

DOI: 10.4172/2254-609X.100062

Commentary/Expert Reviews on Topic Personalized Treatment of Diabetes-Role of Stem Cell

Prashant A Pandya¹

¹GM, Program Management at Reliance Life Sciences, Mumbai, India

Corresponding author: Dr.Prashant A Pandya, GM, Program Management at Reliance Life Sciences, Mumbai, India, Tel: +91-9967017172; E-mail: drpandya18@gmail.com

Received Date: March 27, 2017; **Accepted Date:** April 26, 2017; **Published Date:** May 03, 2017

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Citation: Pandya PA. Commentary/Expert Reviews on Topic Personalized treatment of Diabetes-Role of stem cell. J Biomedical Sci. 2017, 6:3.

Role of Stem Cell in Diabetes Treatment

Personalized medicine is based on targeted therapeutic approaches focus on patient-specific characteristics which helps to reduce cost of ineffective therapies and improve quality of life and health care. The goal of such therapy is to maximize the therapeutic potential and lowering risk and side effects of medicine [1,2].

The number of patients suffering from diabetes continues to increase all over the world from nearly 400 million to almost 600 million by 20135. This numbers are expected to jump heavily. Considering this, scientists are always in search of newer treatment modality to treat Diabetes and stem cell is big hope here [3,4]

Diabetes can be controlled by either Insulin or other drug (in cases of Type –I diabetes), diet or exercise (in case of Type-II diabetes). Uncontrolled diabetes causing serious complication including nerve damage, heart disease, kidney failure, vision loss and several other health issues hence goal of curing diabetes in future is regenerative process of the adult human pancreas [5-8].

Types of Diabetes

Type 1 – It is known as “juvenile diabetes”, here insulin production is nil or beta cell doesn’t produce sufficient insulin as the body’s immune system attacks the beta cells in the pancreas. This situation creates higher blood sugar level which end up causing damage to the important body organs. Type 1 diabetes patients are treated with insulin to help process sugar. It is recommended to monitor blood sugar several times a day in such type of patients.

Type 2 - It is known as “adult-onset diabetes”, here cells in the body become resistant to insulin hence response to Insulin signal is extremely poor leads to rise into blood sugar level and not able to compensate even-if the beta cells produce more insulin to signal the other cells. Most of the Type 2 diabetes can be controlled with diet and exercise. However, eventually have to take insulin injections to control blood sugar levels and/or other medications. Type-II diabetes is associated with number of

complication including stroke. It is the largest cause of non-traumatic blindness and kidney failure.

Causes of type 2 diabetes:

- Family history
- Obesity
- Lack of exercise
- Poor diet

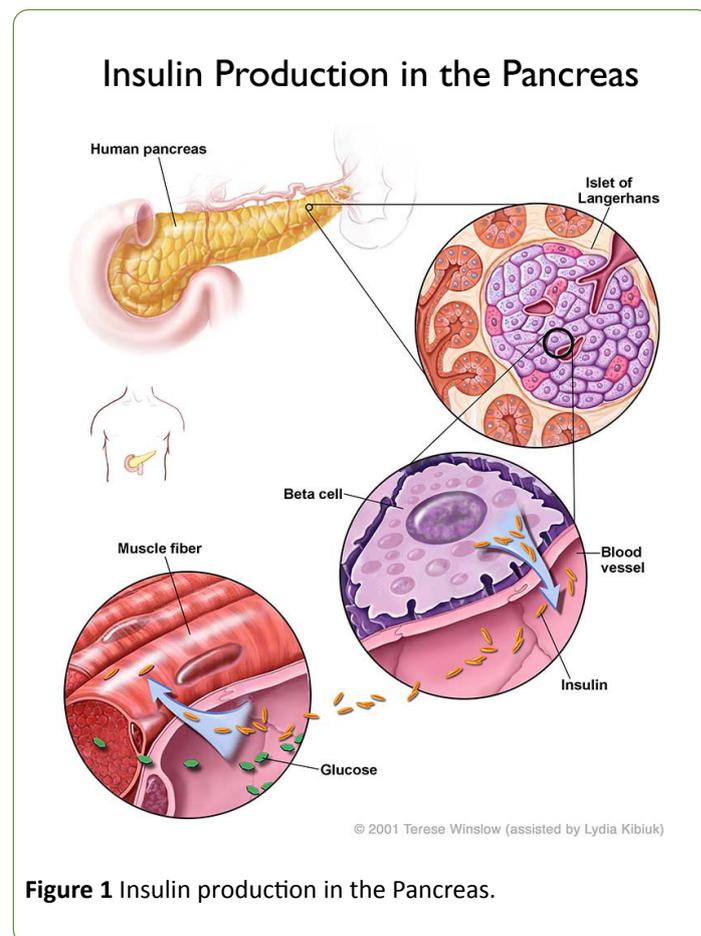


Figure 1 Insulin production in the Pancreas.

Role of Stem Cell

Stem cells are class of undifferentiated cells capable to differentiate into specialized cell types. Stem cells come from two sources: 1. Embryonic stem cells 2. adult stem cells.

In-case of diabetes treatment, the objective is to generate or regenerate cells that capable to sense glucose and produce Insulin which help to compensate loss of beta cell. To do this, there are several different treatment approaches are being used including making glucose sensing, insulin-producing beta cells from Embryonic cells. Many other experimental approaches tested using blood stem cells or mesenchymal stem cells from the bone marrow to curb the immune system's attack on the beta cells. Here the objective is to reset the immune system [9,10]. Clinical trials are ongoing to find safe and effective personalised treatment for the diabetes however, Post-transplant, clinical success of stem cell treatment is highly dependent on below factors:

- Survival of cells in the recipient
- Stem cells should differentiate effectively
- Integration of cells within the targeted tissue
- Stem cells should proliferate properly

Conclusion

Diabetes is a common life-long condition affecting millions of people. Current treatment modalities helps to control symptoms but there is no cure. Adult and embryonic stem cells act as a promising alternative for the treatment of diabetes.

Type-1 diabetes is chronic disease affecting genetically predisposed individuals, and people living with daily insulin injection. The long term usage of Insulin injection damage health. In Type-I diabetes, replacement of damaged β -cells has shown promising result in several clinical trials and could dramatically change treatment. However autoimmunity is biggest hurdle during this process because immune system also attack newly introduced beta cells and Scientists have yet to

devise a way around this. In Type-II diabetes, the body is not able to produce adequate insulin and glucose transport is getting affected and blood sugar level is builds up in-spite of increase insulin production by pancreas. In Type-II, adipose derived stem cells and Mesenchymal stem cells help pancreas to generate and boost it's ability to produce insulin by creating micro-environment which supports beta cell/resident stem cell activation and survival. Cure for Diabetes still a Long Way Off.

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