Stem cells … Ethical view

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Stem cell research (research on stem cells and their use in medicine) is an exciting new field of study that could lead to major breakthroughs in the medical field. Stem cells have the potential to form many different types of tissues, and therefore show promise for treating many types of diseases and even disabilities. The main point of dispute over the use of stem cells is in the origin of the stem cells. These cells can be found in human embryos and in adult tissue, but harvesting stem cells from human embryos requires that the embryo be destroyed. Although stem cell research offers huge potential, it is still considered a controversial field of study.

What are stem cells?

Stem cells are biological cells found in all multicellular organisms, that can divide (through mitosis) and differentiate into diverse specialized cell types and can self-renew to produce more stem cells. In mammals, there are two broad types of stem cells: embryonic stem cells, which are isolated from the inner cell mass of blastocysts, and adult stem cells, which are found in various tissues. In a developing embryo, stem cells can differentiate into all the specialized cells (these are called pluripotent cells), but also maintain the normal turnover of regenerative organs, such as blood, skin, or intestinal tissues.

A stem cell is a remarkable cell, as it has the amazing ability to change into a variety of different cell types in the body such as heart muscle cells, brain cells, and skin cells. Stem cells, which are often referred to as one of the body's "master cells," can grow into any one of the body's more than 200 cell types. Stem cells assist the body in maintaining, renewing and repairing tissue and cells damaged by disease, injury and everyday life. If you think about it, stem cells act as the internal repair system for the body.

Types and sources of Stem cells.

Stem cells are found in all of us

Embryonic stem cells

Embryonic stem cell lines are established from embryos shortly after fertilization. To create an embryonic stem cell line, an embryo must be separated into individual cells. A single cell from the embryo is placed in a dish and provided with nutrients and growth factors that stimulate it to divide. The resulting cell line will continue to divide as long as it is kept in a controlled environment and provided with appropriate growth factors to prevent differentiation.

Currently, most embryonic stem cell lines are created using mouse embryos. Researchers are currently evaluating several other sources for embryonic stem cells:

- **Embryonic stem cells from IVF embryos.**

  Human embryonic stem cell lines can be derived from embryos created through in vitro fertilization (IVF). Usually, fertilization occurs within a woman's body, but IVF technology has made it possible to carry out fertilization and grow embryos in the laboratory. This technology has made it possible for many otherwise infertile couples to have children. In many cases, however, not all of the embryos created will be used, and the remaining embryos are frozen and stored. These embryos are potential resources for scientific research.

- **Embryonic stem cells from therapeutic cloning.**

  Embryonic stem cells can also be created by the same procedure used to clone whole organisms, such as Dolly the sheep. Because of its potential medical uses, this method for creating stem cells is called therapeutic cloning.

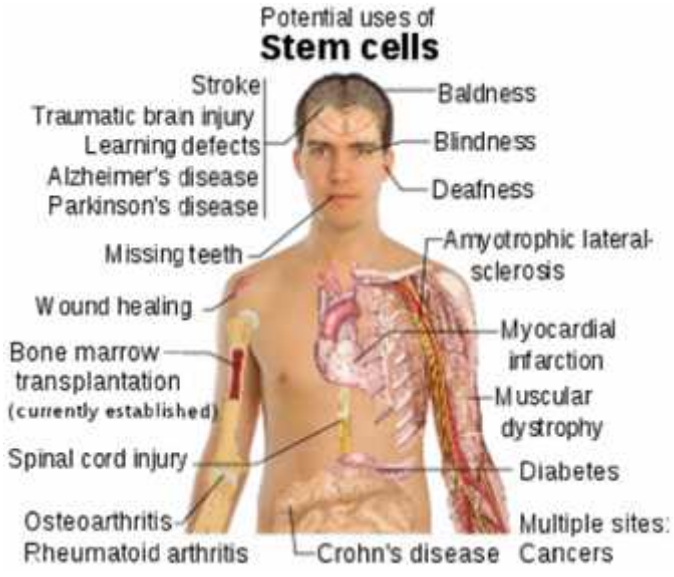
  In this procedure, a nucleus from an adult donor cell is inserted into a recipient egg cell from which the nucleus has been removed. The nucleus provides all of the necessary genetic information, in the form of DNA, for a cell to function and divide. The resulting cell is then stimulated to divide as a zygote would, resulting in the growth of embryonic stem cells that are genetically identical to the adult donor cell.

  Therapeutic cloning might be a viable approach to growing an exact tissue match for a patient in need - if the donor nucleus came from the patient, the resulting embryonic stem cell line would be a perfect match.

Adult stem cell lines

Adult stem cell lines isolated from mature tissues are another excellent resource for research studies. Most research is performed using adult stem cell lines from model organisms such as mice and rats, since obtaining adult stem cells from humans can involve invasive surgical procedures.

Stem cell research



STEM CELL TIMLINE

1956- First successful bone marrow transplant.

1981 - Embryonic stem cells are isolated from mouse blastocysts**.**

1988 - Hematopoietic (blood) stem cells from adult mice are purified and characterized**.**

1992 - Stem cells are Identified in the Adult human brain**.**

1998 - The first human Embryonic stem cells are isolated**.**

2001 - Mouse embryonic stem cells are created by nuclear transfer **.**

2002 - Pancreatic cells derived from mouse embryonic stem cells Cure diabetes in mice**.**

2004 -The type of nerve cell lost in Parkinson's disease is produced from Human Embryonic stem cells.

Religious and Ethical views about stem cell research

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Due to the importance of such research, there has been a lot of arguments regard the use of stem cells, specially the embryonic stem cells. In Islamic religion this issue has been discussed in details in the Islamic council that was held in Mecca city on the 23-10.1424 and concluded the followings:

Access to stem cells is approved if they are cultured for the purpose of research and diseases treatment by which its source should be legal, as in :

- From adults with their permission and if the process with have no serious side effects.
- From children, with their parent's permission and if there is no serious side effects.
- Placenta and umbilical cord post delivery and with the parent's permission.
- Embryos post non intentional miscarriage and with parent's permission.

Illegal cases where use of stem cells is prohibited:

- Embryos post intentional abortion and without a medical cause justified by religion.
- Fertilization between an oocyte from a female donor and a sperm from a male donor.
- Donation of excess fertilized oocytes produced from IVF process.

Stem cells … Around the world

National policies on stem cell and cloning research

Embryonic stem cell research is banned in:

Austria ,Ireland ,Lithuania & Poland It is tightly restricted in Germany and Italy.

Embryonic stem cell research using spare IVF embryos only is <u>allowed</u> in:

Australia ,Brazil ,Canada ,Denmark ,France Japan ,Netherlands ,Spain & Switzerland

Countries that *<u>allow</u> research cloning (with <u>varying</u> <u>degrees</u>* of regulatory oversight) include:

China ,Cuba ,India , Singapore ,South Korea & Israel

United State policies on embryonic stem cell research
vary from active encouragement to explicit bans.

Research cloning is currently banned in:

- Arkansas - Indiana - Iowa Michigan - North Dakota - South Dakota
- Arizona prohibits the use of public funds for research cloning.
- Virginia appears to ban research cloning, but the law is unclear.

Research cloning is specifically legal in:
- California - Illinois - Massachusetts - New Jersey - Rhode Island.

<u>References</u>

1 - Stem Cells and Public Policy , by Richard Hayes. 2006
The Century Foundation
www.tcf.org

2 - Understanding Stem Cells Booklet.
National Academy of Sciences
www. national-academies.org

3 - Stem Cell Research and Applications. 1999
American Association for the Advancement of Science and Institute for Civil Society

4 - Stem Cell Research. 2005
Congressional Research Service - The Library of Congress

5 - Stem Cell Unit , King Saud University.
www.stemcell.org.sa