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Blooming Belly Cord - Stem Cell Therapy

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Heart heals heart, lung heals lung, spleen heals spleen, like cures like

– Paracelsus 16th cen.

Abstract: ***Stem cells are undifferentiated biological cells that can be differentiated into specialized cells and can divide through mitosis to produce more stem cells. Stem cells will play an important role in treating arduous diseases of the human in the modern era. Also it's proved the efficiency in the advancement of Cell Programming, Cell Remodeling, testing new drugs, Repair, Renewal, Re-growth of Cells and Tissues. There is tremendous need to do the research studies to prove the potency of stem cells to treat the challenging disease in the current scenario. Out of the various types of stem cells: the multi-potent umbilical cord stem cells are promising for the transformation of modern protective curative and rehabilitative paradigm to the next generation of our medical technology. Since the umbilical cord stem cell therapy is inevitable and compelled recent innovation in the regenerative medicine: all the health care members need to be oriented with the Blooming Belly Cord stem cell regenerative therapy. It is the major health care investment for our future generation.***

Keywords: Stem Cell Therapy, Regeneration, Umbilical Cord Stem cells, Differentiation, Un-specialization, Reprogramming, renewal, Repair, Cell Programming, Pluri-potent, Multi-potent, Embryonic stem cells

1. Introduction

The initial concept of regenerative medicine dates all the way back to 330 BC, when Aristotle observed that a lizard could grow back the lost tip of its tail. Slowly over time, humans have grown to understand regenerative medicine, and how it may change the way we treat diseases. It's been only relatively recently that the stem cell therapy, a type of regenerative medicine, has gathered fast momentum.

Umbilical cord blood stem cells have been used for over 25 years for more than 30, 000 successful transplants world over with over a lakh of children's stem cells banked in India.

Meaning: Stem cells are undifferentiated biological cells that can differentiate in to specialized cells and can divide through mitosis to produce more stem cells.

Stem Cells

Stem cells are the body's raw materials — cells from which all other cells with specialized functions are generated. Under the right conditions in the body or a laboratory, stem cells divide to form more cells called daughter cells. These daughter cells either become new stem cells (self - renewal) or become specialized cells (differentiation) with a more specific function, such as blood cells, brain cells, heart muscle cells or bone cells. No other cell in the body has the natural ability to generate new cell types.

Nature of Stem Cells

- **Unspecialized**: Stem cells are cells that have the potential to develop into many different or specialized cell types. Stem cells can be thought of as primitive, "unspecialized" cells that are able to divide and become specialized cells of the body such as liver cells, muscle cells, blood cells, and other cells with specific functions.
- **Undifferentiated**: Stem cells are referred to as "undifferentiated" cells because they have not yet committed to a developmental path that will form a specific tissue or organ. The process of changing into a specific cell type is known as **differentiation**.
- **Renew and Repair**: In some areas of the body, stem cells divide regularly to renew and repair the existing tissue. The bone marrow and gastrointestinal tract are examples of areas in which stem cells function to renew and repair tissue

Properties of Stem Cells

Self Renewal (Regeneration): Stem cells are capable of dividing and renewing themselves for long periods.

Unspecialization: Stem cells are unspecialized and do not have any tissue specific structure that allow for specialized functions.

Specialization/Differentiation: Unspecialized stem cells give rise to specialized cells – Differentiated cells in response to external and internal chemical signals.

Internal signals: Specific genes causing differential gene expression

External signals: Chemical secreted by other cells such as growth factors, cytokines ect and physical contact with neighboring cells.

Types of stem cells

1) TORTIPOTENT: The ability to differentiate into all types. This can form any cell of the embryo as well as the placenta. Example: - Morula
2) PLURIPOTENT: The ability to differentiate in to almost all types except placental tissue. Example: - Cells from inner cell mass of Blastocyst
3) MULTIPOTENT: It can differentiate in to multiple specialized cells of a closely related family of cell. Example: - Hematopoietic stem cells
4) OLIGOPOTENT: The ability to differentiate into few cells Example: - Lymphoid

5) UNIPOTENT: These cells only produce one cell type: but have the property of self renewal which distinguishes them from the non stem cells. Example: - Muscle and cardiac stem cells

Why is there such an interest in stem cells?

- Increase understanding of how diseases occur.
- Generate healthy cells to replace diseased cells (regenerative medicine).
- Stem cells may have the potential to be grown to become new tissue for use in transplant and regenerative medicine.
- Test new drugs for safety and effectiveness
- Cell Programming: New areas of study which include the effectiveness of using human stem cells that have been programmed into tissue - specific cells to test new drugs.

Sources of stem cells

Embryonic stem cells
These Pluripotent stem cells come from embryos that are three to five days old. At this stage, an embryo is called a Blastocyst and has about 150 cells. They can divide into more stem cells or can become any type of cell in the body. This versatility allows embryonic stem cells to be used to regenerate or repair diseased tissue and organs. For example, cells taken from one section of an embryo that might have become part of the eye can be transferred into another section of the embryo and could develop into blood, muscle, nerve, or liver cells.

Adult stem cells
These stem cells are found in small numbers in most adult tissues, such as bone marrow or fat. Compared with embryonic stem cells, adult stem cells have a more limited ability to give rise to various cells of the body. Until recently, researchers thought adult stem cells could create only similar types of cells. For instance, researchers thought that stem cells residing in the bone marrow could give rise only to blood cells. However, emerging evidence suggests that adult stem cells may be able to create various types of cells. For instance, bone marrow stem cells may be able to create bone or heart muscle cells.

Altered Adult cells like embryonic stem cells (Induced Pluripotent stem cells)

Scientists have successfully transformed regular adult cells into stem cells using **genetic reprogramming**. By altering the genes in the adult cells, researchers can reprogram the cells to act similarly to embryonic stem cells. This new technique may allow researchers to use reprogrammed cells instead of embryonic stem cells and prevent immune system rejection of the new stem cells.

Peri - natal stem cells
Jennifer D (2007) et al stated that Umbilical cord blood (UCB) banking has become a new obstetrical trend. It offers expectant parents to avail biological insurance policy that can be used in the event of a child or family member's life - threatening illness and puts patients in a position of control over their own treatment options.

Edward H et al (2020) stated that Fetal Stem Cells are multipotent and with minimal ethical restrictions. Fetal MSCs can be harvested from fetal tissues such as blood and bone marrow or extra fetal (perinatal) tissues like placenta, amniotic fluid, Wharton jelly, umbilical cord blood, decidua basalis, and decidua parietalis. Fetal MSCs have reportedly better intrinsic homing and engraftment ability, greater multipotency and lower immunogenicity compared to adult stem cells.

Stem Cell Therapy
Stem cell therapy, also known as regenerative medicine, promotes the repair response of diseased, dysfunctional or injured tissue using stem cells or their derivatives. It is the next chapter in organ transplantation and uses cells instead of donor organs, which are limited in supply.

How does it work?
Researchers grow stem cells in a lab. These stem cells are manipulated to specialize into specific types of cells, such as heart muscle cells, blood cells or nerve cells. The specialized cells can then be implanted into a person. For example, if the person has heart disease, the cells could be injected into the heart muscle. The healthy transplanted heart muscle cells could then contribute to repairing defective heart muscle.

Diseases Treated

- Blood cancers, like leukemia and lymphoma (Hodgkin and non - Hodgkin lymphoma)
- Bone marrow diseases, like Fanconi anemia
- Certain anemias, like sickle cell disease, aplastic anemia and thalassemia
- Certain immune system problems, like severe combined immune deficiency (also called SCID)
- Inherited metabolism problems, such as Hurler syndrome and leuko - dystrophies
- Scientists are studying whether or not cord blood can be used to treat other diseases and health conditions, like cerebral palsy, brain injuries, diabetes and Parkinson's disease
- Cord blood stem cell transplants have now been given successfully to patients (mostly children) with some 70 diseases, including major types of myelodysplastic syndromes (MDS), neuroblastoma and Wiskott - Aldrich syndrome.

Alessandro R Marcon et al (2020) stated that Umbilical cord blood (UCB) represents a substantial source of regenerative cells for various clinical applications for the treatment of numerous diseases.

Cord Blood Stem Cell Transplantation
Umbilical cord blood is a rich source of stem cells for transplantation. There may be advantages for certain patients to have cord blood stem cell transplants instead of transplants with marrow or peripheral blood stem cells (PBSCs).

Stem cell transplants (peripheral blood, marrow or cord blood) may use the patient's own stem cells (called **"Autologous transplants**") Donor cells may come from either a related or unrelated matched donor (called an "**Allogeneic transplant**")

Cord blood for transplantation is collected from the umbilical cord and placenta after a baby is delivered. Donated cord blood that meets requirements is frozen and stored at a cord blood bank for future use.

Storage: It is not known how long cord blood can be frozen and stored before it loses its effectiveness. Cord blood samples have been preserved for as long as 10 years and have still been successfully transplanted. The number of cells required to give a transplant patient is based on his or her weight, age and disease status.

Cord blood stem cell transplantation
The first successful cord blood stem cell transplant was performed in 1988 in Paris, France. To date, more than 5, 500 cord blood stem cell transplants from unrelated donors and several hundred from sibling donors have been performed worldwide.

Mark L. Weiss & Deryl L. Troyer (2006) stated that stem cells are the next frontier in medicine. Stem cells are thought to have great therapeutic and biotechnological potential. This will not only to replace damaged or dysfunctional cells, but also rescue them and/or deliver therapeutic proteins after they have been engineered to do so**.**

2. Advantages

Stem cells from cord blood may have greater benefits compared to stem cells from bone marrow or blood. These include:

- Safe and easy collection
- More matches.
- Easily Available.
- Human Leukocyte Antigen (HLA) Matching: HLA matching plays an important role in successful engraftment, severity of graft - versus - host disease (GVHD) and overall survival. A close match between the patient and the cord blood unit can improve a patient's outcome after transplantation.
- Graft - Versus - Host Disease: Studies have found that after a cord blood stem cell transplant, fewer patients got GVHD but the complication tended to be less severe than it was in patients who had bone marrow or peripheral blood transplants.
- Diversity: Diverse ethnic backgrounds donated cord blood reflects racial diversity.
- Infectious Disease Transmission: Cord blood stem cell transplants carry less risk of transmission of blood - borne infectious diseases
- Ready to use: Cord blood doesn't need much processing time.
- Better chance of transplant success.

3. Potential Disadvantages

- **Small amount:** The umbilical cord contains a small amount of cord blood. Sometimes there isn't enough for a stem cell transplant into an older child or adult.
- **Longer Time:** Longer time to start making blood cells than bone marrow stem cells.
- **Genetic Diseases:** In apparent genetic diseases may be transplanted to the recipient via donor cord blood stem cells. Follow - up is difficult to track this possibility until the donor infant is months or even years old.

So obtain a detailed health history from potential donors in advance of cord blood collection. A future alternative approach may be genetic testing for diseases that affect the blood and immune system and for certain metabolic diseases.

4. Conclusion

Umbilical cord is the link when inside the womb. Love is the link when outside the womb - Sai Sharath Gampa

At the time of Aaradhya's birth, Aishwarya Rai Bachchan opted for banking her daughter's stem cells. She added "The most important role in my life is that of being a mother, choosing to bank our baby's umbilical cord stem cells is a treasured gift that will stay with her for life and is an investment for her healthy future".

Recent researches report that successful translation of stem cell therapies and regenerative strategies may one day become a treatment for a wide range of vexing diseases. Stem cell therapy of regenerative medicine is considered as the one of the most promising disciplines in the fields of modern medicine. Such an advanced technology offers endless possibilities for transformative and potentially curative treatments for some of humanities most life threatening diseases. In the near future, Cord stem cell - based therapies shall significantly impact human health

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