CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Rima R. Deshpande

Project Number

S0506

Project Title

PTEN, Nine, Eight: A Countdown for Diabetes

Abstract

Objectives/Goals

The goal of the project was to evaluate the potential of PTEN/PI3K biochemical pathway in pancreatic beta cell regeneration and improved endogenous insulin production to provide novel options for diabetes treatments of the future. The primary objectives were to determine whether changes in PTEN/PI3K levels affect beta cell mass, and if so, through what mechanism. The central hypothesis was that PTEN removal from beta cells will promote cell growth through sustained progression of cell cycle.

Methods/Materials

To study the effects of PTEN on beta cell mass in vivo, a knock-out mouse model was selected. Pancreatic tissue samples from PTEN-WT and PTEN-Null mice were obtained, paraffin-embedded, sectioned, formalin-fixed, and histochemically stained. Pictures of tissue sections were obtained using light microscopy and computer-assisted imaging. Areas for islets and pancreas, and their ratios were calculated using the Image J and Microsoft Excel software applications. Two-tailed Student#s t-test was applied to determine the statistical significance of differences between PTEN-WT and PTEN-Null groups. To study the mechanism underlying PTEN-driven change in beta cell mass, a cell line model in vitro was selected. Cyclin D1 expression in mouse PTEN-WT and PTEN-null fibroblast cell lines was compared by SDS-PAGE and Western blot. GAPDH expression was used as an internal control.

Results

Pancreas of PTEN-Null mice showed greater number of, and larger, islets containing beta cells compared with those in PTEN-WT mice. Quantitative measurements of islet areas confirmed that the increase in beta cell mass in PTEN-Null mice was statistically significant. SDS-PAGE and Western blot analyses of PTEN-WT and PTEN-Null fibroblasts showed increased expression of cyclin D1 in PTEN-Null cells.

Conclusions/Discussion

The results showed that, as hypothesized, removal of PTEN-mediated negative regulation of biochemical signaling in pancreatic beta cells results in increased beta cell mass. This increase occurs through increased cyclin D1 production.

Summary Statement

PTEN may serve as a target for inhibition to increase beta cell mass and endogenous insulin production, reduce dependency on external medications, and provide an effective alternative to treating diabetes.

Help Received

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