Stem cell therapy: an emerging technology in the field of Medicine

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Abstract

Stem cell is the unspecialized cell which can be transformed to almost any specialized cell. In mammals, there are two broad types of stem cells: embryonic stem cells, which are isolated from the inner cell mass of blastocysts, and adult stem cells, which are found in various tissues. Generally this approach is used for treatment of diseases and conditions include: Diabetes, Rheumatoid arthritis, Parkinson’s disease, Alzheimer’s disease, Osteoarthritis, Stroke and traumatic brain injury repair, Learning disability due to congenital disorder, Spinal cord injury repair, Heart infarction, Anti-cancer treatments, Baldness reversal, Replace missing teeth, Repair hearing, Restore vision, Amyotrophic lateral sclerosis, Crohn’s disease, Wound healing. Bone marrow transplant is a crude form of stem cell therapy that has been used clinically for many years without controversy. Mostly hematopoietic stem cells (HPC), endothelial stem cells (EPC), bone marrow cells, endothelial progenitor cells, mesenchymal stem cells, brain, fat, liver, muscle, pancreas, umbilical cord are used in alleviating chronic disease conditions. No stem cell therapies other than bone marrow transplant are widely used. In recent approaches stem cells have been found successful in lab grown contracting muscle, hair growth, formation of egg and sperm precursor using embryonic stem cells. Sir Stephen Hawking sees a great hope as this might be able to cure paralysis in the near future, which has been successful in a rat and a successful repairment of spinal cord has been performed. They can also be a great help in cloning as they can generate as well as revive a dead heart.

Key words: Stem cells, Bone marrow transplant, Alzheimer’s disease, Crohn’s disease.

INTRODUCTION

Today we are in the new age of medicine where we might to able to heal our body of any illness, all of it because of cells inside us which have special powers. These are called stem cells but are stem cells really magic boons or ticking time bombs. They all start off as unspecialized cells but given the right chemical and genetic signal the stem cells can form slightly more specialized cell and after a few more cycles of division this can give rise to highly specialized cell (Fig 1).

Classification

It is classified as

1. Embryonic stem cells
2. Adult stem cells

Embryonic stem cells

These are the cells that are taken from the fetus. When a woman is pregnant, the fetus contains of amniotic fluids which is rich source of stem cell. However, it is remains controversial. Also this has a higher risk of turning into a cancer cell due to its ability to divide forever (Fig 2).

Adult stem cells

These are taken from the bone marrow of an adult person. This is not controversial. However, there are less willing donors. This has a lower risk of turning into a cancer cell due to its inability to divide forever (Fig 3).

Stem cells culture

1. In vitro fertilized egg
2. Blastocyte stage (6–7 days old)
3. Inner stem cell mass
4. Cultured undifferentiated stem cells
5. Specialized cells
   a. Blood cells
   b. Neural cells
   c. Muscle cells

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In Paralysis Cure
In this growing revolution of stem cells. Sir Stephen Hawking who has spent his life exploring the mystery of cosmos says that he has not been able to live a normal life or dealt with any distractions since his 20's. But these stem cells may give you the freedom allowing you to pursue your wildest dreams without ever having to worry about the limitations of your body. This can come up as an answer and he could be able to fulfill his wildest dreams. The reason behind this is stem cells might come up and become successful in the treatment of paralysis in the near future.

EXPERIMENTAL VERIFICATION
An experiment was performed in a rat whose right leg was paralyzed. The stem cells from that rat was taken and cultured, this was kept in the rat again. And that rat was actually able to move its leg i.e. it’s paralysis was cured.

In spinal cord injury
In a patient with spinal cord injury, when stem cells were passed all of them did not stay most degenerated, but those that stayed joined the neurons from one end to the other in a process of healing the damage. In order to overcome this problem a protein was passed, this formed a mesh (i.e. it acted as a gum) now the cells could not escape and all of them had to stay and when they stayed they joined all the nerves from one end to the other and successfully healed the injury. And all of them formed live green neurons.

In heart condition
Stem cells have come up and become a successful therapy in case of heart injuries or heart diseases. A trial performed in this test came to be successful. In a chest hospital in London a human trial was performed on a patient with a heart condition. At the time of the trial neither the patient nor the doctor knew whether they were going to put stem cells or placebo in his heart. Stem cells were placed into his coronary arteries. The doctor placed a tube through his blood vessels right at the site of the disease in his heart. Incredibly the patient remained completely awake throughout the procedure. And also it came up successful. In the process a dead heart was as well revived. A dead heart still contained of all the arteries, veins and all the vessels inside it. On giving this therapy the dead heart slowly came to life and became active which could also be transplanted.

Treating diabetes
So, this question still remains unanswered as when stem cells from a mice was taken, modified it as insulin producing cells and re-injected into a diabetic mice. The cells functioned as healthy ones, regulating sugar without the need of insulin injection. Six months later their blood sugar was still under control. Now what was important that how it would behave inside a person? The researchers are planning to test it on humans as soon as possible.Well, it would be fun to know that people are living without insulin injections.

Is it an answer to cancer or a threat as cancer?
The cells that are responsible to cause cancer as well are hidden within the stem cells as well. These cells are so versatile that our immune system cannot find these cells, they just sneak n peek into our system and reach appoint where they start multiplying. The stem cells turn into cancer cells as well and because they are very fast our immune system is unable to spot it. But it might also cure cancer by binding to specific proteins of the cancer cells and degenerate it.

Complication and risk
Having a stem-cell transplant is a major challenge for your body. As you recover in the first weeks and months, you are likely to feel fatigued and weak. Certain side effects, like flu-like symptoms, nausea, and a changed sense of taste, are common. Along with these typical side effects, you may experience complications are caused by your body’s attempts to reject donor stem cells.

Complications from Transplants Using Your Own Stem Cells
The most common complications are:
- Bleeding and Anemia
- Infections
- interstitial pneumonia (inflammation of the tissue that supports the lungs)
- liver damage and disease
- dry and damaged mouth.

Antibiotics, antifungal medications, and antiviral medications can help prevent and treat bacterial, fungal, and viral infections.
Fig 1. Conversion of stem cells to specialized and highly specialized

Genetic Correct

Stem Cells

Genetic Correct

Specialized

Highly Specialized Cell

Fig 2. Source of stem cells from fetus

Fig 3. Source of stem cells from adult

Brain cells
Liver cells
Kidney cells
Pancratin cells
Pancreatic cells
Muscle cells
Skin cells
Eye cells
Bone cells
Heart cells

Fig 4. Stem cells culture

Fig 5. Cultured cells injected to paralyzed mice
CONCLUSION

Concluding stem cells power is not limited to this. The power is still to be unleashed. Besides heart cure, spinal cord treatment, paralysis cure, answering to diabetes. Several other researches are going on.

i.e.
1. Tooth replacement
2. Treatment to blood cancer
3. Baldness reversal
And some diseases that are being focused include:
   a) Parkinsonian’s disease
   b) Alzheimer disease
   c) Chron’s disease
   d) Liver damage
Besides this it can not only cure but also form completely new organ.

REFERENCES

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