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Student's Name

University Affiliation

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Stem cell research is the subject of many current researches and studies all over the world. Many countries, such as Germany and Singapore, had already joined the bandwagon and established guidelines and conducted their research and studies on stem cells (Kan & Leng, 2005). Stem cell research involves costs of astronomical proportions. The costs, for example, of embryonic stem cell research could range from $100,000 to $200,000 for human eggs of about 50 to 100, which could only serve one patient (Moffit, Hollowell, Coelho & Weldon, 2005).

Despite the extreme costs involved, stem cell research continuous all over the world because it is believed to be a medical technology that offers a long line of tantalizing possibilities. Through medical technology, stem cell research offers significant improvements in health and quality of life of many people (Leadership U, 2008). Researches believe the stem cell research offers “virtually unlimited application in the treatment and cure of many human diseases and disorders including Alzheimer's, diabetes, cancer, strokes, etc. (Religioustolerance.org)." Other possibilities offered by stem cell research include tissue regeneration and tissue or organ transplantation, which areas have been previously unexplored (Lemischka, 2005).

Stem cell research utilizes two general kinds of stem cells, namely, embryonic stem cells and adult stem cells (Religioustolerance.org). Both general types of stem cells are important in regenerative medicine, since both could self-renew and “differentiate into various cell types (Ching-Shwun, Zhong-Cheng, Chun-Hua, Hongxiu, Guiting & Lue, 2008).” This power of differentiation is a reaction to the different stimuli

received by stem cells (Ching-Shwun, Zhong-Cheng, Chun-Hua, Hongxiu, Guiting & Lue, 2008).

The difference, as the names suggest, lies in the time that the stem cells would be harvested from the human body. Embryonic stem cells are harvested from human embryos, and this process leads to the death of the embryos. More specifically, embryonic stem cells are harvested from the “inner cell mass of a blastocyst (Ching-Shwun, Zhong-Cheng, Chun-Hua, Hongxiu, Guiting & Lue, 2008).” The advantages and possibilities offered by embryonic stem cells are better than adult stem cells, because embryonic stem cells are capable of being “coaxed into developing into all of the 220 types of cells found in the human body.” Thus, embryonic stem cells could develop into heart, brain, and nerve cells (Religioustolerance.org). Indeed, embryonic stem cells provide a possibly unlimited source of somatic cells, which may be used in cellular therapies. Moreover, embryonic stem cells provide a "useful model system for elucidating mechanisms involved in human development and disease (Devolder & Ward, 2007).

Despite the fact that embryonic stem cells offer greater possibilities for medicine because of their higher differentiation potential, its research has taken off two decades later than adult stem cells, and up to the present, research on the matter is still beset by different deterrents, such as government regulations, lack of funding, and ethical concerns (Ching-Shwun, Zhong-Cheng, Chun-Hua, Hongxiu, Guiting & Lue, 2008).

On the other hand, adult stem cells, which are harvested from adult humans, are less flexible than embryonic stem cells (Religioustolerance.org). Adult stem cells could be derived from the tissues of either a developed or developing individual (Ching-

Shwun, Zhong-Cheng, Chun-Hua, Hongxiu, Guiting & Lue, 2008). It is, however, noted that studies on adult stem cells have reached the development level of human clinical trials, since it has been going on for two decades ahead of embryonic stem cell research (Religioustolerance.org).

The possibilities offered by stem cells could be differentiated based on their potentials for differentiation. For example, embryonic stem cells, which have higher differentiation potential, are pluripotent, which means they are capable of differentiating into any type of cell, except a fertilized egg. However, a fertilized egg, which could differentiate into any type of cell, is described as totipotent. Adult stem cells, which are less flexible in terms of differentiation potential, are only multipotent. This means that it is capable of differentiating into “most cell types of its tissue origin (Ching-Shwun, Zhong-Cheng, Chun-Hua, Hongxiu, Guiting & Lue, 2008).”

One particular set of adult stem cells that has shown great potential is bone marrow stem cells. This group of stem cells has been proven in many studies to be able to differentiate into types of cells other than their tissue origin. Thus, bone marrow stem cells could differentiate into cardiomyocytes. Bone marrow stem cells offer numerous possibilities for differentiation. Indeed, they could differentiate into various other cell types, which include epithelial cells, endothelial cells, adipocytes, neurons, glial cells, smooth muscle cells, skeletal muscle cells, and cardiac muscle cells. (Ching-Shwun, Zhong-Cheng, Chun-Hua, Hongxiu, Guiting & Lue, 2008)…

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