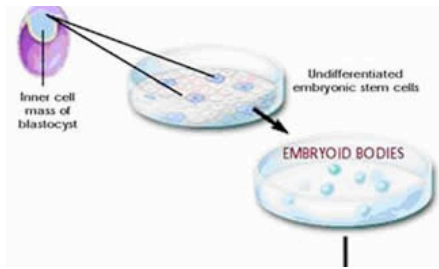


The source of pluripotent stem cells from developing embryos.
Mike Jones, 2006

Stem cell lines are established and well-studied.

- Embryonic stem cells

- continue to divide
- remain unspecialized
 - undifferentiated
- if successful,
 - can generate millions of embryonic stem cells

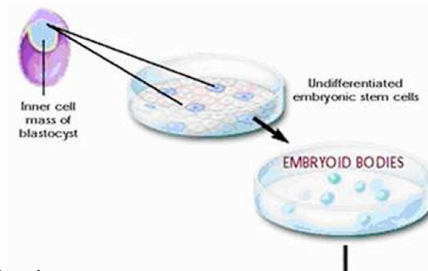


http://stemcells.nih.gov/staticresources/images/figure1_lg.jpg

Changing conditions for the stem cells will cause them to begin to develop.

- Embryoid bodies

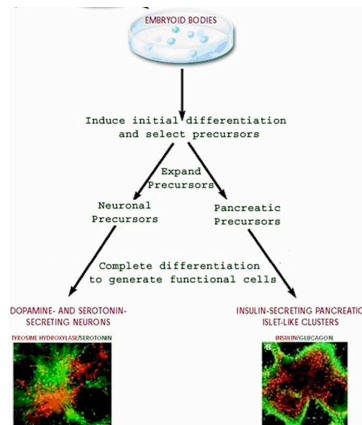
- cells continue to divide
- begin to clump together
- cell begin to develop
 - stop being stem cells when they begin to differentiate.



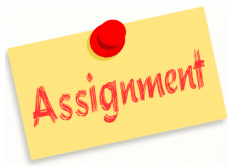
http://stemcells.nih.gov/staticresources/images/figure1_lg.jpg

The developing cells can be supported and selected based on specific characteristics.

- altering the conditions that the cells are growing in
 - allows for differentiation
 - become specific types of cells
 - that may have medical implications



http://stemcells.nih.gov/staticresources/images/figure1_lg.jpg



Assignment

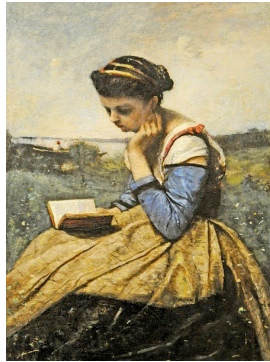
When does the embryo/fetus become an individual that has a protected status?

The discussion around embryonic stem cells is often approached as to when human life begins. The egg and sperm cell are human and alive, so life is present at all stages. A better way to examine this question is to consider when human beings begin. To help in considering this question, please read "When do human beings begin? 'Scientific' myths and scientific facts" at <http://www.all.org/abac/dni003.htm>

In your discussion group, consider the question: When does the embryo/fetus become an individual that has a protected status?

Readings

Stem Cell Information: The official National Institutes of Health resource for stem cell research. National Institutes of Health. (retrieved January 29, 2008) <http://stemcells.nih.gov/info/basics/>



Stem Cells. (April 19, 2005). Science Now. (video approximately 15 minutes long) <http://www.pbs.org/wgbh/nova/sciencenow/3209/04.html>

Woman Reading in a Landscape
Jean-Baptiste Camille Corot, 1869

Any Questions?

Email me at:
hoffmanj@arcadia.edu



<http://www.vipitbullkenels.com/images/animated-question-mark.gif>