Improvement of isolated caprine islet survival and functionality in vitro by enhancing of PDX1 gene expression

ABSTRACT

Background: Dead islets replaced with viable islets are a promising offer to restore normal insulin production to a person with diabetes. The main reason for establishing a new islet source for transplantation is the insufficiency of human donor pancreas while using xenogeneic islets perhaps assists this problem. The expression of PDX1 is essential for the pancreas expansion. In mature ϐ-cells, PDX1 has several critical roles such as glucose sensing, insulin synthesis, and insulin secretion. In this study, we aimed to evaluate the expression of pancreatic duodenal homeobox-1 (PDX1) in treated caprine islets in culture and to assess the protective effects of antioxidant factors on the PDX1 gene in cultured caprine islets.

Materials and methods: Purified islets were treated with serum-free, serum, IBMX, tocopherol, or IBMX and tocopherol media. Quantitative polymerase chain reaction and Western blotting were carried out to compare the expression levels of PDX1 in treated purified islets cultured with different media.

Results: Islets treated with IBMX/tocopherol exhibited the highest fold change in the relative expression of PDX1 on day 5 post-treatment (relative expression: 6.80±2.08), whereas serum-treated islets showed the lowest fold changes in PDX1 expression on day 5 post-treatment (0.67±0.36), as compared with the expression on day 1 post-treatment. Insulin production and viability tests of purified islets showed superiority of islet at supplemented serum-free media with IBMX/tocopherol compared to other cultures (53.875%±1.59%).

Conclusions: Our results indicated that supplemented serum-free medium with tocopherol and IBMX enhances viability and PDX1 gene expression compared to serum-added and serum-free media.

Keyword: Antioxidant supplement; Caprine islet; Islet survival; PDX1 gene expression