

Stem Cell Therapy for Diabetes Mellitus

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Abstract

Background: Diabetes mellitus results from the loss or impairment in the function beta cells of pancreas. Mainly, there are two types of diabetes mellitus that include, type 1 diabetes mellitus and type 2 diabetes mellitus. Type 1 diabetes mellitus is characterized by the destruction of beta cells results from auto immune attack while type 2 diabetes mellitus results from beta cells de-differentiation the development of insulin resistance and is a more complex type of diabetes mellitus. According to the international federation of diabetes mellitus, more than three hundred million people are affected worldwide and the incident of Diabetes mellitus is increasing every year. It causes the death of about 4 million people worldwide.

Introduction: Stem cell therapy includes cells that are used to treat or prevent a disease or disorder in the body because these cells have the potential to differentiate into any tissue in body of humans, therefore, these cells have potential for therapy and repair of tissues. The main condition of the cells to fall under the definition of stem cells, they must have two essential features. Firstly, it is necessary for stem cells to produce new cells which are genetically the same as that of parent cell. Secondly, the division if stem cells is highly organized and regulated.

Till now, there are many pharmaceutical industries that used different therapeutic procedures but it only postponed its complication. Recent therapies aimed to restore the production of endogenous insulin rather than exogenous insulin.

Administration of insulin is not the permanent treatment but it only postpones the complications in this disorder. The main goal of treatment of diabetes mellitus is to improve insulin resistance, restoration of insulin independency and the control of blood sugar.

There are many approaches like transplantation of pancreas which have been a very promising therapy for diabetes mellitus but these procedures have many hurdles like the lack of donor for organs and also the

requirement of immune suppression for life time. Stem cell therapy is a highly new technique that can be used to treat advanced diabetes mellitus.

The use of stem cell therapy holds a great promise for the treatment of many disorders also including diabetes mellitus. Stem cell therapy is a highly new technique that can be used to treat advanced diabetes mellitus. These cells can provide an ultimate source of beta cells of pancreas that have the potential to secrete insulin.

The term diabetes is characterized by multiple disorders that are related with disturbance in glucose homeostasis. The control of glucose can only prevent the progression of this disease.

In type 1 diabetes, beta cells in pancreas are destroyed due to mutations or by autoimmune attack which can result in the abnormalities in the metabolism of carbohydrates and lipids. It is characterized by the absolute deficiency of insulin which leads to ketosis and also causes the dependency on insulin from exogenous source to survive life.

The only cure for these patients is the replacement of defected insulin producing beta cells with normal beta cells. But there are many limitations but the main limitation is to find sources of insulin producing pancreatic beta cells because there is a shortage of donor organs. It spurs these limitations into an alternating means of producing beta cells from embryonic stem cells because stem cells have the potential to differentiate into any desired cell because stem cells are multipotent or can be genetically modified. These differentiated cells are used for transplantation. The most important type of stem cells used to treat diabetes mellitus are mesenchymal stem cells. These cells can easily be found mostly in all organs and tissues but these cells are mostly isolated from bone marrow. Depending on the therapeutic use, they can also be isolated from compact bone and adipose tissues.

These Stem cells can also be grown in lab and can be differentiated into beta cells by introducing two genes 'cyclin d' and 'cdk' through a vector usually a plasmid

or a virus. Recent studies on stem cell therapy defined numbers of differentiation protocols used to differentiate stem cells into specific beta cells. These cells when entered into body express insulin and can also be used to restore beta cell functioning.

Conclusion and future directions: Stem cell therapy research is a key to progress in medical science and also have implications in regenerative medicine by doing investigation in pathological mechanism that allows us to design new drugs with therapeutic potential and also providing functional cells such as insulin secreting cells.

Many evidences from the recent researches tell us that beta cell replacement results in the protection from hypoglycemia and stem cells have potential to treat many disorders including diabetes. Because stem cells have great therapeutic potential, many advanced like USA, UK and Canada have done great efforts and invested heavily in stem cell research. Encouraging research in animal models may set the stage for investigation and studies in humans as well. Due to hurdles and high cost, stem cell therapy is not reaching to a common man.

To cure human disorders by stem cell therapy, there are also many obstacles which must be overcome. However, there are many problems which include huge risk of transformation of malignant MSC. It should be properly addressed before these stem cells can be defined as effective therapeutic agent for the treatment of diabetes mellitus and its complications. The main problem that needs to be resolved in future is the immune rejections and teratoma formation. Therefore, protocols without the risk of teratoma formation and immune rejection are required that can mimic the function of beta cells of pancreas.

The efficiency of stem cells requires further improvement to obtain good number of beta cells that are responsive to glucose. Government should also play a role to boost up this research and therapy. Industries and academia should make serious efforts to promote research. So it will help millions of people with diabetes around the world.

Keywords: Diabetes mellitus, Insulin, therapeutic potential, transplant, pancreas, blood sugar.

Biography

My educational background includes bachelors and masters in biochemistry at University of Agriculture Faisalabad, Pakistan.

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