

Menstrual Blood Banking

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ABSTRACT

Cell science and therapies related to stem cell are making remarkable progress. Menstrual blood has always been a subject of study in different researches due to its easy availability. The possibility of isolation of stem cells from the menstrual blood and the umbilical cord blood cells has opened a new channel in stem cell research that can offer future therapeutic benefits to mankind. Several successful researches have shown the use of the stem cells derived from the endometrial blood for the treatments of different fatal diseases. The current breakthrough discovery that the menstrual blood contains stem cells that are proliferative and are capable of differentiating into different types of cells including cardiac cells, neural cells and into almost 9 types of tissues including heart, liver and lung, has opened a new field for therapeutic treatment. Moreover, the stem cells from these sources have the potential to differentiate into many types of cells and being immunologically immature offers them the potential to promote cell survival rather than playing a role in cell replacement, which takes place after cell transplantation. The stem cells derived from the menstrual blood i.e. menstrual blood-derived stem cells (MenSCs) have the additional advantage of being available every month in a woman in her reproductive age; hence, could be collected easily than the human umbilical cord blood cells (huCBs), which could be collected only at the time of birth. According to research based on neuroscience, it has been found that the transplantation of the stem cells isolated from the umbilical cord blood cells and the menstrual blood cells can help the therapeutics of the various neurological disorders like Alzheimer's disease (AD), amyotrophic Lateral sclerosis, stroke, etc.

Keywords: Menstrual blood, Stem cells.

INTRODUCTION

Key aspects of menstrual blood stem cells and collection

Earlier, blood from umbilical cord was regarded as the ultimate reserve for stem cells. Only those who have given birth at anytime of their life were able to preserve the stem cells as they were obtained from umbilical cord. But researchers have now discovered and successfully harvested stem cells from menstrual blood making it possible for all the women including those who have never given birth to preserve stem cells for themselves. The discovery of stem cells in the menstrual blood has given a new meaning to menstruation for women who earlier considered menstruation as

nothing but a painful and necessary evil.

Menstruation serves an important purpose, clearing the uterus out monthly in order to prepare the womb for a potential pregnancy. We women understand that, but still, bleeding every month down yonder is no one's idea of fun. But what if that blood could help someone? It just might make the monthly cycle a little less annoying.

Current trends of menstrual stem cell

People are dealing with moral issues associated with embryonic stem cells starting from the first conducted experiment. Those cells are used in treatment of numerous diseases because they can be turned into all cell types. They are also excellent tool for analysis of various diseases (useful in drug development) because scientists could track disease progression from the initiation of the disease. This is probably the most controversial part associated with embryonic stem cells - using the embryo's parts purely for laboratory research.

Important fact (that critics often forget) is that embryos are not cultivated because of the experiments, but rather turned from medical waste into useful material. Typical examples are cells donated from the unsuccessful in vitro fertilization. Umbilical cord is medical waste also. After baby is delivered, umbilical cord will be discarded. In that moment, you have potential solution for future diseases directly in your hands, but no one can force a person to keep these cells until they finally can be used Same is with menstrual blood. Every month females have incredible opportunity to secure themselves against the future illnesses through depositing sample of menstrual stem cells in the bank. List of stem cells associated treatments is already long; I can just imagine future applications of these cells when some new technologies become available.

Around 1970s, researchers discovered that umbilical cord contains cells that have same potential like bone marrow derived hematopoietic cells. In 1988, first successful transplantation of stem cells cured a 5-year-old child that suffered from Fanconi's anaemia. That operation opened an era of successful application of stem cells in various medical fields. People also became more familiar with this topic and more opened toward idea of collecting and storing stem cells.1

Almost all countries in the world have opportunity to collect and store their stem cells for the future use. Stem cells can be donated also. Public stem cell banks will collect stem cells and use them for the future transplantations of children or young people. Children and youngsters are best candidates for stem cell transplantation because their organisms are not fully grown (bigger organism requires more cells). If you donate stem cells, you can save life of someone else's child, just like someone's donation could save life of your child. People might think that donated stem cells are same as donated organs, but unlike already formed organs, stem cells are not fully differentiated and they are flexible and easily adaptable to the new environment.

In other words, stem cells used in transplantation don't have to match exactly with the recipient. Also, statistics showed that people who decide to keep the stem cells in a private bank usually never use them. Your own cells will match your body 100% but only 25% if they are needed for your close relatives. In public stem cell banks, you can find stem cells that will match 90% with your body. Umbilical stem cells are collected immediately after baby is born. If you decide to collect and store menstrual blood stem cells, again, procedure is very simple and painless. Physician will insert a tube that will be collecting blood 4h and during that period you can continue with your regular daily activities. All collected stem cells will be cry-preserved until they are needed. Stem cells should have indefinite longevity, but since preservation of these cells is just "few years" old

method, we can't be 100% sure.

Menstrual stem cells:

Stem cells in menstrual blood are highly proliferative and possess the unique ability to develop into various other types of healthy cells. During a woman's menstrual cycle, these valuable stem cells are discarded.

Cryo-Cell's menstrual stem cell banking service captures those self-renewing stem cells, processes and cryopreserves them for emerging cellular therapies that hold the promise of potentially treating life-threatening diseases.

Banking menstrual stem cells:

Stem cells in menstrual blood have similar regenerative capabilities as the stem cells in umbilical cord blood and bone marrow. Cryo-Cell's patent-pending menstrual stem cell service offers women in their reproductive years the ability to store and preserve these cells for potential use by herself or a family member free from ethical or political controversy.

MATERIAL AND METHODS

Scope and future:

- Stem cells have the unique quality of differentiating into any type of cell. As these cells are immunologically immature in nature, they are able to contribute successfully in the cell survival after a transplant.
- Researchers have harvested stem cells from menstrual blood under laboratory conditions and the harvested cells were successfully differentiated into nerve cells in vitro under lab culture conditions that were controlled. When the differentiated cells were infused into an animal model of stroke, these cultured stem cells reduced behavioural impairments in the stroke model.
- It is now established that endometrial wall of the uterus has unique quality of regeneration. There is a thick growth of blood cells which are dispelled every month and the uterus prepares a new endometrial lining and prepares itself for pregnancy. The shed blood contains varied cells some of which have regenerative properties.
- Researchers tried to find out the practicality and feasibility of collecting menstrual blood in order to harvest the stem cells. They performed several types of analysis of the shed blood and found that these cells can not only be harvested but they also differentiated into specific cells like cartilage, neural tissue or adipose tissue. When menstrual stem cells were induced to the adipogenic lineage, chondrogenic or osteogenic lineage, they displayed histological characteristics such as the presence of fat vacuoles in adipocytes or calcium deposits for bone.
- The Menstrual stem cells (MeSC's) have a great importance for clinical translation of regenerative therapies. The studies demonstrate that these are a unique population of cells that can be safely isolated and can provide us with an expandable source of stem cells from women until they reach menopause.
- Considering their relevance and importance in treatment of rare diseases including certain neuro disorders, it becomes crucial for women to preserve their menstrual blood in the Menstrual Blood Bank.
- Menstrual Stem Cell technology is yet to be utilized in human treatments and therapies, the

research has established the beneficial properties of these cells and their potential use in treatment of several medical conditions like atherosclerosis, diabetes, stroke, rheumatoid arthritis, Parkinson disease and many more.

- Menstrual blood can overcome the problem of immune rejection during the transplant, allowing the female patients to use their own stem cells for the treatment. Thus, it can be said that Menstrual Blood Banking has a vast scope in future and is the next big thing in the medical world.

Collection of menstrual blood

The menstrual blood is collected in physician's or healthcare provider's office with a proprietary kit. Prior to collection, it is recommended that the patient shower and empty the bladder. Menstrual blood collection should be collected on the day of the patient's heaviest menstrual flow. Samples are collected during a woman's menstrual period by using a medical-grade silicone menstrual cup in place of a tampon or sanitary napkin, which is inserted by the physician. The collection can be done at the privacy and convenience of home using a 'Menstrual Cup' - a conical shaped medical grade silicon cup which can collect up to 30 ml of menstrual blood.

The menstrual cup is a reusable product, approved by US FDA and is used as an alternative to sanitary napkin or tampon globally. Depending on the patient's menstrual flow, the menstrual cup should be in place 1-4 hours, but no longer than 4 hours. During this time, the patient should go about their normal routine and return to the physician's office for removal. The cup needs to be placed inside the vagina for at least three hours so as to collect approximately 20 millilitres of blood.

This is then poured in the collection kit and is sent back to the menstrual blood bank laboratory where it is processed, frozen and stored. What makes this method user friendly is that it is completely painless and non invasive. Also, any woman who wants to preserve stem cells for future can do so without having to wait for delivery of baby. The collected menstrual fluid is placed into the menstrual collection container with media, tightly closed and secured, then gently inverted to mix the media solution with the menstrual fluid.



Figure 1: Menstrual Cup Used For Menstrual Blood Banking

Process and storage:

The menstrual blood collection is shipped to Cryo-Cell via medical courier and processed in our state-of-the-art ISO Class 7 clean room. The stem cells are stored in two cryovials, which are overwrapped to safeguard the stem cells during storage and a technique called “controlled-rate freezing” is used to prepare the cells for long-term storage. The overwrapped storage vials are housed in the vapor phase of liquid nitrogen for cryogenic preservation. Storage facilities are monitored 24 hrs/day, 365 days/year for security and temperature, keeping your specimen safe and ready for future use.

RESULT AND DISCUSSION

Benefits of menstrual blood banking

- The menstrual stem cells are unique because they have many properties and characteristics similar to both bone marrow and embryonic stem cells; they multiply rapidly and can differentiate into many other types of stem cells such as neural, cardiac, bone, fat, cartilage and possibly others; demonstrating great promise for future use in clinical regenerative medical therapies.
- The beneficial properties of these cells and their potential use in treatment of several medical conditions like atherosclerosis, diabetes, stroke, rheumatoid arthritis, Parkinson disease and many more.
- Alongside, menstrual blood can overcome the problem of immune rejection during the transplant, allowing the female patients to use their own stem cells for the treatment.

Therapeutic application of menstrual stem cells:

Stem cells found in menstrual blood — along with cells from babies’ umbilical cords — could potentially be incorporated into treatments for

1. Stroke
2. Alzheimer’s disease
3. Lou Gehrig’s disease
4. Amyotrophic lateral sclerosis
5. Atherosclerosis
6. Diabetes
7. Heart Disease
8. Inflammatory Bowel Disease
9. Parkinson's disease
10. Osteoarthritis
11. Rheumatoid Arthritis and many other

Menstrual stem cells have the potential to differentiate into possibly every other cell type in the human body. Although menstrual stem cell technology has not yet been utilized to date in human

therapies, the collective body of ongoing research may potentially change the types of therapies used to diagnose or treat a host of significant medical conditions in the future affecting hundreds of millions worldwide

CONCLUSION

Advantages of menstrual blood stem cells:

- Higher Potential compared to similar cells from the bone marrow, and hence can potentially be used across a wider range of applications.
- Higher proliferative properties compared to similar cells from bone marrow. Allows them to multiply for longer duration without damages to DNA and hence larger numbers can be obtained on expansion from small initial numbers
- Multiple Dosages are possible by obtaining unlimited numbers of purified mesenchymal stem cells for therapeutic use for more than once.
- Painless and harmless procedure allowing simple, easy and convenient collection of menstrual blood.
- High Patient safety since these cells are well tolerated, with no patient deaths, no toxicity or any adverse side effects reported thus holding the potential for a large scale clinical.

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