STEM CELL RESEARCH

2003

Outline:

A) Introduction:

Stem cell research has come under the microscope for a variety of reasons. The benefits accrued from these studies has to be weighed against a gamut of issues of far reaching implication. Although it is impossible to predict the exact outcome, it is apparent that scientists and the discerning public will accrue tremendous insight into the biology of human growth. Scientists infer that with the passage of time, stem cell research may become the cornerstone for treating maladies such as Parkinson's disease, diabetes, and other heart related ailments. (Blake 186).

B) General Discussion:

1. What constitutes stem cell research?
2. A scientific perspective of stem cell research
3. Varied implications of carrying out this type of studies
4. Gains to the medical field and humans
5. Future trends for stem cell research

C) Conclusion

Foreword:

The benefits to individuals and society gained by the entry of new drugs or medical engineering are hard to estimate. The launching of antibiotics and vaccines, for example, have dramatically altered life spans and bettered the health of people around the globe. Despite these and other upgrades in the prevention and treatment of human diseases, there other serious afflictions, which needs immediate attention. Heart problems, diabetes, cancer, Alzheimer's disease pose continuing challenges to the health and well being of people everywhere.

Thesis Statement:

This research paper presents a close look at stem cell research .The writer explores both sides of the issue and argues that this study is a positive medical innovation and highly beneficial to people afflicted with varying ailments. The discussions and recordings of this paper will be limited to the scope of the literature surveyed.

Steam cell research is in its infancy and a few select individuals comprising of professionals or the general public have extended serious thought to its examination, medical, societal, ethical, moral and religious imports. Given these uncertainties steam cell research is a multi-faceted and not a single issue per se.

Scientists primarily work on with two kinds of stem cells from animals and humans: embryonic stem cells (a zygote formed by a single egg and a sperm) and adult stem cells (derived from human cells or tissues) (Marshak, Gottlieb and Gardner 1).

Extensive studies of the biology of mouse stem cells led to the discovery, in 1998, of how to isolate stem cells from human embryos and develop the cells in the laboratory (Marshak, Gottlieb and Gardner 129). These are named human embryonic stem cells. Scientists desire to study stem cells in the laboratory, so they can ascertain about their essential properties and what makes them unlike from specialized cell types. As researchers assimilate more about stem cells, it may become imaginable to use the cells not just in cell-based therapies, but also for screening new drugs and toxins and interpreting birth defects. Scientists are examining the key attributes of stem cells, which will encompass determining exactly how stem cells remain unspecialized and self-renewing for many years; and discovering the signals that cause stem cells to become specialized cells.

Adult stem cells typically yield the cell types of the tissue in which they reside. A blood-constituting adult stem cell located in the bone marrow, for example are red blood cells, white blood cells and platelets (Marshak, Gottlieb and Gardner 205). Until recently, it had been believed that a blood-forming cell in the bone marrow, which is named a hematopoietic stem cell is not capable of configuring cells of dissimilar tissues, such as nerve cells in the brain. Sustained experiments have conspired the theory that stem cells from one tissue has the ability to give rise to cell types of a totally alien type of tissue, a phenomenon known as plasticity. Examples of such plasticity include blood cells getting neurons, liver cells having the capacity to create insulin, and hematopoietic stem cells that can

develop into heart muscle. Serious research is carried out to ascertain whether adult stem cells can be used for different types of therapies.

Differentiation is a method by which unspecialized stem cells mature into specialized cells. Scientists are just beginning to interpret the signals inside and outside cells that trigger stem cell differentiation. The internal signals are checked by a cell's genes, which are interspersed across long strands of DNA, and carry coded commands for all the structures and functions of a cell. The external signals for cell differentiation include chemicals released by other cells, physical contact with adjoining cells, and certain molecules in the microenvironment.

Therefore, many doubts about stem cell differentiation persist. For example, are the internal and external signals for cell differentiation alike for all kinds of stem cells? Can specific sets of signals be identified that encourage differentiation into specific cell types? These questions may compel scientists to breakthrough new ways of curbing stem cell differentiation in the laboratory.

Current attempts to care for diabetes in children with human islet transplantation in an effort to restore insulin function (obtained from human pancreas) are limited seriously by the small numbers of donated pancreas available each year. Pluripotent stem cells, instructed to distinguish into a particular pancreatic cell called a beta cell, could overcome the dearth of therapeutically effective material to transplant. They also afford the opportunity to direct such cells to effectively resist immune attack.

Parkinson's patients have been handled by surgical implantation of fetal cells into their brain with some gain. Although only partly effective, perhaps owing to deficiency of sufficient numbers of dopamine secreting cells, similar experiments using appropriately differentiated stem cells should overcome those obstacles.

Stem cells, once suitably distinguished, could rectify many diseases and degenerative conditions in which bone or cartilage cells are insufficient in numbers or defective in function. This holds assurance for treatment of genetic disorders such as osteogenesis imperfecta and

chondrodysplasias Currently, bone marrow stem cells, representing a more committed stem cell, are used to deliver patients following high dose chemotherapy.

Some religious communities think that the embryo or fetus is an entire human being from the moment of conception, since it is genetically human and has the potential for development into a human individual. Other traditions take a developmental perspective of personhood, believing that the early embryo or fetus only gradually becomes a full human being and thus may not be entitled to the same moral protections, as it will later. Still others hold that while the embryo constitutes human life that life may be taken for the sake of saving and conserving other lives in the future.

The ethical position of human embryonic stem cells partly hinges on the question of whether they should be qualified as embryos or specialized bodily tissue. Although the answer to this question will be less crucial to those who consider that the early embryo has little or no moral status, it will determine the views of those who regard the embryo as a protected feature.

Those who do not concord significant moral burden to the pre-implantation embryo will probably not object to its being destroyed to be used as a source of ES cells. Some people holding this opinion may also accept the deliberate creation of embryos for this purpose, while others would only permit the use of so-called "spare embryos" remaining from infertility procedures.

Going by the discussions, stem cell research is an emerging field in which the benefits accrued should be weighed against the negative implications associated with its studies. Surmounting these hurdles and ensuring equitable access to the benefits of stem cell research will be a politically and financially ambitious task. The quest and production of knowledge through scientific research is an undertaking that extends enormous intellectual rewards for researchers while also executing an important social purpose.

It would be appropriate to conduct stem cell research complying with the following stipulations:

The public has to be educated with regards to the differences between embryonic and adult stem cell research related to science and ethical dimension (e.g. moral, ethical, religious, etc).

A comprehensive ban can be imposed on any kind of work on embryonic stem cells.

Intentional creation of human life by means of cloning or use of embryonic stem cells has to be censored.

Genetic modification of zygote by any methods has to be prevented.

Funding and support for carrying out research work encompassing cloning, zygotes and embryonic stem cells has to be prevented.

Researchers and clinicians are to be made accountable for violations of imposed restrictions.

Exercise abundant caution with research proposals involving adult stem cells.

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