

Perspective Overview on Stem Cell Biology and Regenerative Medicine

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Stem cells are a population of undifferentiated cells which have the ability to proliferate usually to develop from a single cell clone and can be divided into different types of cells and tissues. There are several sources of stem cells with different potencies. Pluripotent cells are embryonic stem cells and from the internal cell mass of the embryo and induced pluripotent cells, resulting from the somatic cell reprogramming. Pluripotent cells can differentiate into tissues from 3 germ layers. Regenerative medicine is a new development in the medical science that deals with the functional

restoration of tissues or organs from a patient who is suffering from severe injuries or chronic diseases. An impressive progress in the research of stem cells provides a basis for cell therapy for diseases that are not cured with conventional medicine. Undefined, self-repair, and the ability to differentiate into other cell types are stem cells, and the limits of regenerative medicine. The Trans differentiating potential of stem cells varies depending on the source, and regenerative medicine applications to change as well.

Keywords: stem cell; stem cell applications; stem cell types; pluripotent stem cells; totipotent stem cells; stem cell use in medicine; stem cell therapy.

INTRODUCTION

Stem cells are undifferentiated cells that are present in the embryonic, fetal, and adult stages of life and lead to a variety of cells, which are the building blocks of tissues and organs in the body. In the postnatal and adult stages of life, in a tissue-specific stem cells, which are found in different organs in the body and plays an important role in the restoration of the organ damage. The main features of the cells are as follows: (a) self-renewal, (b) clonality and (c) the potency. These properties can be different for different cells. For example, embryonic stem cells (ESCs), derived from a blastocyst, have a greater capacity for self-renewal and the potential, while the stem cells are found in adult tissues is of limited self-renewal, because they can't reproduce on a large scale, and can only be differentiated into tissue-specific cells [1]. Regenerative medicine is a modern development in the field of medical science that deals with the functional restoration of tissues/organs of patients who have severe injuries or chronic diseases, in a condition where the body has its own recovery. In this situation, the donor's tissues and organs, is not able to meet the needs of the whole of the older and sick people, which has led to a strong desire to look for some alternatives. Stem cells have been approved by their division of potencies and can trans differentiate into other cell types and has recently become a powerful source for the repair of tissues and organs and the diseases that are caused by the diseases and age-related effects. Stem cells are the basis for all of the organs and tissues of the body. It has played a variety of roles in the regression of the disease, and the development and regeneration of tissues within the host's body. On the basis of trans differentiation potencies, stem cells are classified into four types: unipotent, multipotent, pluripotent and totipotent. The zygote is the only totipotent stem cell in the human body, which can lead to the whole organism i.e. the process of trans differentiation, whereas the cells from the inner cell mass (PCM) of the embryo are pluripotent in nature, and are able to differentiate into cells of three germ layers, however, are not sorted in the extra embryonic tissues of cells. The stem-and transdifferentiation potential of the embryonic, extraembryonic, fetal, and adult stem cells, is dependent on the functional status of these pluripotency factors such as OCT4, cMYC, KLF44, NANOG, SOX2, etc. [2].

TYPES OF STEM CELLS

Totipotent stem cells

Cells that have the potential to continue to develop with each and every type of cell found in the human body. On the other hand, they have the ability to the develop three germ layers of the embryo's cells in the extraembryonic tissues like placenta.

Pluripotent stem cells

These are the cells with the potential to develop with approximately all cells. They are having ESCs and the cells which are isolated from mesoderm, endoderm and ectoderm germ layers organized in begening period of ESC differentiation.

Multipotent stem cells

They have less proliferative potential than other stem cells and have the ability to generate variety of cells limited to germ cell.

Unipotent stem cells

These are the cells that create cells with one linear differentiation. For example muscle cells. These cells donot have cell renewal property [4].

APPLICATIONS OF STEM CELLS

Stem cells in Dentistry

Teeth are a very complex material for the use in regenerative medicine. It can be difficult to reproduce their abilities in aspects such as: articulation, mastication, or aesthetics due to their complex structure. At this point, it is more likely that the stem cells are to be used, rather than man-made materials. The teeth have the great advantage that it is most non-invasive and natural source of stem cells [3].

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Stem cells in neurodegenerative diseases

It slows down the progression of incurable neurodegenerative diseases such as Parkinson's disease, Alzheimer's disease (AD), Huntington's disease. In the field of neuroscience, the discovery of neural stem cells (NSCs) nullified the idea that the adult central nervous system is not capable of neurogenesis. Neuron degeneration in Parkinson's disease (PD) is the focal and the dopaminergic neurons can be efficiently generated from hESCs. The PD is an ideal disease for iPSC-based cell therapy [3].

Stem cells in Fertility diseases

Young adults at risk of losing their spermatogonial stem cells (SSC), mostly cancer patients, are the main target group that can benefit from testicular tissue cryopreservation and auto transplantation. Effective freezing methods for adult and pre-pubertal testicular tissue are available [3].

CONCLUSION

After years of experimentation, stem cell therapy is still an amazing game changer in field of medicine. With each experiment, the potency of stem cells is growing, but there are still many obstacles to be overcome. Despite this, however, it is the impact of stem cells in regenerative medicine and transplantology is huge. In currently incurable neurodegenerative diseases there are chances to treat with the help of stem cell therapy. Induced pluripotency makes it possible to use the patient's own cells. Tissue reservoirs are becoming more and more popular because they can accumulate in the cells, which are a great source of regenerative medicine in the fight against the current and future diseases. Thanks to stem cell therapy in all forms of benefits. We can extend the life of a person is any better than any other time in history.

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