

STEM CELLS IN WOMEN MENSTRUAL BLOOD

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Abstract: Menstrual blood-derived stem cells (MenSCs) are a novel source of stem cells that can be easily isolated non-invasively from female volunteered donor without ethical consideration. These mesenchymal-like stem cells have high rate of proliferation and possess multi lineage differentiation potency. Stem cell is the cell in our body which has the ability to grow into new cells. Stem cells are highly specialized and take the place of cells that die or are lost. Stem cells contribute to the body's ability to renew and repair its tissues. Unlike mature cells, which are permanently committed to their fate, stem cells can both renew themselves and create new cells of whatever tissue they belong to (and other tissues).

Researcher have found stem cells in the menstrual blood which have the similar regenerative capabilities as the stem cells in umbilical cord blood and bone marrow. The Menstrual stem cells (MeSC's) have a great importance for clinical translation of regenerative therapies.

Key Words: MSC, Stem cells, Cryo – Cell, MenSCs, Endometrium, Bone marrow, Blastocyst, Endometrium, Umbilical Cord Banking, Adipocytes.

1. INTRODUCTION:

Stem cells as self-renewing cells proliferating without differentiation, and under defined conditions can differentiate into various cell types. The stem cells can be categorized into two major groups of embryonic stem cells (ESCs) and adult stem cells (ASCs). Embryonic stem cells are derived from inner cell mass of the blastocysts and show pluripotency characteristics by differentiation into all cells types belong to the three germinative layers (ectoderm, mesoderm, and endoderm). On the other hand, the ASCs are deposited in most adult tissues and are long-lived with restricted differentiation potency (Mehrabani et al. 2015), and lack tumorigenicity and ethical issues seen with ESCs. Friedensten et al (1968) were the ones who primarily isolated mesenchymal stem cells (MSCs) from bone marrow (BM). They were also isolated from other tissues such as adipose tissue, umbilical cord blood, endometrial tissue, and from dental pulp. MSCs have been used for regenerative purposes in patients. Multi-lineage properties of MSCs into mesodermal and ectodermal lineages were previously demonstrated for osteoblasts, neuronal-like cells, and heart muscles. Tissues such as bone marrow, adipose tissue, umbilical cord blood, placenta, dental pulp, and peripheral blood contain a pool of ASCs. Isolation and cultivation of these cells by standard protocols give the opportunity to use them in research and therapeutic application. The point is that the most isolation protocols are invasive and need to do surgical operation. Thus demands on finding an accessible source to harvest stem cells from an adult tissue through non-invasive methodology have increased. The newly defined adult stem cells are menstrual blood-derived stem cells (MenSCs), giving rise to hopes in clinical application of these cells. They are mesenchymal-like stem cells that can be harvested from human menstrual blood shedding of endometrium monthly. MenSCs have a highly proliferation and differentiation capability under specific differentiation conditions. The easy and simple way to get MenSCs without any invasive surgical intervention or hospitalization and absence of any ethical issues to isolate them are advantages of these MSCs. Molecular profile assay shows that MenSCs express some pluripotency markers including Oct-4, SSEA-4, nanog, and c-kit and also some mesenchymal stem cells specific markers such as CD9, CD29, CD44. So MenSCs are a good source of stem cells in research for differentiation into different cells and use in regenerative medicine. The differentiation of MenSCs into adipocytes, osteocytes, chondrocytes, hepatocytes, cardiomyocytes, and pancreatic cells has been previous demonstrated. They can provide a new hope in regenerative medicine for their ability in differentiation into desired cells and tissues.

Therefore, MenSCs would be a valuable choice in cell-based therapies and we can consider their potential in clinical trials especially in repair of dermatological lesions. Skin regeneration and repair has become the main goal of dermatological treatments including wrinkles, photoaging, cutaneous deep wounds, and burns as they are still major concerns in dermocosmetics.



In a normal pregnancy, the blastocyst stage continues until implantation of the embryo in the uterus, at which point the embryo is referred to as a fetus. This usually occurs by the end of the 10th week of gestation after all major organs of the body have been created.

However, when extracting embryonic stem cells, the blastocyst stage signals when to isolate stem cells by placing the "inner cell mass" of the blastocyst into a culture dish containing a nutrient-rich broth. Lacking the necessary stimulation to differentiate, they begin to divide and replicate while maintaining their ability to become any cell type in the human body. Eventually, these undifferentiated cells can be stimulated to create specialized cells. The “monthly curse” may be anything but: menstrual blood appears to be a rich and easily accessible source of adult stem cells, claim two competing research groups.

Each month, after a woman’s uterine lining is shed, it has to be rebuilt in preparation for a fertilised egg. This feat involves growing the billions of cells making up the 5 millimetre-thick lining in just seven days. Recent research has indicated that the uterine lining, or endometrium, is a rich source of adult stem cells. But retrieving those cells is as invasive as harvesting adult stem cells from other sources, such as bone marrow.

Now two separate groups say they have found these endometrial stem cells in menstrual blood. Both groups say the cells in question show all the hallmarks of stem cells: they replicate themselves without differentiating, they can be made to differentiate into many different cell types under the right conditions, and they show characteristic cell surfaces of stem cells.

2. STEM CELLS:

Stem cells are those cells which can multiply rapidly and can grow into others type of cells and develop into neural, cardiac , cartilage tissue as well as fat and bone.



Stem cells found in menstrual blood — along with cells from babies’ umbilical cords — could potentially be incorporated into treatments for stroke, Alzheimer’s disease and Lou Gehrig’s disease, or amyotrophic lateral sclerosis, kind of puts a different spin on things.

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.

Cryo-Cell is the only stem cell bank in the world that can offer women the reassurance and peace of mind that comes with this opportunity.

Mesenchymal stem cells (MSCs) are self-renewing progenitor cells with the capacity to differentiate into various cell types under specific conditions. Adult stem cells derived from different sources, including bone marrow, adipose tissue or post-natal tissues, such as umbilical cord and placenta. A study published in 2007, was the first to identify and characterize a new source of stem cells within menstrual fluid. It showed that menstrual-derived stem cells (MenSCs) are rapidly expanded and differentiated under standard laboratory conditions.

3. 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.

4. MENSTRUAL BLOOD COLLECTION:

The menstrual blood is collected in healthcare provider’s office. Prior to collection, it is recommended that the patient shower and empty the bladder. For best results, 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. 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 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. The container will then be prepared for shipment.

5. MENSTRUAL BLOOD BANKING PROCESS AND STORAGE:

The menstrual blood collection is shipped to Cryo-Cell. 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. It is closely monitored at all times to ensure that menstrual stem cells are safe. The overwrapped storage vials are housed in the vapor phase of liquid nitrogen for cryogenic preservation. The storage facilities are monitored 24 hrs/day, 365 days/year for security and temperature, specimens are kept safe and ready for future use.

6. MENSTRUAL BLOOD BANKING IN INDIA:

Menstrual blood stem cells can now be easily collected, processed and harvested in an affordable, painless and non-invasive manner.

This unique stem cell banking is being launched in India for the first time at Chennai, capital of Tamil Nadu state, as LifeCell Femme menstrual blood stem cell banking service.

7. BENEFITS OF BANKING MENSTRUAL STEM CELLS:

Cryo-Cell's innovative menstrual stem cell banking service provides women with the exclusive opportunity to build their own personal healthcare portfolio with stem cells that will be a 100% match for the donor. New research shows that menstrual fluid contains self-renewing stem cells that can be easily collected, processed and cryo-preserved for potential cellular therapies that may emerge in the future. The menstrual stem cells come from the uterine lining (endometrium) that is shed as part of a woman's menstrual period. These 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.

Menstrual blood stem cells used to treat heart failure patients. 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. Menstrual Blood Banking enables women to store their menstrual blood under required conditions and preserve it for future.

8. PATENTED PROCESS:

What is more, Cryo-Cell has patented a collection, processing and freeze-storage technique, called "C'Elle", which enables women to preserve their own menstrual stem cells. Although at this point the stored cells are intended for use by only the woman herself, there is speculation that the cells may help others as well. "There are indicators that they could be used for first or second degree relatives, or beyond," says Allickson.

Caroline Gargett, of Monash University in Victoria, Australia, who first identified endometrial stem cells in the uterine lining, admits she is a little surprised. "I'd always thought the body wouldn't want to be shedding too many stem cells," she says. Both sets of findings are "very interesting and very significant", she says.

Cryo-cell has partnered with four outside stem-cell researchers to examine potential use of the cells in treating heart disease, diabetes, and spinal cord injury. Meng's group is also investigating the cells' use in diabetes.

10. RECENT RESEARCH IN THE MENSTRUAL STEM CELL FIELD BY CRYO-CELL:

Cryo-Cell and S-Evans Biosciences Obtain FDA Approval for Clinical Trials. S-Evans Biosciences, a Cryo-Cell Chinese affiliate, has recently received FDA approval for two Phase I/II trials for the use of the Cryo-Cell menstrual stem cells. One trial is for the treatment of Type I diabetes and the second trial is for cirrhosis of the liver.

Cryo-Cell and Stanford University Collaborate on Diabetes Research. Cryo-Cell and Stanford University are testing the efficacy of the Cryo-Cell menstrual stem cells in a model of pancreatic islet transplantation for type I diabetes treatment. Specifically, the menstrual blood stem cells provided by Cryo-Cell are being tested in vitro and in vivo to enhance pancreatic islet viability, regeneration, and function during the peritransplantation period.

Cryo-Cell and Saneron CCEL Therapeutics Move Forward on Research. Cryo-Cell and Saneron CCEL Therapeutics, a leading company in the field of regenerative medicine research, are collaborating on the role of menstrual stem cells in restorative treatments for Basal Ganglia disorders including Parkinson's Disease, Huntington's Disease and stroke. The stroke data demonstrates immediate behavioral recovery at an early period after transplantation.

11. CONCLUSION:

The Stem cell is found in the menstrual blood by the researchers. Menstrual blood derived stem cell (MensCS) have a great clinical importance for regenerative therapies. Menstrual blood derived stem cell (MensCS) can be preserve in cryo cell. 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.

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