

A Review on Stem Cells of Placenta

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ABSTRACT

The placenta is a feto-maternal organ. It connects the fetus and maternal wall of the pregnant uterus. It is an organ for physiological exchange, it acts as a temporary organ that allows the transport of oxygen, water, electrolytes, and nutrients. It eliminates carbon dioxide, urea, and other waste products produced by the fetus into maternal blood. Maternal antibodies immunoglobulin (IgG) gamma globulins, reach the fetus. Embryonic stem cells are obtained in the early stage of the embryo which forms eggs with sperm fertilization in vitro. Placenta comprised many stem cells found in the inner layer of mass cells of blastocysts, the main before implantation. In early embryo (4 to 7 days) after fertilization formation of blastocysts, (hollow balls of cells) has two layers of the inner mass cell (embryonic stem cell) and outer trophoblast (TE) in normal embryonic development they disappear after 7 days and begins from three embryonic tissue layers

Keywords: Placenta, Blastocyte, Pluripotent, Hematopoietic, Totipotent, Amnion, Chorion, Trophoblast,

INTRODUCTION

The placenta, A Hodge-podge- describes a confused or disorderly mass or collection of things of stem cells. The human placenta and umbilical cord blood are purpose in hematopoietic progenitor and hematopoietic stem cells (HSCs). Which produces all types of blood cells including myeloid (monocytes), macrophages, neutrophils, basophils, eosinophils, erythrocytes, megakaryocytes, platelets, and lymphoid cells (T-cells, B -cells, and NK cells). Stem cells are unspecialized cells in the human body that have the regenerative capability, the key ability of stem cells to constantly self-generate renewable new cells that proliferate and differentiate into special cells. An adaptable physiological environment allows them to renew new tissues to pre- injuries conditions¹. The source of stem cells includes bone marrow, umbilical cord, cord blood, and adipose tissue. Stem cell potency is defined as the capability of self-cell divisions and their types of pluripotent, unipotent, multipotent, and totipotent. Nexus plasticity quality of stem cells is molded or changed to adapt to the new situation. The potency of stem cells reduces with each cell division of lineage differentiation from early embryogenesis to mature the new special cells. A zygote which formed by the ovum and sperm., its

totipotent stem cells, It has generated embryonic as well as extra-embryonic structures including the placenta. The blastocyst formed 5 days after fertilization, and the inner cell mass of the embryoblast rim is trophoblast. The latter will develop into the placenta human Embryonic Stem Cells (hESCs) which arise inner cell mass and undifferentiated pluripotent potential similar to totipotent stem cells. Pluripotent stem cells are capable to give rise to all cell types of three primary germ cells (ectoderm, mesoderm, and endoderm) in the body but cannot produce extra-embryonic cells multipotent stem cells with differentiate the potential restrictions (Ex) Adult and fetal stem cells are multipotent cells².

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Adult stem cells or somatic stem cells are found in somatic tissues, which fetal stem cells obtained from cadaveric fetuses³. Unipotent stem cells are only one type of cells. Progenitor stem cells with limited capability to replicate (Ex- Neural cardiac and hematopoietic. Several types of stem cells have been investigated over the last few decades. Moreover, pluripotent cells possess oncogenic properties with cancer stem cells and their risk of transplantation and grafting for therapeutic uses.

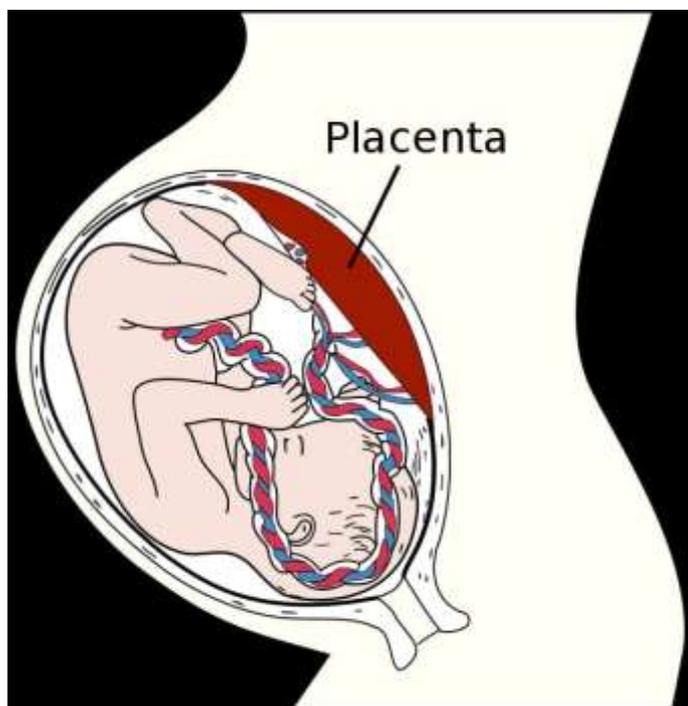


Figure-1. A 38 week-old fetus with placenta has completed development and will soon be born (Source: *Gray's Anatomy*)

Placental Stem Cells

- Totipotent stem cells - capability form entire organism.
- Pluripotent stem cells - most of the cell arises but not all cells.
- Multipotent stem cells - undifferentiated cells limited and specific cells.

Source of Stem Cells

P-MSCs (Placental Mesenchymal Stem Cells)

In 1968 Friedenstein describe stem cells in bone marrow, the most common source of MSC, these cells are isolated from various human tissues such as adipose tissue, umbilical cord, cardiac tissues, amniotic fluid, placenta, spleen, liver, kidney, dental pulp, synovium and skeletal muscles (Figure-1).

In 2017 Davies proposed Umbilical cord -derived stem cells. Wharton's jelly shows mesenchymal fibroblast with self-renewable ability. Although MSCs are not as

pluripotent, as ESCs these cells are widely multipotent and do not develop teratomas in immunocompromised mice⁴.



Figure-2. Stem cells taken from the umbilical cords can help improve heart function

(Source:<https://www.irishnews.com/magazine/science/2017/09/27/news/umbilical-cord-stem-cells-can-help-improve-function-in-heart-failure-patients--1147048/>)

Therapeutical Uses of Placental Stem Cells

Lifesaving transplants to treat diseases including leukaemia, certain metabolic abnormalities, inherited diseases of immune and red blood cells. People might benefit from stem cells including Spinal cord injuries, type1 diabetes, Parkinson's diseases, Amyotrophic lateral sclerosis, Alzheimer's disease, Heart diseases, Stroke, Burns, Cancer, Intestinal diseases, Vascular diseases tissue engineering, Osteoarthritis, Regenerative Medicine, Imbalance between pro-Anti-inflammatory Activities, Pulmonary inflammation and Aberrant reparation process⁵, Fibrosis, Angiogenic signalling and Cell-based replacement therapy (Figure-2).

CONCLUSION

Ethical debate of stem cell research is well involved pursued, Stem cell research can provide treatment for many transplantations surgery and critical condition Few decades of research has allowed for stem cell benefits and therapeutic uses among degenerative and inflammatory diseases. Stem cells that able to develop into many different cells from brain cells to muscular cells. Stem cells enhance the growth of new healthy skin tissues and collagen production and stimulate hair development. Stem cell components in modern medicine and regenerative medicine are capable of healing and curable diseases.

Conflicts of Interest

Authors declare that there is no conflict of interests regarding the publication of this paper.

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