

# Stem cell essay sample

[Health & Medicine](#), [Hospital](#)



## Abstract

There are several types of stem cells being used in stem cell research and therapy today. They are embryonic, adult and induced pluripotent stem cells. Each will be discussed further. This topic has stirred much moral, ethical and political debate as whether cells from fetuses should be used in this research. This impacts governmental policies on laws and funding. Another issue that must be analyzed is the economics and who should have access to this treatment. The views of people and government on this research differ greatly across the world. There are countries that have very strict laws restricting this research while others take an extremely liberal stance.

## Stem Cell Research and Therapy and Its Impacts on Society

### Introduction

Stem cells are the basic unit of life that gives rise to all living things. They are the undifferentiated cells that transform into the specialized cells that make up all of the tissues in organisms. With further research and understating, these cells can be used in medicine to cure a wide range of diseases. The most important type of stem cell to humans is the pluripotent stem cell which is usually obtained from human embryos. This has sparked controversy in many aspects of human life. In this paper, we will concentrate on animal and human stem cell research, and its impact on society. A Brief Description Of The Technology And An Explanation Of The Associated Science Before understanding stem cells, it might be beneficial to understand exactly what a cell is. “ Cells are the ultimate structural unit of an animal or plant body.” (Slack, 2012) The cell has a nucleus and cytoplasm. The nucleus contains the DNA, the genetic coding that

determines the development of the cell. The cytoplasm contains other parts of the cell that carries out various chemical and mechanical functions in the cell. There are about 210 different kinds of cells which make up a human, most of which are differentiated cells. Differentiated cells are ones which have a particular and specific function and a distinctive appearance when viewed through a microscope. The differentiated type to which a cell belongs is determined by which particular genes are active in its nucleus. Common examples are cells of the liver, heart, skin and brain.

To avoid any confusion, one should also understand the nature of undifferentiated cells. “ An undifferentiated cell is one that does not have any obvious specialization of gene expression and has a bland generic appearance down the microscope. But just because you cannot see specialization this does not mean that it does not exist. Most undifferentiated cells are specialized in some way, especially in terms of restriction into what other types of cells they can become. [They] are found in the embryo, where they develop into various types of differentiated cells in the course of time... Undifferentiated cells are sometimes, but by no means always, stem cells.” (Slack, 2012). A Stem Cell, defined by Dr. Slack, is “ a cell that persists for the lifetime of the organism and continues both to reproduce itself and to generate differentiated progeny.” (Slack, 2012) In other words, stem cells are distinguished from other cell types by two important characteristics.

First, they are unspecialized cells capable of renewing themselves through cell division (creating other stem cells), sometimes after long periods of inactivity. This is unlike other cell types, such as muscle or blood cells, which

normally cannot replicate themselves. Second, under certain physiologic or experimental conditions, they can be induced to become tissue or organ-specific cells with special functions such as skin, muscle, or brain cells. “ For example, a stem cell cannot work with its neighbors to pump blood through the body (like a heart muscle cell), and it cannot carry oxygen molecules through the bloodstream (like a red blood cell). However, unspecialized stem cells can give rise to specialized cells, including heart muscle cells, blood cells, or nerve cells.” (Stem Cell Information, 2009)

There are 3 different types of stem cells we will discuss. The first is embryonic stem cells. These, as the name implies, are derived from embryos and have been the topic of much ethical controversy. The second is adult stem cells. These are undifferentiated cells but can only renew or repair the tissue in which they are found. The third is induced pluripotent stem cells which are adult stem cells that have been reprogrammed to an embryonic stem cell-like state.

Embryonic stem cells are derived from embryos which have been developed from an egg that was fertilized “ in vitro”. This is done at an in vitro fertilization clinic and then donated for research purposes with informed consent of the donors. They are not derived from eggs fertilized in a woman’s body. Embryonic stem cells are valuable for many reasons. “ In the 3- to 5-day-old embryo, called a blastocyst, the inner cells give rise to the entire body of the organism, including all of the many specialized cell types and organs such as the heart, lung, skin, sperm, eggs and other tissues.” (Stem Cell Information, 2009) Ironically, according to Dr. Slack, embryonic

stem cells do not exist in nature. “ It is a creature that has been created by mankind and exists only in the world of tissue culture: the growth of cells in flasks in the laboratory...The reason that their in vivo counterparts are not regarded as true stem cells is that in normal embryonic development they will soon develop into other cell types, so...they do not remain the same for more than a few days.” (Slack, 2012) Research is also being performed on the less controversial adult or somatic stem cell. “ An adult stem cell is thought to be an undifferentiated cell, found among differentiated cells in a tissue or organ that can renew itself and can differentiate to yield some or all of the major specialized cell types of the tissue or organ.” (Stem Cell Information, 2009)

The adult stem cell's function in an organism is to maintain and repair the tissue of the organs in which they are found throughout the lifecycle of the organism. Scientists have identified adult stem cells in many organs and tissues including the brain, bone marrow, peripheral blood, blood vessels, skeletal muscle, skin, teeth, heart, lining of the intestine, liver, ovarian epithelium, and testis. The epidermis, or outer layer of the skin, is an example of where the adult stem cell acts in a renewal tissue. “ The top layer of the epidermis are worn away every day, and our skin persists as a functional tissue because new cells are being created continuously in the lowest layer of cells. This basal layer contains the stem cells of the epidermis.” (Slack, 2012) The main difference between adult and embryonic stem cells is their potential to be differentiated cells. Embryonic stem cells are pluripotent; believed to have the potential to become any tissue in the organism while adult stem cells are limited to give rise one or some types of

tissues. However, recent research has given rise to the development of induced pluripotent stem cells. These are “ adult cells that have been genetically reprogrammed to an embryonic stem cell-like state by being forced to express genes and factors important for maintaining the defining properties of embryonic stem cells.” (Stem Cell Information, 2009)

Embryonic stem cells are found in the blastocyst, “ a pre-implantation embryo of about 150 cells produced by cell division following fertilization.” (Stem Cell Information, 2009) After this stage, the embryo becomes organized into three distinct layers known as germ layers; the ectoderm, the mesoderm, and the endoderm. These three layers give rise to specific tissues, organs and systems of the entire human body. “ Human iPSCs also express stem cell markers and are capable of generating cells characteristic of all three germ layers.” (Stem Cell Information, 2009) There are many potential uses for stem cells and stem cell research which could cure a wide range of human illnesses. One potential benefit in studying stem cells is understanding the growth and development of cells and how they transform into the specialized cells that make up organisms. “ Some of the most serious medical conditions, such as cancer and birth defects, are due to problems that occur somewhere in this process.” (Stem Cell Information, 2009) Another potential use is in the testing of new medications for safety and effectiveness.

“ For example, new medications could be tested for safety on differentiated cells generated from human pluripotent cell lines...The availability of pluripotent stem cells would allow drug testing in a wider range of cell

types.” (Stem Cell Information, 2009) Finally, and perhaps of most importance, is the use of stem cells in cell-based therapy. This is where stem cells are cultured and used to regenerate or replace damaged cells, organs or tissues. Currently, organs and tissue must be obtained from a donor to be transplanted which takes time and runs the risk of rejection. “ Stem cells, directed to differentiate into specific cell types, offer the possibility of a renewable source of replacement cells and tissues to treat diseases including Alzheimer’s diseases, spinal cord injury, stroke, burns, heart disease, diabetes, osteoarthritis, and rheumatoid arthritis.” (Stem Cell Information, 2009) The Historical Development And Context Of The Technology

Stem Cell research may sound like a recent discovery, however, the history of stem cell research began in the 19th century and has had many influences including science, technology, politics, and ethics. The first time the term “ stem cell” appeared in scientific literature is when it was used by Ernst Haeckel, a German biologist, to describe a fertilized egg in 1968. Since then there had been several observations and theories on the topic. However, it was not until February, 1961 that Toronto scientists Drs. James Till, a biophysicist, and Ernest McCulloch, a hematologist, proved the existence of stem cells. And in 1963 they defined the 2 key properties of stem cells: stem cells have the capacity for self-renewal, and stem cells can differentiate into more specialized cells. Since Till’s and McCulloch’s discovery, there has been much more work and discovery in stem cell research. The next milestone was the isolation of the human embryonic stem cell by University of Wisconsin scientist James Thomson in 1998. He also demonstrated their potential to rejuvenate and to specialize into tissues. “ This discovery also

initiates the ethical debate on human embryonic stem cell research because his team derives the stem cells through a process that destroys human embryos." (Stem Cell Timeline, 2013) In 2007, Thompson and Shinya Yamanaka of Kyoto University both independently published papers on their discovery of the induced pluripotent stem cell. The cells began as skin cells. They were inserted with genes using viruses.

" Researchers were able to coax these so-called iPS cells into becoming beating heart cells and nerve cells." (Stem Cell Timeline, 2013) In October of 2010, the first patient was treated with stem cell therapy. " Geron Corporation announced the enrollment of the first patient in the company's clinical trial of human embryonic stem cell (HESC)-derived oligodendrocyte progenitor cells, GRNOPC1." (Stem Cell Timeline, 2013) A patient who was partially paralyzed by a spinal cord injury was injected with millions of human embryonic stem cells. In January of 2012, " Two people with eye degeneration both say their vision improved in the four months after they received implants of retinal pigment epithelial cells made from hESCs (human embryonic stem cells)." (Stem Cell Timeline, 2013) The procedures were performed by Dr. Robert Lanza, a renowned stem cell scientist from Massachusetts and were successful with no side effects that are possible with stem cell therapy.

The most recent advancements in stem cell research and therapy appear to be promising for the future. In June 2013, pluripotent stem cells were derived from cloned human embryos, " , a longstanding goal that could lead to new treatments for such illnesses as Parkinson's disease and diabetes, using



somatic nuclear transfer.” (Stem Cell Timeline, 2013) In July of 2013, Takanori Takebe of the Yokohama City University Graduate School of Medicine in Japan grew human liver tissue from induced pluripotent stem cells; a technique that would reduce or eliminate the need for donors in liver transplants. In August, 2013, the first test tube burger was made from cow stem cells by Dutch scientist Mark Post of Maastricht University in the Netherlands. “ Post hopes that his research into laboratory-made food could solve the looming food crisis.” (Ott, 2013) Political and Legal Influences

The political aspects and legal influences of human embryonic stem cell research have been debated for years. There are several state legislatures that have addressed these issues and limit or ban human embryonic stem cell research. The federal level is a different story because their main focus is how much federal funding will be used for research. The controversy still exists about whether it should be funded and for how much. It has to be balanced in what is the public interest in the funding of new cures and treatments. The moral judgments have to be considered and not just the cost of the research. The debate over the funding of human embryonic cell research has a history and it is not a recent subject. The 1930s is when scientists began experimenting on human fetal tissue. Then, in 1960s, there were more non-therapeutic experiments with human fetuses that were still-living fetuses that had been obtained by induced abortions. It troubles me to have scientists use living fetuses for experiments and arrive at no conclusion. In the 1970s, the researchers became interested in using fetal tissues for clinical purposes.

Their main focus was to implant fetal tissues into the brains of patients that suffered from diseases such as Alzheimer's, Parkinson's, or Huntington, where the absence of these tissues have led to the disease. The United States Supreme Court's 1973 decision Roe V. Wade invalidated all of these laws, and set guidelines for the availability of abortion, rapidly rising the rate of abortions may have encouraged the scientist interest for the research. The Ronald Reagan and George H. W. Bush administration had no federal funding human embryonic stem cell research and at that time the congress was controlled by Democrats made all the attempts to fund it but was blocked. Despite the lack of federal funding fetal-tissue-transplant research was funded privately and the experiments proceeded. President Clinton had a different view and on January 23, 1993 he directed the Health and Human Services (HHS) to lift the ban by the Bush administration on fetal-tissue research. On June 10, 1993, the National Institutes of Health Revitalization Act was passed by Congress which was Democratic-controlled. It allowed federal funding for research on fetal transplantation, where the tissues came from miscarried or aborted fetuses with the mother's consent. The act provided provisions to prevent the purchasing or commercialization of fetal tissue. There was still controversy that opened doors for more research funding with human embryos research created for fertility treatments. On February 2, 1994, The National Institute of Health (NIH) established a Human Embryo research Panel (HERP) with recommendations on funding it. The 1994 election brought Republican the majorities to the House and Senate, Congress passed the Dickey-Wicker Amendment in 1995, named by Representatives Jay Dickey (R.-Ark.) and Roger Wicker (R.-Miss.).

The amendment prohibited the funded for research that included the creation or destruction human embryos. The Bush funding policy during his presidency in 2001 was one of the first issues he confronted. There were several moments that President Bush describes that decided on this policy, including a conversation that he had with bioethicist Leon R. Kass on July 10, 2001, a person we discussed in class. Kass advised the president that because embryos are an early form of human life, “ we at least owe them the respect not manipulate them for our purposes.” (Kass, 2001). Kass’ explanation to President Bush during his presidency was interesting. The human life should be given respect and not be used for science or experiment for our benefit because the human body losses it values of being human. Kass also said that destroying human embryos violated the dignity of the human life. That is a statement that we should support and has the human body with respect and not as a trial destroying everything about the body to be human. In 2005, Bush signed into law the Stem Cell Therapeutic and Research Act, it was a program to increase the amount of bone marrow and cord blood available for transplantation.

President Obama in 2009 issued an executive order revoking President Bush’s 2001 stem cell funding policy. The interesting part was that after July 7, 2009 to be eligible for funding the IVF embryos had to be left over and unwanted in fertility clinics. At least the donors were going to be informed that the embryos would to be used to derive stem cells for research and the embryos would be destroyed in the process. Obama had legal challenges in front of him because of his policy. The legal process was taking place to determine whether to defund stem cell research. On August 23, 2010, Judge

Lambert ruled to cease funding the embryonic stem cell research. This is a constant battle with conservatives, Republicans, and Democrats. We can all observe that it depends on the party that is in control of the House or Senate, whether the funding will be in place or not for stem cell research. Each party has a different view on stem cell research, and we can observe currently Republicans and Democrats can't be on the same page. It was going back and forth and with appeals that finally in April 29, 2011, the D. C. Circuit ruled in favor of the government, and voided Judge Lamberth's injunction. With all that being said, the final resolution is still pending in courts. pp. 114-128. (2012, March 11). *The New Atlantis - A Journal of Technology & Society*, NIH is on track to provide \$562 million for human ES cell research during the Obama administration (2009 through 2011, 2012), and \$294 million during Bush administration (2002 through 2008). The figures are not in for 2013 and the million could be higher for Obama administration. Stem cell research will continue to be a debate politically and legally because the view of people and political parties do change and with the appeal process the legal aspects can last for years. *The Stem Cell Research and Healthcare Economy*

The healthcare system is complex and becoming more costly every year for each household. For years, politicians have been trying to make healthcare affordable for everyone. There are issues to consider that includes the financial, political, legal, ethical, and technology advancement. Eve, et al. (2008) said " stem cells are believed to be one of the greatest untapped resources currently available for the prevention and treatment of diseases". There is also Time magazine article explaining the benefits of embryonic-

stem-cell therapy in treating diseases of the eye, Alzheimer's, and spinal cord injuries. The scientists are trying to harvest these cells and implant them to regenerate of healthy new cells, the purpose is to replace the damage cells and hopefully treat the disease, and a good example is insulin for diabetes. We have to consider the financial costs that are significant when we put all those numbers in paper. The costs involved in testing, harvesting, storing, and implanting the cells, and then how people are able to afford this type of therapy. Is these benefits are only going to be for the rich and not with the poor with limited income, or will their medical insurance cover this therapies? That is a question that needs to be answer and make it affordable or resources for those patients in need and beneficial to save life.

The effective therapy in healthcare is the Adult stem cell therapy with patients that are willing and is occurring through transplantation and medically effective in the treatment of cancers of the blood, cardiovascular disease, diabetes, and liver disease. These are costly and if we consider the cost and the benefits, then the benefits must be considered. There is a state that we can mention and is California proposed a bill in 2004, involved the sale of \$3 billion in bonds to provide \$295 million annually for 10 years to the funding of stem cell research. The state is currently in a financial crisis. The money could have been devoted to improve healthcare and promote better programs to reduce the cost of healthcare. The question we can ask is whether all those resources could be used on healthcare delivery in the U. S. For example, there are still millions of people without healthcare while the debate continues over whether Obamacare is effective to cover that gap in healthcare. We, as a country have to put into perspective that if spending

billions of dollars for research is worth leaving millions without access to healthcare.

In other words, it doesn't have to be a trade-off but have available funds for both programs. The potential trade-off should be provided funds for citizens that don't have healthcare and provide cost effective healthcare for everyone. The priority should be that the spending funds be designated for healthcare. The political process can be long and exhausting but people are going without basic necessary healthcare and that should be our main concern. The embryonic-stem-cell research will continue to have issues ethically both positive and negative. The nurses and healthcare staff should advocate for the patients, whether the cost for research is beneficial to our country, when we are in a financial crisis. It's going to continue to be a challenge because the cost, quality, and access. Healthcare is a broad subject that is the main concern of all citizens of U. S. The process has to keep moving with healthcare reform to have a better understanding to whether the taxpayers should be paying millions for stem cell research. The recommendations are that healthcare should be affordable to everyone with plans that are low cost, and the government should help those to struggle with the cost to buy or have a medical plan. We should analyze the important issues facing U. S. today with millions of people without healthcare and how important it is to fund stem cell research or not.

#### Medical Risks and Ethical Problems

There are human rights advocates around the world have concerned about women's health. The risk is for young women that are being asked to donate

their eggs for research or even for human cloning research. The harvesting of eggs involves using hormonal drugs and some drugs have not been approved and it is not known the long term effects in women's. The attention is to be cautious because of the short term or long term effect. The commercialized can lead to exploitation of young women. These scientist and researcher are using women as bait for experimentation and research. In 1978, the first birth ' test-tube baby', by Louise Brown. Egg-harvesting became a procedures widely used in IVF. The women had the understanding that this procedure was safe. These procedures were being done in private fertility clinics with no supervision at all. The existing research is very limited and often retrospective. (Pearson, 2006). There are dangers for women short term or long term for egg-harvesting. Harvesting eggs can be uncomfortable for women that require several clinic visits and multiple hormonal drugs to produce often a dozen or more. Significantly, this problem do exist today, emotionally there are risk because egg freezing can provide false hope.

The procedure, coupled with vitro fertilization, has limited success rate. (Camilleri, 2013). The normal for a woman is to produce one or two. The mature eggs are to be used in research or IVF procedures. The short term effect is that stimulation cause's ovarian hyperstimulation syndrome (OHSS). The symptoms of OHSS include vomiting, nausea, diarrhea, and abdominal distention. These are symptoms that can get worse later and have more symptoms like rapid weight gain, accumulation of serous fluid in the spaces between tissues and organs. In 2005 five women in the UK died of OHSS. Long -term effects are not understood and this can have more women later in life be at risk. There is a drug Lupron (leuprolide acetate) that is used in

the first phase of egg harvesting, it has several complaints. The US FDA has over 600 complaints, and around 25 reported deaths. This is troubling; this is data that women need to have to make an important choice in their lives. There are reports that the long term effect could be ovarian cancer. It should be more studies and available for women that are willing to have these procedures with the short term and long term risk. The potential is out there even in poor countries is the exploitation of young women to the rise in demand for human eggs created by embryonic stem cell (or cloning). It is not ethically and socially justifiable to have young women to provide eggs and risk their own health. There have been ethical concern and moral arguments about the type of cell, the techniques and the production.

The opponent's debate is the respect for human dignity. The utilitarian approach is the consequences of stem cell utilization should be accessed using the benefit to harm ration that will determine to accept or reject the new technology. The deontologic approach is the duty to help those who suffer or to save lives, and then the stem cell research should be permitted. The opponents of stem cell research have a problem when a human embryos is destroyed because is morally equivalent like killing a human being. The facts about a embryos is determined by these, the initial appearance of the primitive streak (19 days), the beginning of heartbeat (23 days), the development of brain waves (48 days), the point when essential internal and external structure is complete (56 days), the point the fetus begins to move (12-13 weeks) (Hinman, 2009). There should be no doubt that the embryo is a living being. It has entity and should be treated with full right and privilege



of human beings. The conclusion is that more studies should be made if all those millions should be provided for stem cell research.

The political aspects are complicated because each party has their own views about or how much should stem cell research be funded. It can be scary with all the complications young women can have with harvesting eggs. Harvesting eggs can become a market for other countries to have young women donate eggs. There are concerns in other countries where women can be forced to donate eggs without their consent. Ethical varies by people or religious organizations. The embryonic stem cell research has been debated for years because of the ethical issues of terminating death to a human. The human should be respected because the embryo is consider a living person and disposing it would be consider killing a human being by many people and religious groups. Psychological Considerations and Sociological Effects

How is the use of Stem Cell Research viewed in our society? In our society the use of Stem Cells and the research behind it is greatly accepted as well as greatly frown upon. In my research I found it that people are willing to accept stem cells for toxicity testing and other areas where promise is seen when using these systems. Toxicity testing is the “ investigation on how chemicals may affect the viability and functions of stem cells. As well as observing the effects of chemical exposures on stem-cell differentiation as a model of developmental exposures. This would produce common toxicant targets, such as human liver and kidney cells, for studying the specific effects of chemical exposures, and screening for gene-environment

interaction". (Environmental, 2011) The ability that stem cells have due to their potential therapeutic qualities is their special property of being able to differentiate to produce a wide variety of cell types. In the article Stem Cell Models for Environment Health, Jane Lebkowski, explain how pluripotent embryonic stem cell, which is the cells that are capable of forming every cell type of the body except the cells to form the placenta. " The main reason that stem cells can be manipulated to produce so many cell types is that they retain the plasticity to express the DNA sequences required to produce different types of cells". (Environmental, 2011)

People in our society today still do reject the research and benefits of Stem Cell because where they are derived from. They are the beginning cells of a developing human child; it is the embryo that is a blastocyst that gives it its special characteristics. The great qualities that this research have in stored for our future have change the minds of many, but some still believe that life starts at conception and not at the birth of the child. This battle of taking a life to preserve life will continue to go on until people acquire the knowledge to understand that the use of Stem Cells out way any of its downfalls. The benefit of any kind of stem cell, regardless where it was taken from have the three general properties that it is capable of which are dividing and renewing themselves for long periods, they are unspecialized and they can form to be specialized cell types. (Stem Cell Basics [Stem Cell Information]) The major benefit of Stem cell research is that it save many lives, and causes less death amongst the world around us. Such as, " Pluripotent stem cells offer the possibility of a renewable source of replacement cells and tissues to treat a myriad of diseases, conditions, and disabilities". (Environmental Impact -

Stem Cell Research.) Pluripotent stem cells are able to replace cells and tissues to treat illnesses that have not been treated before, that would allow people to live a healthier and longer life. Having the ability to form muscle cells, nerve cells, to generate the necessary cells for a liver to properly function, and many other cell types that the body needs to live.

Another great benefit if scientists can reliably direct the differentiation of embryonic stem cells into specific cell types, they may be able to use the resulting, differentiated cells to treat certain diseases in the future and give someone a chance in living a longer, healthier life. Diseases that might be treated by transplanting cells that are generated from human embryonic stem cells include Parkinson's disease, diabetes, traumatic spinal cord injury, Duchene's muscular dystrophy, heart disease, and vision and hearing loss. (Stem Cell Basics [Stem Cell Information]) Also the great benefits that adult stem cells have compared to the lowering risk factor that may occur, such as the procedure to acquire the stem cells from the bone marrow, it is outweighed due to the fact of generating healthy blood forming cells. In the 1950s researchers discovered that the bone marrow contains at least two kinds of stem cells. Which are called hematopoietic stem cell that forms all the types of blood cells in the body and the second is called bone marrow stromal stem cells that make up the genetic make of the bone marrow. This allows the generation of bones, cartilage, fat, cells that support the formation of blood, and fibrous connective tissue to be made. (Environmental Impact - Stem Cell Research.)

Understanding that the more we development and research stem cells, the more we know that it is greatly needed because of the countless benefits it has to offer. Other risks despite the many great factors the use of stem cell; remain to be questioned in the theoretical and scientific fields. Religious groups claim that because embryonic stem cell research requires the subsequent destruction of the embryos used, it is a form of abortion. They sustain that creating embryos for the sole purpose of commercial use, followed by their disposal is morally unacceptable, and strongly oppose the area of study while adult and cord stem cells are readily available instead. (Stem Cell Research, 2008) That is why some people are against the use of embryonic stem cell. But people have to understand that the determination of life in the womb cannot be determined it is only speculated. With any developing form of medical research, the biggest practical risk is the unknown. Because stem cells injected into a patient are permanent, long term side effects may not be fully understood for years after the procedure have been done.

“ A French study ten years ago found that recipients of genetically altered bone marrow transplants developed leukemia years after their allegedly successful transplants had cured their severe combined immunodeficiency” (Stem Cell Research, 2008). Also, a number of studies have found the injection of embryonic stem cells to result in minor miscalculations resulting in the growth of strange objects such as teeth, bones and hair in areas where they were not intended, often resembling tumors. With embryonic cells, these growths continue for the remainder of the patient’s life. But these are

the factors we have to consider when it comes to sustaining life and end someone suffering. (Stem Cell Research, 2008)

### The Technology in Its Culture Context and Media Influence

Brown countries have the most liberal policies on human embryonic stem cell research, whereas countries like the United States and those shown in yellow and gray have either restrictive policies or no policy at all (Stem Cell Research, 2008).

Compared to United States of America, overseas researchers have been given permission not just to use discarded embryos but to create embryos specifically for the purposes of stem cell research. Even though scientists argue that if any of those embryos produce a breakthrough in treatment for conditions like Parkinson's disease, it would be a brave government that would stand in the way of its application to patients in Australia (Epstein, 2002). The United Kingdom now has the most liberal research laws in the world. But then there are the countries, particularly in Asia, where there are no laws restricting the use of embryos and fetuses in stem cell research. In Canberra, therapeutic cloning is being greatly considered because of the specific creation of an embryo to treat disease. It contains the DNA of the person who is to be treated with the stem cell therapy, which is a major ethical step in furthering stem cell research. Within the states the topic is very political because it's tied into the abortion battle, that companies are not always so forward about where they're making their investments. They may quietly invest behind the scenes in a small biotech company, but not openly display where they are investing their money. The political factors

that go along with this type of investment have its downfalls but with that investment also come with the hope that their investment helps the research and development for the future good of the people who are using it.

### Implications for the Environment

The factors of life or death must be understood when discussing the use of stem cells. Stem cells could launch a new era of regenerative medicine, curing deadly diseases with custom-made tissues and organs. But the manner on which stem cells are derived and disposed of, how does this affect the environment where we live at. There are many facilities like the UCR Stem Cell Core Facility that develops resources for cell culture, molecular biology and celling imaging. Like other facilities, this facility provides scientific advice and training in documentation of approvals needed for working the material at the stem cell lines. As well as guidelines and protocols for the maintenance, differentiation, and disposal of stem cells. Scientists at this facility also develop and validate new technologies for human stem cell growth, differentiation, and manipulation (Stem Cell Core Facility: UCR Stem Cell Policy). The effect that this facility and others like it has on the environment is the manner of how the unused or damages stem cells are disposed of. The facility consist of two form of disposal based on the type and structure that the stem cell is in. one is the Tissue Culture Waste. In this process all liquid waste is to be aspirated with aspirating pipettes to a vacuum aspirator bottle that is prefilled with Bacdown solution, which is a special solution to help in the breakdown of the cell.

When the waste reaches the marked level (3/4 full), the liquid waste must be emptied, vacuum aspirator bottle must be rinsed, washed and prefilled with Bacdown solution by each biosafety cabinet user. Consumable tissue culture waste, such as serological pipettes and tissue culture vessels that have been in contact with human or mouse cells must be discarded in the red biohazard bin designated for each tissue culture cabinet. Other consumable waste that has not been in contact with any cells, such as serological pipettes and their wrappers is to be discarded in the trash bin located next to every tissue culture cabinet. Pipette tips must be discarded in an empty plastic bottle instead of in the waste bags to avoid puncturing of the bags and injury. (Stem Cell Core Facility: UCR Stem Cell Policy) This form of procedures to dispose of tissue stem cell culture is to protect the company and the company's research and development.

As well as to protect the individuals that work there because if wrongly injected with these cultures can have harmful side effects because those cultures were not intended for them. The other form of disposal is the form of molecular waste. " For this process serological pipettes must be discarded in the designated trash bins. Pipette tips must be discarded in a solid plastic bottle and sharp items must be discarded in the sharps bin. Any chemicals that meet the definition of a hazardous material, such as paraformaldehyde and methanol, must be discarded in the designated waste container in the fume hood. These materials require special disposal by Department of Environmental Health and Safety because if exposed would cause great harm for a human being" (Stem Cell Core Facility: UCR Stem Cell Policy).

Conclusion

Despite the many debates and controversy, stem cell research has enormous potential to increase the quality of human life. The methods in which the cells required for the research may seem unethical, however this loss of life could possibly save thousands more by find ways to cure diseases for which there are currently none. Some of the latest findings of ways to obtain the cells from non-embryo sources seem especially promising. With this technology, there would be less controversy and more support. Research should continue to discover harvesting of stem cells in less controversial and more ethical ways. This would rally more support from governmental and private funding. The ultimate result would better treatments for many diseases that will hopefully be available to all.

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