ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 5(J), pp. 27147-27152, May, 2018

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

BENEFITS OF STORAGE OF UMBILICAL CORD BLOOD AND TISSUE-'GENEROUS GIFT FOR TREATMENT OF MANY CRITICAL DISEASES'

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DOI: http://dx.doi.org/10.24327/ijrsr.2018.0905.2198

ARTICLE INFO

Article History:
Received 06th February, 2018
Received in revised form 14th March, 2018
Accepted 23rd April, 2018
Published online 28th May, 2018

Key Words:

Umbilical cord, Umbilical cord blood, stem cells, cord blood bank

ABSTRACT

Introduction-Since past whenever delivery of a baby occurred, umbilical cord and placenta are thrown out because health workers thought that umbilical cord and placenta is a waste product. But now a days scientist are well known importance of Umbilical cord blood and cells, as most potent and much more number of stem cells are found in Umbilical cord blood and tissue. Stem cell have capability to create and heal our body. **Aim-**This review will focus on Umbilical cord derived stem cells and compare those with adult bone marrow derived mesenchymal stem cells. So that peoples understand importance of Umbilical cord blood and tissue and became aware to donating Umbilical cord blood, which is a precious gift for critically ill patient. **Conclusion -**Umbilical cord derived stem cells are readily available and inexpensive source of cells that are capable of forming different types of cells (i.e. pluripotent, Multi-potent) which have ability to create and heal our organs, blood, immune system.

INTRODUCTION

Umbilical cord blood means blood that remains in a baby's umbilical cord and placenta immediately after baby is born and umbilical cord is clamped out.

Umbilical cord blood have stem cells [pluripotent cells, multipotent cells, hematopoietic stem cell (HSCs)]which have ability to create and heal our organs, blood, immune system .Because of their 'Youth' stem cells from umbilical cord blood are most flexible and potent in our body.

Pluripotent cells (true stem cells) *-These cells are able to make cells of all3 basic layers of body, so they can produce any cell or tissue for body needs to repair. This mater property is called pluripotentcy.*

Why are stem cells are Power Full – because they have power of create and regenerate the tissue, organs, blood and immune system that make up our bodies. They have function of growth and healing throughout life.

Properties of stem cells can also be illustrated 'in- Vitro'(out side body, in laboratories) using clonogenic assays. In which we assesses capability of single cells to differentiate and self renew[1,2].

Stem cells also found in bone marrow, fat tissue of children as well as in adult but in young age more flexible stem cells found. Adult stem cells also called somatic stem cells, are those stem cells which maintain and repair tissue in which they are found. Pluripotent Adult stem cells are rare and small in number but they found more in number in Umbilical cord blood and in other tissue. Adult stem cells (progenitor cells) act as a repair system for body, replenishing adult tissues. Maintain normal turnover of regenerative organs such as blood, skin and intestinal tissues.

Embryonic Stem cells also found in blastocyst stage[3] of Inner cell mass (In early stage of embryo).

Bone-marrow is a rich source of several disease like liver, cirrhosis, chronic limb ischemia, end stage heart failure. In stem cells, with age DNA damage start. So quantity of bone marrow /peripheral stem cells decrease with age and is greater in males than females during reproductive life.

Umbilical cord blood which is usually thrown out enriched with blood forming cells (haematopoietic stem cell) used as an alternative source of bone marrow /peripheral stem cell, that if give to a patient with malignant (Leukemia) and non-malignant condition (thalasemia) there is a possibility to cure both of adult and of children (gift of 'survive' to a dying patient by waste product of human origin). So in this way in the world

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little heroes are born in each and every movement ,because new-born baby just like a hero can save many life by giving umbilical cord blood. He/she became angel for many critically ill patient specially with blood disease (Leukemia), immune disease (Lymphoma), genetic disease, cancer.

Stem cells recovered post-nataly from Umbilical cord

1. Umbilical cord blood
2. Umbilical cord vein
3. Umbilical cord matrix cells, Wharton's jelly
4. Amnion /Placenta

1st clinically documented use of Umbilical cord blood stem cells was in 1988 for a 6 year old boy, which has Fanconi anemia. Since then Umbilical cord blood is used as stem cell therapy[4]. Umbilical cord blood has unique advantages over traditional Bone marrow transplantation, specially in children and can be life saving in rare disease, where a matching Bone marrow donor can not meet.

So donating your baby's Umbilical cord blood to a Umbilical cord blood bank we can save life of many patients that are in need of such transplantation.

Worldwide Umbilical cord blood has been used in approximately 40000 transplants in treatment of over 80 disease. In Australia over 500 Umbilical cord blood units have been released for cure diseases.

Benefits

1. Umbilical cord blood donation is completely safe for mother and baby. It is collected from Umbilical cord just after birth of baby.
2. It is donated for humanity (you earn blessings without any cost).
3. Reduced risk of graft versus host reaction and lower incidence of transmission of virus, bacteria.
4. Umbilical cord blood stem cell are more potent then adult stem cells.
5. Umbilical cord blood stem cells have not exposed to environmental pollution, virus, chemicals, carcinogens.
6. Umbilical cord blood transplants require less strong HLA matching between tissue of donor and recipient.

Bone marrow transplants in Acute Leukemia require strong HLA matching between tissue of donor and recipient. Bone marrow transplants require complete match of 6 key antigen, which are measures of graft versus host reaction (6/6 match). Umbilical cord blood transplants achieve same medical success with only a 4/6 match.2 siblings required a 6/6 match for a bone marrow transplantation but 2 siblings required only 4/6 match for Umbilical cord blood transplants.

Transplants –are of 2 types

Autologus graft- Self donation of tissue
Allogenic graft – Other (related or unrelated) person donate tissue.

Disease Treated By Umbilical Cord Blood Transplants Or By Cord Blood Transfusion-

Cancer

Acute biphenotypic Leukemia
Acute undifferentiated Leukemia
Chronic myelo-monocytic Leukemia (CMML)
Acute myelogenous Leukemia (AML)
Acute lymphocytic Leukemia(ALL)
Adult T cell Leukemia
Chronic myelogenous Leukemia (CML), Chronic lymphocytic Leukemia (CLL),
Juvenile Chronic myelogenous Leukemia (JCML)
Juvenile myelo-monocytic Leukemia (JMML)
leukocyte Adhesion deficiency syndrome
Myloid /natural killer (NK)cell precursor acute Leukemia
Promylomocytic Leukemia
Rhabdomyosarcoma
Thymoma
Waldenstrom's macroglobulinemia
plasma cell Leukemia
Chronic Active epistein Barr virus
Neruroblastoma
Ewing sarcoma
Multiple myeloma
Solid tumors (with high risk)
Myedodysplastic syndrome
Hodgkin & Non - Hodgkin Lymphoma.

Blood Disorders

Sickle cell Anemia
Fanconi Anemia
Beta- thalassaemia
Diamond –Blackfan Anemia
Aplastic Anemia.
Acute myelofibrosis
Amyloidosis
Congenital Amegakaryocytic thrombocytopenia (CAT)
Agnogenic myeloid metaplasia (myelofibrosis)
Myelodysplastic syndrome
Glanzmann's thrombasthenia
Refractory anemia with excess Blasts (RAEB)
Refractory anemia with excess in transition (RAEB-I)
Refractory anemia with ringed sideroblasts (RARS)

Metabolic Disorders

Hurler Syndrome (MPS-IH)
Hunter Syndrome (MPS-II)
Mannosidosis
Maroteaux-lany Syndrome (MPS-VI)
Mucolipidosis II (I-cell disease)
Leish-nyhan syndrome
Scheie Syndrome (MPS-VI)
Gaucher disease
Congenital erythropoietic porphyria (Gunther disease)
Krabbe disease,
Metachromatic Leukodystrophy
Sanfilippo Syndrome.
Nieman-pick disease
Sandhoff disease
Wolman diseaseukodystrophy
X-linked Adrenol

Immune Disorders

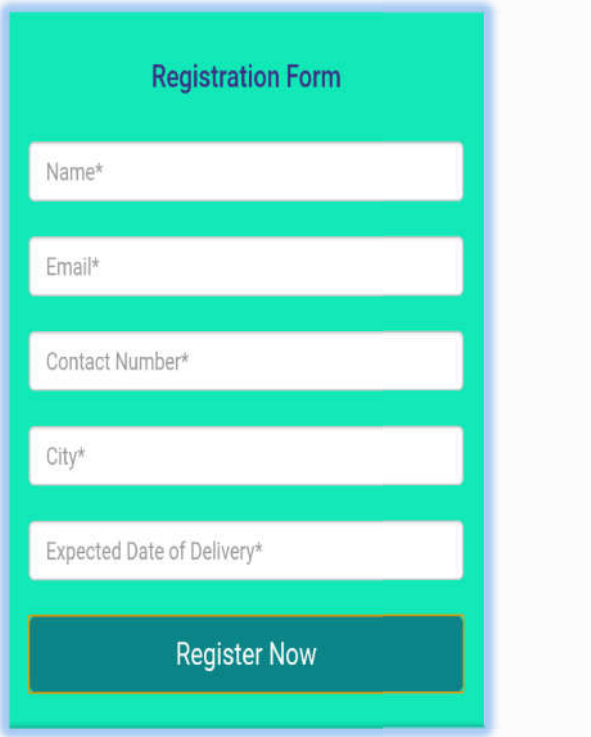
Chronic granulomatous disease,
Leukocyte adhesion deficiency severe combined disease
Hystiocytic disorders-Hystiocytosis-X
Wiskott –Aldrich Syndrome.

Sever combind immunodeficiency syndrome
adenosne deaminase deficienicy syndrome
X-linked Agammaglobulinimia
X-linked lymphoproliferative
X-linked hyper IgM syndrome
Bare lymphocyte syndrome
Congenital neutropenia
Digeorge syndrome
Fucosidosis

Donate Your Baby's Umbilical Cord Blood

Preserve your baby's stem cell and get unlimited access to donor stem cells for family as well as for self.

DOWNLOAD Registration form from click link https://www.lifecell.in/ or www.reelabs.com or any link written below-



Institution where registration can be done or ask for registraion

Lifecell International PVT.LTD

#26,Vandalur Kelambakkm Main Road
Keelakottiyur
Chennai-600127
Tamil Nadu , India
link https://www.lifecell.in/

REE LABS PVT.LTD

1st Floor , KK Chambers
Sir P.T.Road,
Fort ,Mumbai-400001
Phone: (+91)2222072526
Fax: (+91)2222072527
Tollfree hotline:1800-222-454
(mon –Fri, 10am-6pm)
www.reelabs.com

Cordlife

Tollfree hotline:18004196200
Customer care hotline (+91)9830166200
(+91)7044065825
SMS –type CL to 56677

HRSA –Health resourses and service adminstration
Click at - https://www.hrsa.gov/ or

https://bloodcell.transplant.hrsa.gov/cord/options/donating/index.html

FOR health workers

- Be sure that Blood is free from contamination.
- Tissue typed and listed on the registry of the C.W. Bill Young Cell Transplantation Program, also called the Be The Match Registry. (The registry is a list of potential donor of cord blood. When a patient in needs of a transplant, the registry is searched to find a matching donor of cord blood unit.)

Protecting Your Privacy After You Have Donated - Your and your baby's personal information are always kept private by the public cord blood bank. The cord blood unit is given in certaint hospital, and this is listed on the registry and at the public cord blood bank**.**

Thank You for This Generous Gift

Cord blood after donation Frozen in a liquid nitrogen freezer and stored, when cord blood unit is selected as a match for a patient needing a transplant, it will be available.

To learn about cord donation

To learn about cord donation-participating public cord blood bank– click at http://marrow.org/Get.Involved/Donate-Cord-Blood/How-To-Donate/Sibling-Directed-Donation.aspx#related-donor-cb program
To learn about family cord blood bank donation– call at Parent's Guide to Cord Blood
click at http://parentsguidecordblood.org/

All this at affordable rate.

Collection of Umbilical Cord Blood

First you Sign a consent form to donate your's baby cord blood. This consent form says that the donated cord blood may be used by any patient which is in need of a transplant. If the baby's cord blood cannot be used for transplantation, it may be used in research studies or thrown away. These studies help in future to treat more diseases and more successful transplant.

Step -1

Collection of Umbilical Cord Blood

Health care professionals should obtain consent from mother who will deliver baby for collection of Umbilical cord blood prior to onset of active labour.

1. Just after birth of baby Umbilical cord cut and Umbilical cord blood collect. Umbilical cord blood extracted from fetal end of Umbilical cord. It is generally done within 10 minutes of baby's birth.
2. Additional stem cells may be collected from placenta. After Umbilical cord blood collection by health workers,

Umbilical cord stored in a sterile container AND send to stem cell laboratory.

3. C.A sufficient Umbilical cord blood collection require at least 75 ml in order to insure that there will be sufficient cells for transplantation.
4. Umbilical cord blood undergo for vital testing (test for HIV, Hepatitis B & C, tissue typing to determine HLA typing). It is also examined for nucleated cell count, cell viability, blood group antigen ABO & Rh blood group system.

Umbilical cord blood collection
Umbilical cord stored in a sterile container

Step II

After Umbilical cord blood collection unit is shift to laboratory and processed and then cryo preserved.

Now collected Umbilical cord blood collection goes through a process of cell separation.

The cells are spun in a centrifuge to reduce red blood cells and unwanted plasma and non-useful detrimental components from the desired pure stem cell collection. Pure stem cell are more amenable for regeneration.

Centrifugation process

Processing method -
1.In one method RBC separate out .
2. In other method RBC keep in (Not separate out).

When baby's cord blood tissue arrives at lab highly trained lab technicians extract cord tissue stem cell prior to storage in 5 compartments bag (In past time –Dual (2) compartments bag) for treating Umbilical cord tissue. This is a critical step as clinical usage requires cells not tissue. Using this processing method result in 8 x the number of mesenchymal stem cell. (MSCs)

Dual chambered or 2 compartments bag held 80% blood in main compartment, giving parents and doctors for only one sample for transfusion and second smaller compartment contain sample for future cultivation or research.

5 compartments bag

2 compartments bag

New FDA approved 5 compartments bag replace dual chambered or 2 compartments bag.

Dual chambered or 2 compartments bag –this out going bag held 80% blood in main compartment, giving parents and doctors for only one sample for transfusion and second smaller compartment contain sample for future cultivation or research.

Now a days premium cord blood freezer bag has 5 equal chambers, giving doctors opportunity for utilize only one chamber of collection if less blood transfusion required.

All subsequent step are performed in a biohazard safety cabinet to eliminate risk of contamination.

Step III

1. Remove all other component, leaving only umbilical cord lining.
2. Umbilical cord lining is then cleaned with wash buffer solution and cut into small pieces.

Remove all other component , leaving only umbilical cord lining .

Umbilical cord cut into small pieces

Step IV

Decontaminated small pieces are then transferred in to multiple cryo vials added with cryoprotectant solution to keep viability of umbilical cord piece during cryo-preservative (dimethyl sufoxide).

Step V

Now cord lining pieces are frozen gradually in the controlled rate freezer, where temperature lowered by 1 - 2^0 cells per Minute. By this viability of stem cell remain preserved.

Step VI

After controlled rate freezing cryo-vials are transferred into a MVE anti-contamination vapor-phage liquid nitrogen storage system for long term cryo-preservation at -190^o c.

Multiple cryo-vial added with cryoprotectant

stem cell preserved

Umbilical Cord Blood Bank – A cord blood bank is a facility which stores Umbilical cord blood for future use. Both private and public cord blood bank developed for using Umbilical cord blood for cure many critical diseases.

Public Umbilical cord blood banks accept donations of Umbilical cord blood used for anyone who is in need and so public Umbilical cord blood banking more widely accepted by medical community. Public banks put No-charge for collection and storage of Umbilical cord blood. Anyone who are registered for cord blood donation can give owns baby cord blood (but donor with infectious disease as HIV excluded). Ideally registration done before 3 month prior to EDD (expected date of delivery).

Private Umbilical cord blood bank (Family cord banking) store Umbilical cord blood only for potential use by donor or donor's family. Private banks charge for collection and storage of Umbilical cord blood.
Charge is affordable
Rate vary from bank to bank.
Each Umbilical cord blood /stem cells bank have some-what different charge.

Umbilical cord blood stem cells can also be used for siblings and other members of your family who have a matching tissue type. Siblings have a 25% chance of compatibility and Umbilical cord blood may even be a match for parents (50 %) or grand- parents.

Private banking -http://www.stemcellcare.co.uk
Ability to use Umbilical cord blood depend on long term commercial viability of enterprise.

Umbilical cord blood bank –Situated out-side of India

Cryo-Cell-International

1. It is a Umbilical cord blood bank founded by Dan Richard in 1989.
2. It is 1st private [5] Umbilical cord blood bank for store and separate Stem cells.
3. Head-quarter-Old- smar, Florida, United –State.
4. cryo-cell- international facility is FDA registered.
5. cryo-cell-international is accredited by American Association of blood bank.
6. cryo-cell-international is ISO[6] 9001:2008 certified by BSI group.
7. cryo-cell-international is only private bank in United – State FACT[7] accredited .
8. cryo-cell-international service -Preservation of Umbilical cord blood and Umbilical cord tissue.

Viacord

1. Viacord processing laboratory (VPL) is accredited by American Association of blood banks (AABB) for processing of cord tissue (somatic cells).
2. It provide a quality process from collection to storage. Viacord's advanced cord blood collection bag is pre – filled with citrate phosphate dextrose (CPD), an FDA recommended anti-coagulant that also functions as a cell preservative collection bags. CPD collection bag have been proven to increase stem cell yield by more than 50% compared to heparin is a key consideration for physicians with regard to treatment science.

Toll free hotline-866-668-4895

Life Cell International PVT. LTD.

Life cell international[8] pvt. ltd. In 2004 originally as a private Umbilical cord blood bank. It launch baby cord share community stem cell banking in 2017. It allow sharing of preserved umbilical stem cells amongst the families that have preserved their baby's stem cell at birth.

Cell Care

It is 1st private Umbilical cord blood bank for storage Umbilical cord tissue in Australia.
Cell care worked with scientists from Monash institute of Medical research to build a dedicated cord tissue laboratory.
Cell care has stored over 2,500 cord tissue samples since this service was launched in April 2012.
Cell care offers a low deposit of $250 for Umbilical cord blood and Umbilical cord tissue storage.

In January 1997, company's stock began trading on NASDAQ Small cap market under symbol of Blood bank.

IVIDA

IVIDA[9] is a private Umbilical cord pool bank in Spain.

Virgin Health Bank [10]

Private as well as public stem cell bank in United Kingdom.
Service – Storage of Umbilical cord blood for 25 years.

VITA 34

VITA 34[11] one of largest Umbilical cord blood bank in Europe and German.
It give service since last 20 years (stem cell banking).
Hybrid cord blood bank banking– Include both public & private banking models.

Cord- Life Science India PVT.LTD

Cord- life science india pvt.ltd. is a subsidiary of cord life group limited, a Singapur exchange(SGX),main board listed company, providing service of cord blood and cord lining (cord tissue) banking.

Customer service hotline –(+91)7044065825
(+91)9830166200
Toll free hotline 800 419 6200

Federal Cord Blood Mandate

Be the Match was started by United State government to operate Nation's cord blood coordinating center as mandated by stem cell therapeutic and research Act of 2005.(stem cell Act of 2005) and amended by stem cell therapeutic Reauthorization Act of 2010 and 2015 .They work with (public) Umbilical cord blood bank ,doctors ,researches to improve Umbilical cord blood transplantation and educate medical professional and Public.

Umbilical cord Blood Bank in India - Myocord[12]

Myocord cellugen a private limited stem cell research company started its stem cell banking division Myocord in 2008 in Gurgaon, India.

Myocord introduce 1st private Umbilical cord pool banking.

Myocord precious pool plan (MPPP) allow baby's family to become members of a combined pool of donor units via its Contribution.

OTHER BANK IN INDIA – NAME OF BANK	NAME OF CITY
1.LIFE CELL	Chennai & Gurgaon
2.Cord-life india	Kolkata
3.Baby cell	Mumbai
4.Cord care India(Pathcare lab)	Hyderabad
5.Cryo stem cell	Bangalore
6.Indu stem cell bank	Voluntary blood bank in Gujarat
7.International stem cell services Ltd.(ISSL)	Bangalore
8.Nova cord	Fortis Memorial Research Institute, Gujarat
9.Ree Labs	Mumbai
10.Reliance	Reliance life science , Mumbai
11.Stem plus	Maharashtra
12. Stem Cyte India	At Appolo hospital compus, Gujarat

Autologous harvesting: Obtained from ones own body Umbilical cord blood cells just as one may store in family banks for his/her 'own-blood' for elective surgical procedures in future.

Safety and effectiveness: But Children who have any immunological disease are unable to use their own Umbilical cord blood for transplant because owns blood also contain same genetic defect.

So using one's own Umbilical cord blood cells might not be wise always or ineffective, especially in cases of childhood malignancy and leukemia.

CONCLUSION

Each little angel (baby) when born can give a precious gift (Umbilical cord blood having stem cells) for mankind. It is our duty that we collect this gift and store for future use for anybody which is in need.

Stem cells are next frontier in medicine. Stem cells are thought to have great therapeutic and biotechnological potential so very useful for cure many disease. Also many new research going on for more Clinical trials – as for treatment of cerebral palsy, Autism, Type –I Diabetes and many other diseases.

So Umbilical cord blood is 'A *precious gift for critically ill patient, give them A second life'.*

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How to cite this article:

Ritu Bala Soni *et al.*2018, Benefits of Storage of Umbilical Cord Blood And Tissue-'Generous Gift For Treatment of Many Critical Diseases'. *Int J Recent Sci Res.* 9(5), pp. 27147-27152. DOI: http://dx.doi.org/10.24327/ijrsr.2018.0905.2198

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