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Review Article

**STEM CELLS: A SPECIALIZED TREATMENT FOR VARIOUS  
DISEASES**

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**Article Received:** July 2020**Accepted:** August 2020**Published:** September 2020**Abstract:**

*Now-a-days stem cells therapy is playing a crucial role in treating various kinds of deadly diseases and had proved to be a blessing for a new life of patient. Stem cells are unspecialized type of cells that has ability to proliferate or self-renew into specialized matured cells. Till now scientist are working on the numerous possibilities that the stem cells have and studies carried out to categorized their sources to the best for the benefit of human beings.*

*There are various types of stem cells which are used in repairing the damaged tissues and forming a functional organ. Therefore stem cells therapy plays an vital role in the era of medical discovery of cell based therapies that will restore function to those whose life who are now challenged & gives a new Start of life.*

*Stem cells mediated therapy had great promising approach for treating pancreatic disease like diabetes. Its an approach to regenerate the damaged part of the body.*

*THE treatment of stem cells aims for healthy human life. There are many types of stem cells like Adult Stem Cell, Mesenchymal Stem Cell, Hematopoietic Stem Cells, And Embryonic Stem Cells,*

**Keywords:** *Stem Cells, Stem Cells Therapy, Stem Cells Treatments, Hematopoietic Stem Cells, Embryonic Stem Cells.*

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**INTRODUCTION:**

Stem cells are the cells that has ability to proliferate or self-renew to developed into a specialized matured cells under suitable conditions like heart muscles, skin or nervous cells.

In 1998 , the first time , the scientist were able to isolate the pluripotent stem cells class cells from early human embryos and they grow them in culture.

The main property of stem cells i.e unique characteristic for tissue repair, replacement, or regeneration. Because of this marked characteristics property of stem cells they are widely used to cure deadly diseases..These stem cells treatment are the recent advance in the biomedical field. The origin of stem cells research was dated back to 1960's with the discovery of haemaopoetic stem cells within the bone marrow was investigated by Dr.JAMES TILL and

ERNEST MCCULLOCH. The brief introduction to the stem cells therapy was started from 1963 with the discovery of renewing cells in bone marrow. In 2001 the mouse embryonic stem cells was created. In 2006

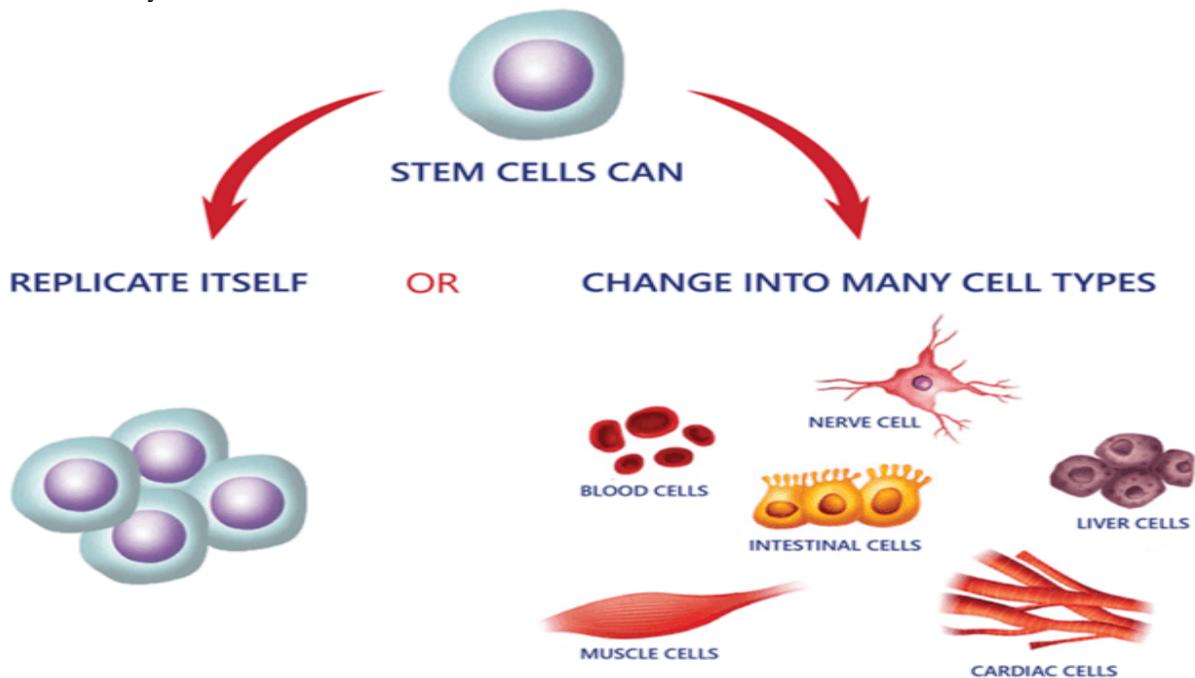
the nobel prize was achieved for discovery of Induced PLURIPOTENT Stem Cells.

And now the research have been so advanced that in 2014 embryonic cells from adult stem cells were generated i.e insulin producing beta cells were generated from skin cells.

Various researcher were doing work to evaluate the stem cells and now its advance technique for curing various diseases.

**WHAT ARE STEM CELLS?**

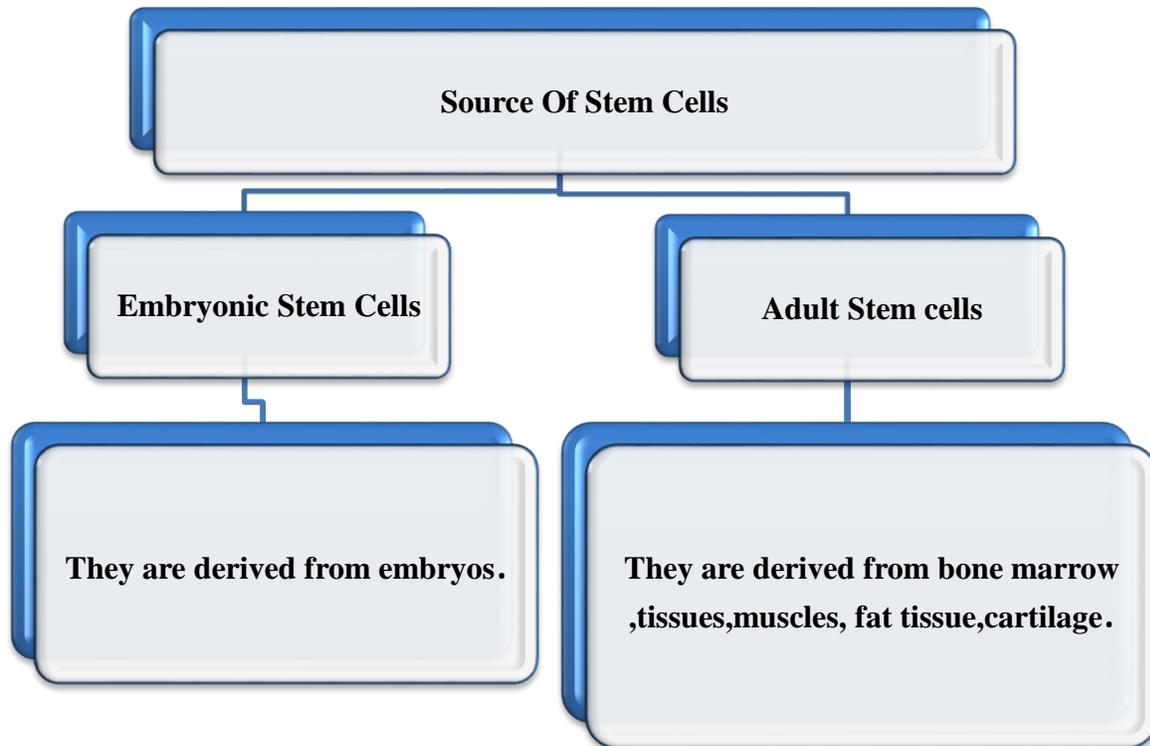
Stem cells are unspecialized type of cells, undifferentiated cells that have ability to proliferate or self-replicate under suitable condition to developed into specialized, matured, differentiated cells, such as heart cells, skin cells, nerve cells or even embryonic cells. These stem cells are also known to be "BLANK" precursor cells as they can give rise to different multiple tissue such as skin muscles or nerve cells. [FIGURE 1].



[FIGURE 1] Showing Various Replication Steps Of Stem Cells Forming A New Type Of Stem Cells

**DIFFERENT SOURCES OF STEM CELLS**

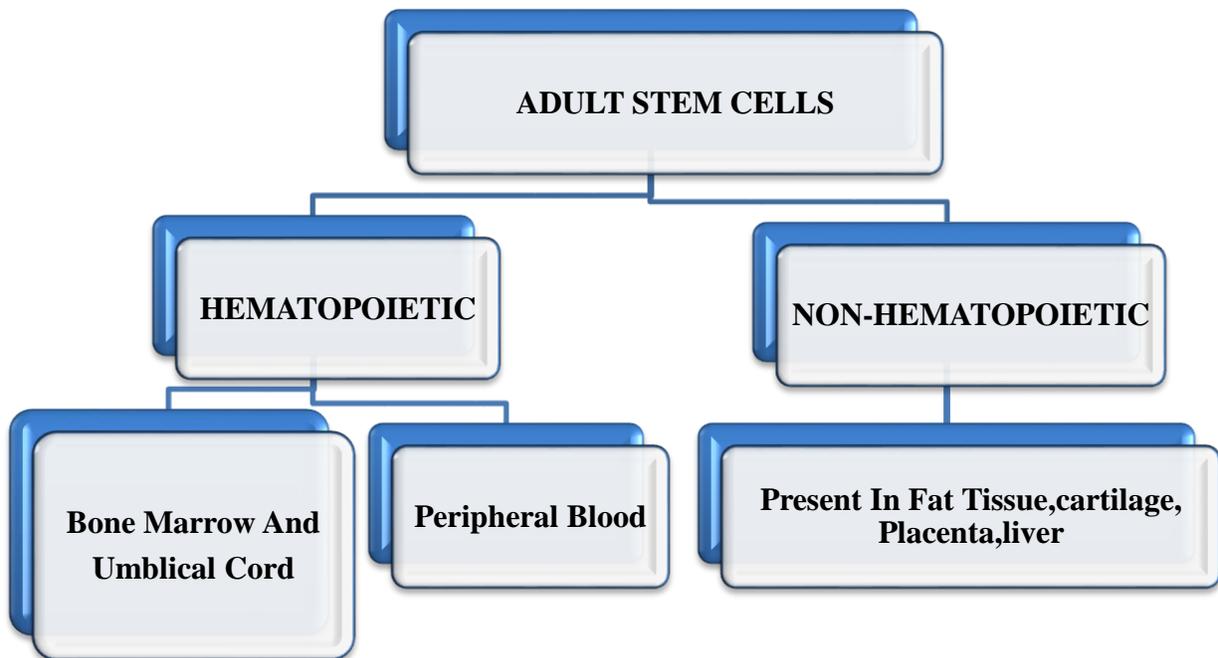
There are different sources of stem cells from which they are either isolated or derived.



**FIGURE [2] Showing Different Sources Of Stem Cells.**

- EMBRYONIC STEM CELLS are also called as 'BLASTOCYST'[i.e.inner cell mass of blastocyst],which is fertilized invitro for 4-5 days,these cells are first differentiated after fertilization process of proper embryo is formed.
- ADULT STEM Cells are also called as SOMATIC STEM CELLS.

**FURTHER ADULT STEM CELLS ARE CLASSIFIED INTO TWO CELLS WITH DIFFERENT TYPES OF SOURCES FROM WHICH IT IS OBTAINED...**



**FIGURE [3] Showing Different Types Of Adult Stem Cells**

- Hematopoietic stem cells: They forms all types of blood cells in the body.
- Non-Hematopoietic stem cells: They are also known as MESENCHYMAL STEM CELLS.
- Also known as 'STROMAL STEM CELLS'

#### **DIFFERENT TYPES OF STEM CELLS DEPENDING UPON DIFFERENTIATION POTENTIAL**

##### **1] Totipotent stem cells**

- ✓ They are also known as omnipotent.
- ✓ These stem cells are most powerful that exist in all of the stem cells.
- ✓ They can differentiated into embryonic and extraembryonic tissues, such as Yolk sac, Chorion, amnion.
- ✓ In human beings and developed animals they form placenta.
- ✓ The most important characteristic of totipotent stem cells are that they built up fully functional living organism
- ✓ E.g fertilized egg [formed when sperm and egg unite to form zygote]

##### **2] Pluripotent stem cells**

- ✓ Pluripotent stem cells can be self renewed and differentiated into any of the three germ layer which are- 1]ectoderm 2] endoderm 3] mesoderm
- ✓ These further differentiate to form all tissues and organ in a human.
- ✓ Example : Embryonic stem cells.

##### **3] Multipotent stem cells**

- ✓ These belongs to middle range type of stem cells .
- ✓ They can self renew and differentiate into specific range of cell types.
- ✓ They can differentiate only those stem cells which are closely related to family of cells.
- ✓ Example : Mesenchymal stem cells

##### **4] Oligopotent stem cells**

- ✓ These stem cells are similar to previous stem cells but they become further restricted in their capacity to differentiate .

- ✓ They can differentiate into lymphoid or myeloid stem cells.
- ✓ Example : Hematopoietic stem cells.

#### 5]Unipotent stem cells

- ✓ These stem cells are least potent and most limited type of stem cells.
- ✓ They can produce only one cell type ,their own but have the property of self renewal

that distinguishes them from non- stem cells.

- ✓ Examples : Muscle stem cells.

*Various types of stem cells now a days are used to cure deadly diseases.The advancement and technology helps the people to survive more healthy and disease free. Stem cells therapy had proven a great blessings to mankind.*

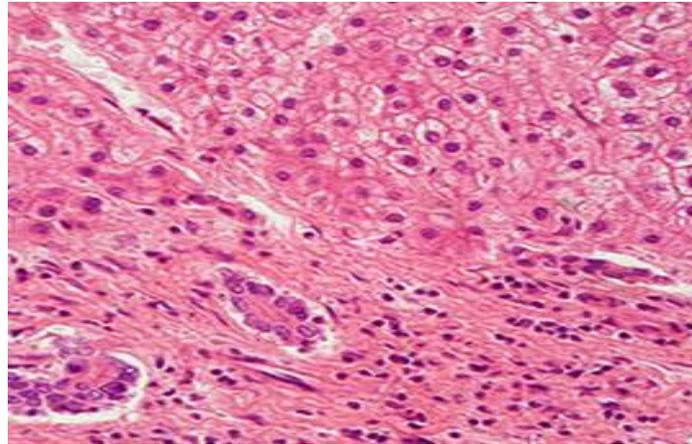


FIGURE NO [4] *Human Induced Pluripotent Stem Cell*

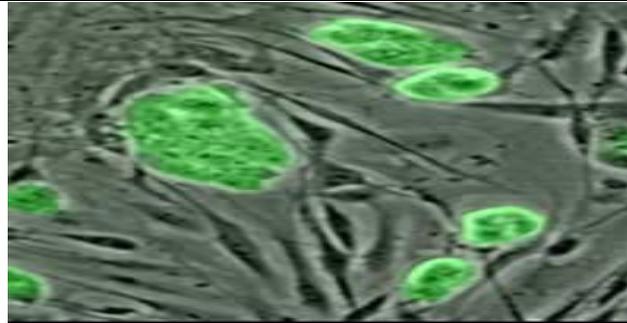


FIGURE NO [5] *Multipotent Stem Cells*

#### WHAT IS STEM CELLS THERAPY?

**Therapy is another** word for treatment..Stem cells therapy is the treatment of curing various diseases using these special cells.

Stem cells therapy is also known as regenerative medicine which promotes the reparative responses of diseased or damaged tissue using stem cells or their derivative.

#### How do these stem cells work to cure diseases?

Stem cells are very special type of cells which are non differentiated and that have ability to multiply ,regenerate and get converted into differentiated cells and tissue production.This cells works on the

mechanism of differentiation .They get differentiate from one stem cells to form the whole functional organ or tissue.

According to the researcher they grow these stem cells in laboratory. These stem cells are manipulated into a specialized cells type and then specific type of the cell such as HEART CELLS,MUSCLE CELLS OR NERVE CELLS.

These specialized cells can be implanted into a person.

FOR EXAMPLE: if a person is suffering from heart disease ,then these cells could be injected into heart

muscle. Then a healthy transplanted heart cell could then contribute to repairing defective heart muscle.

Stem cells play an important role in curing various diseases. By mechanism of multiplying in to human body and then repairing the diseased part hence the disease is cure.

The diseased part is totally renewed by treating with stem cells. there are many dysfunction organs or tissues which was observed working properly by giving a stem cells differentiation therapy in the human or animal body.

### **STEM CELLS: THERAPY FOR VARIOUS DISEASES**

#### **1] Alzheimer :a nervous system disorder.**

Alzheimer is a very ancient disease related to nervous system.

It is defined as irreversible progressive, neurodegenerative illness or disease that is most common form of dementia among the old age people.

Alzheimer disease mostly occur in old age people. It's a form of loss of memory and learning centre.

In recent days the most effective treatment for treating AD is STEM CELLS THERAPY. It has been one of the most promising treatment. stem cells therapy has proven better to cure Alzheimer disease.

XUAN EL AL had pronounced that neural stem cells of hippocampus and glial cells derived from neural stem cells. In his experiment of stem cells he had injected these both the stem cells into forebrain in 2 group of mice. He noticed that number of cholinergic neuron in group received neural stem cells was significantly higher than those who received several glial cells. But the difference was noticed in cognitive ability of both group of mice which received the injection and which has lesions who didn't received injection.

Another approach may be regenerative therapy which regenerated the lost functions.

Neuroreplacement therapies can also be marked therapy for Alzheimer disease. The adult born neurons in the diseases brain seem to be a good nominee for those lost the neurons.

The stem cells can genetically modified invitro which have high migratory capacity after transplant into brain, which delivers the neurotropic factors, which

enhance the ability if (neurons damaged) to repair or function normally.

Some of the progenitor cells exist in adult CNS, and to be involved in neurogenesis process, the activation of endogenous stem cells can migrate to injured or damaged part of brain and the neurons which proliferate and works to function normal. It plays a significant role to promote neuronal regeneration in the diseased brain, and also protects the remaining tissue and secondary neurons loss through production of neurotrophic factors and protective factors like (BDNF) i.e. BRAIN DERIVED NEUROTROPHIC FACTOR.

#### **2] Cardiovascular diseases**

STEM CELLS are seem to be playing a crucial role in curing a heart diseases. Cardiovascular diseases include various dysfunctioning programs of HEART. It includes ISCHEMIA, CORONARY HEART DISEASE, MYOCARDIAL INFRACTION, HEART ATTACK, STROKE, ARRHYTHMIA, HYPERTENSION, HYPOTENSION.

Cardiovascular disease is a leading cause of death worldwide killing 17.5 million representing 31% of global deaths. Of these deaths 85% are due to heart attack and stroke. In united states it is number one cause of death.

This happen due to inability to repair the damaged tissue of heart. but in recent days stem cells therapy had proven a great opportunity to cure cardiovascular disease rather than performing angioplasty.

Various clinical trials have proved adult stem cells therapy is safe and effective to treat CVS.

In recent research it is possible to generate healthy heart muscle cells in the laboratory and then transplant into patient with chronic heart disease.

In study of Cahill et al heterogenous cells were injected into 3 different location of the animal i.p.s.c or i.v. hence it was expected that after replacement of these cells precursor cell would obtain ability of replacement and would differentiate to functional osteoprogenitor cells. hence it can cure the disease.

In various research programme transplantation of bone marrow stromal cells in damaged heart of mice and other animal proved to be improved in CVS conditions and get benefited. The embryonic stem cells proves to be regenerating into many differentiating cardiac cells and repair the damaged area. Many discovery have lead that myocardial injury induces cardiomyocyte cardiac cells

proliferation..Identification of cardiac stem cells in the adult heart is activated by AMI supported. These cardiac stem cells reenters into the cell cycle and circulating stem cells to move at injured site and repair the cardiac cells.

Embryonic stem cells are most favourable cells for unlimited self-renewal and pluripotency.

Various methods of inducing stem cells delivery is peripheral intravenous infusion i.e indirect method widely used in animal models.which gives favourable result.

Intramyocardial injection during coronary artery bypass graft surgery easily allows stem cells to be placed in targeted area.

### 3) Diabetes:

Diabetes is autoimmune disorder. In Diabetic condition the immune system attacks and destroys the insulin producing beta cells of the pancreas. This beta cells deficiency leading to complete insulin deficiency , which causes either rise in blood glucose level.

Stem cells had proved to cure TYPE-1 diabetes by various ways.

- ❖ Embryonic stem cells : Soria et al had reported the first report of insulin producing cells which were found in mouse embryonic stem cells which was published in 2001
- ❖ Mesenchymal cells : These type of stem cells had showed that have immunomodulation ability through regulation activity of beta cells. These type of cells had shown ability to differentiate into insulin producing cells  
Research in clinical laboratory is still ongoing on mesenchymal stem cells to cure type-1 diabetes.

### CONCLUSION:

After reviewing the stem cells various advances & techniques are available to cure various disease. These special types of cells are very helpful in curing deadly diseases. A patient by stem cells therapy can live a new life after suffering from these life threatening disease.These specialized cells are now a days playing a crucial role in various hospital and life sciences.

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