



Stem Cell User's Guide

By CK Wong 2005.09.02

<http://www.ck-wong.ca/Science/Stem%20Cell%20User's%20Guide.pdf>

Introduction

Stem cells are the cells that have not been specialized in functions. When the zygote is fertilized, it starts to subdivide. All of them are exactly the same. There is no brain cell, muscle cell or bone cell. These cells are called stem cells. To be more specific, they are embryonic stem cells (ESC). Stem cells do exist in many parts of our body for example bone marrow. These are called adult stem cells (ASC). ESC could be morphed into any tissue. ASC could only be morphed to a limited number of tissue using existing start of art.

Metamorphism

The power of stem cell is its ability to become specialized cell. It could become retina, it could become heart, and it could become bone. Scientist found that by introducing the stem cell to other specialized cell, the stem cell could be evolved to these specialized cells. If you have broken bone, the stem cell turns into bone cell which fills the gap of the fracture. In other word, it fixes the fracture without nuts and bolts. If you put stem cell next to a diabetic pancreas, it will be converted to islet that generates insulin to regulate the blood sugar. If you introduce the stem cell to the retina, it could cure some retinal ailment, in theory. If we could develop regeneration of skin from stem cell this could be the magnificent new for skin burn.

Why stem cell therapy is significant?

A deficiency ailment can be cured or treated by supplementing the deficiency. Yet the better way is to fix the source of deficiency. In case of damaged organ, the best way is to regenerate the damaged part rather than patch it up. For example, diabetic is caused by the deficiency of insulin caused by the irregularity of insulin production at the islet. If we can restore the islet function, it would be better than insulin injection. In the case of Parkinson Disease, it is better to restore the function of the brain rather than using chemical treatment. In the case of retina repairing, there is no existing possibility the only hope is stem cell. Although electronic retina research has great advancement but it is still a long way to solve the implant and electronic/biological coupling. In case of limb lost, the regeneration of the limb is definitely a major research area.

Other than the thesis of restoring, we are looking at a very single method of treatment to cure a significant number of ailments. Some of them require stem cell from the donors (similar to the blood transfusion) and some other can be harvested from the patient. I am

not sure any biological rejection could be caused by foreign stem cell but certainly there will be none from the individual. This is significant.

Are we opening the Pandora Box?

Every time new concept is introduced, there is a outcry of Pandora Box; like Genetic Modified Food. We really cannot be 100% certain until a few hundred years down the road. It could be too late. The best we could do is to mitigate the risk and do it with care. It is possible that we create a disaster. On the other hand we should not use this chain to slow down the progress of science. We have to do it sensibly.

Scientists develop new technology. They bear the heavy burden on the moral and ethical consequence. They are not trained on that area. The social infrastructure does not support them too. There should be mechanism and organization to provide scientist the deserved support. This organization is better not killing the advancement in name of carefulness and bias.

Sharing the Responsibility

The stem cell technology is so promising that there are many sci-fi literatures have been written on it. But the progress is slow. Commercial will be pushed out in 6 to 12 months when FDA approved the first vendor. The public has not been fully informed. If government does not start to educate the public it will be much worse than silicon breast implant. This could be life and dead matter in the hand of the unknowledgeable. Any chaos caused with creates a wide spread condemn. This is unfair to the technology. The government should step up the challenge to manage the public expectation on new technology by open communication rather than banning and suppressing discussions.

The patient also has the responsibility to learn the true facts of the technology rather than the commercial highlights. The National Institute of Health (NIH) is a very good start. Please start with the NIH FAQ resources [2].

Resources

- [1] Stem Cell Information – Stem Cell Basics by National Institute of Health of United States. <http://stemcells.nih.gov/staticresources/info/basics/StemCellBasics.pdf>
- [2] Stem Cell Information – Frequently Asked Questions (FAQ) by National Institute of Health of United States. <http://stemcells.nih.gov/info/faqs.asp>
- [3] “Today’s Stem Cell Research” web site. <http://www.stemnews.com/>
- [4] “Stem Cell Science” Harvard Magazine May – June 2004: Volume 106, Number 5, Page 59 <http://www.harvard-magazine.com/on-line/050466.html>
- [5] “Stem Cell Research Foundation” web site <http://www.stemcellresearchfoundation.org/>.
- [6] Federal Stem Cell Research: What Tax Payer Should Know. <http://www.heritage.org/Research/HealthCare/hl888.cfm>.

[7] AAAS Policy Brief: Stem Cell Research
<http://www.aaas.org/spp/cstc/briefs/stemcells/index.shtml>

[8] For silicon retina, Foveon (<http://www.foveon.com/>) could provide some background on silicon retina.