

Misconceptions in Stem Cell Research: The Pursuit for the Truth

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Introduction:

Stem cell research is one of the most **controversial** topics in the world today. The use of embryos is a major **ethical roadblock** in an area of research that could be a game changer in the field of medicine. The heightened emotions surrounding this controversial subject may be leading to **misconceptions** about stem cell research. By creating a survey and gathering data, I will be able to see if there are common misconceptions shared with the public. Educational level, religious view, age, and/or ethnicity might play a role in these misconceptions, so I will ask about these in the survey. The end result may show correlations with the data I collect. By clearing up these misconceptions with actual facts in a finalized pamphlet or handout, people may **become more accepting** of this type of research and push for the **advancements** that are possible through stem cell use, such as **regenerative medicine**.

Research Question:

Are there misconceptions regarding stem cells that are hindering the push for research? If these misconceptions are clarified with the actual facts, people may become more accepting of the research and may desire to push for these medical benefits.

Background:

Given all of the misconceptions about the topic of stem cells, it is important to understand what the science is really about. Stem cells can be imagined as the **building blocks of nature**. Stem cells have the ability to produce any type of cell in the body. They are found in embryos and can give rise to the **three germ layers** in humans. Stem cells are also found in certain areas of the body where they help in **tissue repair and renewal**. In the beginning, scientists were only able to grow stem cells from certain vertebrates. Now, scientists are able to culture human embryonic stem cells. This has raised ethical concerns, but also has contributed to a great deal of **hope** for the researchers and for the patients needing treatments from these stem cells (Stem Cell Information, 2015).

Three Key Facts About Stem Cells

- The defining characteristic of a stem cell is that it can self-renew or differentiate.
- Stem cells enable the body to grow, repair and renew.
- There are three types of stem cells:

Tissue Stem Cells
In the fetus, baby and throughout life. Found throughout the body, each type gives rise to at least one type of more specialized cell. For example, blood stem cells are found in the bone marrow.

Embryonic Stem Cells
A blastocyst. The cells inside are the inner cell mass. These cells, then grown in the lab, are called embryonic stem cells. Varying factors are added to differentiate the ES cells into any cell type.

Induced Pluripotent Stem Cells (iPSCs)
Cell from the body. Genetically reprogrammed. Pluripotent cell ['embryonic-like']. iPSCs are grown in the lab. Varying factors are added to differentiate the iPSC cells into any cell type.

Differentiation (Specializing)
Specialized cell (e.g. muscle cell, nerve cell)

Self-Renewal (Copying)
Stem cell

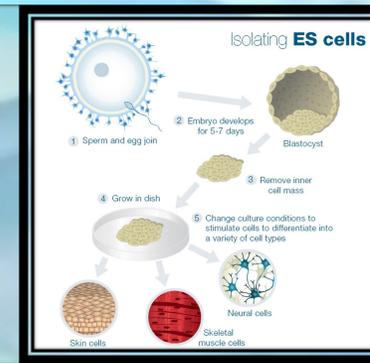
Embryonic stem cells and iPSC cells are pluripotent: they can generate all the specialized cells of the body.

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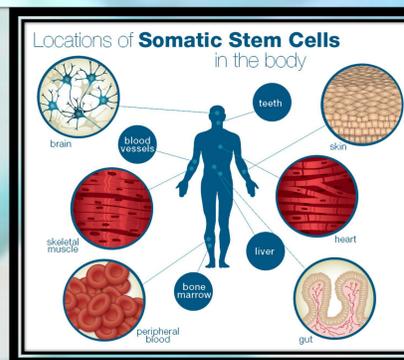
Embryonic Stem Cells (ESCs) are created in-vitro (in a lab dish). An egg is fertilized and becomes an embryo. The inner cells, or inner cell mass, of the embryo during the blastocyst stage are stem cells. These cells differentiate into all the types of cells found in the body (Stem Cell Information, 2015).

Source of embryos: donated with consent by females from In-Vitro Fertilization clinics (IVF clinics) who no longer need or want the embryos. The fate of these embryos is destruction in these clinics, since they cannot be donated to other couples.

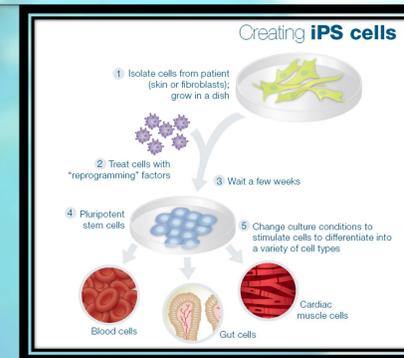
Simplified steps to ESC culturing are displayed in the image to the right.



Adult/ Somatic Stem Cells (ASCs) are undifferentiated stem cells found **within a tissue or organ**. They can differentiate to yield some or all of the **major specialized cell types** of the tissue or organ. They normally **maintain and repair** the tissue they are found in. They were once thought to be specialized, but now they are seen as **multipotent** with the ability to differentiate into other tissues (**transdifferentiation**). This has been proven only in certain vertebrates, not humans. This has raised the topic of the possibility of reprogramming these ASCs to act as ESCs. These are called Induced Pluripotent Stem Cells (Stem Cell Information, 2015).

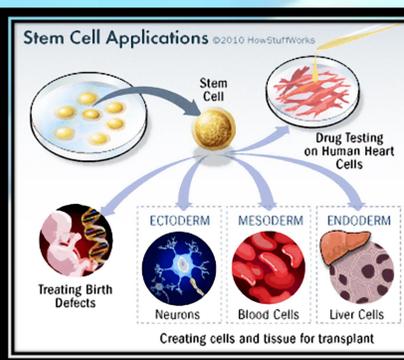


Induced Pluripotent Stem Cells (iPSCs) come from the **reprogramming** of ASCs to become **ESC-like cells**. Much more research is needed before this can be used in transplantation medicine. For now, viruses are being used to reprogram the cells, which has been a rather imperfect process resulting in abnormalities such as cancer. There is research being done on any alternatives to these viruses. The ASCs were thought to have a set fate, but they have found that they can be **"de-differentiated"** and reprogrammed. The tissues from iPSCs would be nearly an **identical match** to the recipient, avoiding the risk of rejection (Stem Cell Information, 2015).



Benefits of Stem Cell Research:

- Drug testing
- Curing/treating diseases (therapeutic cloning)
- Insight in abnormal cell growth (cancer)
- Treating birth defects
- Tissue replacement/regeneration
- Treatment for burn victims
- Organ transplants
- Other unknown potential benefits



Methods:

- Collect **accurate information** about the topic of stem cells
- Find **possible misconceptions** by asking opinions
- Choose **variables** that could play a role in these misconceptions
- Create a **survey** with statements that require a response
- Get **approved** by the UIRB
- Collect responses from a large classroom at CSU Stanislaus and responses from random people in a shopping center
- Create a spreadsheet for the data and translate my findings into **graphical representations**
- Create a **pamphlet** with facts clarifying these misconceptions

Expected Results:

I believe there will be correlations involving educational level and religious views. I think people with a higher education level will have a better understanding of stem cells or will at least be more open-minded to the research. I think religious views play a big part in how some people view stem cell research. The more religious a person is, the less accepting they will be of stem cell research.

Moral Assessments

% of U.S. adults who say each of these is ...

	Morally wrong	Not a moral issue	Morally acceptable
Having an abortion	49	23	15
Embryonic stem cell research	22	36	32
Non-embryonic stem cell research	16	42	33
Using in vitro fertilization	12	46	33

Source: Pew Research Center survey March 21-April 8, 2013. Q58a-d. Responses of those who volunteered "depends on situation" and those who did not give an answer are not shown.

PEW RESEARCH CENTER
<http://www.pewresearch.org/2013/03/21/abortion-views-in-moral-terms/>

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