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Stem Cell: Future of Medicine

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Abstract:

Stem cells are basic cells of all multicellular organisms with the ability of proliferation, regeneration, conversion to differentiated cells and producing various tissues. Self-renewal and totipotency are the characteristic of stem cells. For the treatment of diseases and injury stem cell therapy is an emerging and revolutionary way with wide range of medical benefits. The aim of stem cell therapy is to repair damaged and diseased body parts with new healthy stem cell transplantation. The knowledge of regulators of stem cells has opened the therapeutic usage of stem cells in the form of neuron regeneration, treatment of bone defect, drug testing, gene therapy and cell based therapy in the form of muscle damage, spinal cord injury, cancer therapy etc. Many scientific and ethical questions with many future challenges is present in the research of stem cell. This paper gives a general overview and update on stem cell, their properties and applications in the world of therapy.

KEYWORDS: *Stem Cell, Therapy, Tissues, Diseases*

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Introduction

Current medicine faces one of the major challenge which consists understanding and implementing reformative strategies for a number of biological entities, with the aim of repairing damaged or degenerated cells, tissues, and organs, thus restoring their original functions. For restoring normal function and achieving successful therapy, stem cell represent one of the most promising tool. It is the important domain of biomedical research which have a potential to offer feasible therapeutic options for incapacitating diseases and injuries.

Stem cells are one of the master cells of human body which have ability to grow into any one of body more than 200 cell type. It distinctive and versatile type of cells that can divide indefinitely and have a unique capacity to renew themselves and to give rise to specialized cell types. A stem cell remains uncommitted, until it receives a signal to develop into a specialized cell on the other side most cells of the body, such as heart cells or skin cells, are committed to conduct a specific function. Under the right conditions, or given the right signals, stem cells have the potential to develop into mature cells that have characteristic shapes and specialized functions, such as heart cells, skin cells, or nerve cells. Their proliferative capacity combined with the ability to become specialized makes stem cells unique. Stem cells found in the early mammalian embryo, at around 5-7 days after fertilization, are able to give rise to all the different cell types of the organism.

Source of Stem Cells

1) Embryonic stem cell

2) Adult stem cell

Embryonic Stem Cells

Embryonic stem cells are also known as early stem cells. As the name suggest embryonic stem cells are derived from embryos at a developmental stage before the time of implantation would normally occur in the uterus, the developmental stage is the blastocyst stage that develop from eggs that have been fertilized in vitro in an in vitro fertilization clinic and then donated for research purposes with informed consent of the donors – 32 cell stage, from which these pluripotent cells can be isolated.

Adult Stem Cells

Adult stem cells are undifferentiated cells found among differentiated cells in a tissue or organ, can renew itself and can differentiate to yield the major specialized cell types of the tissue or organ. They are also known as somatic stem cells which can be found in children as well as adults. To maintain and repair the tissue in which they are found in a living organism is the primary role of adult stem cell.

On the basis of capacity of divisibility and differentiation there is another classification of stem cells which are as Totipotent Pluripotent and Multipotent.

A fertilized egg is considered totipotent when its potential is total, it gives rise to all the different types of cells in the body. The cell who needed to develop a fetus is exception otherwise it can give rise to any type of cell in the body. Multipotent cells are the stem cells which can give rise to small number of different cell types.

Social justice:

As seeking the role of stem cell in today's life stem cell based therapies are likely to remain, at least for many years, both expensive and technologically demanding. Stem cell therapy would be available only to individuals which are wealthy and pay for their own treatment. The ethical questions raised by expensive new therapies are not unique to stem cells but nevertheless merit consideration. The question of social justice may also arise. It has been suggested that a range of different tissue types are represented by the collection of clinical-grade I stem cell lines should be build up by the UK Stem Cell Bank. The main aim is to provide the immunologically matched lines to many patients.

Review of Literature

Wert and Mummery, (2003) the research of Stem cell is highly dynamic. For the ethical evaluation of the isolation of human embryonic stem (hES) cells new insights into the effectiveness, risks and usefulness of the various alternatives may have immediate consequences. On the isolation of hES cells for research the status of the pre-implantation embryo is the most sensitive and disputed point. The moral status of non-viable pre-implantation embryos is lower than the moral status of viable pre-implantation embryos.

Kumar and Singh, (2006) knowing the potentials of this new stem cell technology in modern therapeutics and biomedical research the recommendation of Stem cell research and its clinical applications should be promoted in the country. To understanding the human biology and treatment of various diseases Stem cell research provides the advanced opportunities. The research of stem is quite progressive and provides various challenges for future.

Avasthi, et al. (2008) in the world of therapeutic, Stem cells pose a bright future by giving promising treatment options for the diseases which are considered as noncurable now a days. However, because of the transplant morbidity and mortality the significant of peri and post-transplant requires further research and trials to refine and optimize conditioning regimens and modalities of supportive care. New horizon of therapeutics in the form of organ development and replacement of lost tissue such as hairs, tooth, retina and cochlear cells can be seen by virtue of funding of stem cell research.

Siqueira, (2011) Stem cells are responsible for organ regeneration and maintain the balance between somatic cell populations in various tissues. In the treatment of ophthalmic disorders the progress of regenerative medicine indicates the promise for the use of stem cell.

Larijani, *et al.* (2012) destruction of dopaminergic neurons in substantia nigra of midbrain is characterized as Parkinson. Cell therapy is considered as a novel treatment and different types of cells have been studied for this purpose. In different diseases like Amyotrophic lateral sclerosis, Alzheimer, Stroke, Spinal Cord Injury, Multiple Sclerosis, Radiation Induced Intestinal Injury, Inflammatory Bowel Disease, Liver Disease, etc. cell therapy is consider as the most prominent technique but still more research and development should be required in this field.

Ricotti and Menciassi, (2013) many researches has been carried out in different fields. Such as stem cell molecular biology, physics, organic chemistry, biomaterials, micro engineering, etc. but the researcher or scientist still lacks of an integrated interdisciplinary and Transdisciplinary view toward the treatment of major diseases by means of engineered stem cells. In order to accelerate this merging process and to provide society and healthcare systems with novel and effective advanced therapeutic technologies significant advancements in various technologies, miniaturized mechatronic platforms and robotic control strategies are desirable and should be driven, in a certain measure, by a "stem-cell-centered" view.

Kimbrel and lanza, (2016) the dramatic progress of stem cell therapy made over the past decade will almost certainly translate into exciting new advancements in decades to come. Pluripotent stem cells (PSCs) can differentiate into virtually any cell type in the body, making them attractive for both regenerative medicine and drug discovery. The ability to precisely correct disease-causing mutations, create isogenic controls and potentially eliminate immunogenicity of PSC derivatives make -gene editing in PSCs an incredibly important endeavor.

Conclusion

To regulate stem cell propagation and control their differentiation into defined derivatives, small molecules play a significant role in stem cell biology. The historical progress made over the past decade will almost translate into exciting new advancements in decades. In this therapeutic world, stem cell gave a promising treatment option for the diseases which are considered as non-curable. Currently researcher are trying to cure diseases the diseases which are non-curable like strokes, burns, spinal cord injuries, type 1 diabetes, etc. from stem cell therapy. This therapy could also be used to replace or repair tissue damaged by diseases or any type of injury.

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