J Cell Sci Ther 2016, 7:1 (Suppl)
http://dx.doi.org/10.4172/2157-7013.C1.036

OMICS International
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6th World Congress on
Cell & Stem Cell Research
February 29-March 02, 2016 Philadelphia, USA

Cellular and glycemic regenerative effect of systemic mesenchymal stem cells in diabetic animal model

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Background: Umbilical cord blood is known as a rich source of hematopoietic stem cells, which makes it a valuable alternative to bone marrow transplantation in hematology and oncology.

Aim of Work: The aim of this work was to detect the feasibility of generating insulin producing cells obtained from progenitor cells of cord blood and their success in reversing the hyperglycemia in diabetic rats.

Subjects & Methods: The current study was performed on 44 male rats and 6 umbilical cord blood samples collected from 6 normal vaginal deliveries from the obstetric ward of Kasr El Eini Hospitals.

Results: The present study confirmed that CB-MSCs are able to differentiate into islets that can secrete insulin in response to glucose *in vitro* and *in vivo*. The transplantation of culture expanded, undifferentiated CB-MSCs in experimental diabetic mice reversed hyperglycemia.

Conclusions: MSCs offer another non-pancreatic, readily available, non-invasive and inexhaustible source of allogeneic stem cells for cell replacement therapy in diabetes.

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CenC, a multi domain thermostable GH9 processive endoglucanase from Clostridium thermocellum: Cloning, characterization and saccharification studies

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The growing demand of bioenergy has led to the emphasis on novel cellulases to improve efficiency of biodegradation process of plant biomass. Therefore, a thermostable cellulolytic gene (CenC) with 3,675 bp was cloned from *Clostridium thermocellum* and overexpressed in *Escherichia coli* strain BL21 Codon Plus. It was attested that CenC belongs to glycoside hydrolase family 9 (GH9) with four binding domains, a processive endoglucanase. CenC was purified to homogeneity, producing a single band on SDS-PAGE corresponding to 137.11 kDa, by purification steps of heat treatment combined with ion-exchange chromatography. Purified enzyme displayed optimal activity at pH 6.0 and 70°C. CenC had a half life of 24 min at 74°C, was stable up to 2 hours at 60°C and over a pH range of 5.5-7.5. Enzyme showed high affinity towards various substrates and processively released cellobiose from cellulosic substrates. It efficiently hydrolyzed carboxymethyl cellulose (30 U/mg), β-glucan Barley (94 U/mg); also showed activity towards p-nitrophenyl-β-D-cellobioside (18 U/mg), birchwood xylan (19 U/mg), beechwood xylan (17.5 U/mg), avicel (9 U/mg), Whatman filter paper (11 U/mg) and laminarin (3.3 U/mg). CenC exhibited K_m, V_{max}, K_{cat}, $V_{max}K_m$-1 and $K_{cat}K_m$-1 of 7.14 mM, 52.4 μmol mg-^{1}min^{-1}, 632.85 s^{-1}, 7.34 min^{-1} and 88.63, respectively used CMC as substrate. Recombinant CenC saccharified pretreated wheat straw and bagasse to 5.12% and 7.31%, respectively at pH 7.0 and 45°C after 2 hours incubation. Its thermostability, high catalytic efficiency and independence of inhibitors make CenC enzyme an appropriate candidate for industrial applications and cost effective saccharification process.

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