

Caprine pancreatic islet xenotransplantation into diabetic immunosuppressed BALB/c mice

ABSTRACT

Background: Type 1 diabetes mellitus is a devastating disease for which there is currently no cure, but only lifetime management. Islet xenotransplantation is a promising technique for the restoration of blood glucose control in patients with diabetes mellitus. The purpose of this study was to explore the potential use of caprine (goat) islet cells as xenogeneic grafts in the treatment for diabetes in a mouse model. Methods: Caprine pancreases were harvested and transported to the laboratory under conditions optimized to prevent ischemia. Islets were isolated, purified, and tested for functionality. Caprine islets (2000 islet equivalent) were transplanted beneath the kidney capsules of diabetic BALB/c mice under thalidomide-induced immunosuppression. Blood glucose and insulin levels of grafted mice were evaluated by glucometer and enzyme-linked immunosorbent assay kit, respectively. The functionality and quality of caprine pancreatic islet grafts were assessed by intraperitoneal glucose tolerance tests. Results: The viability of purified islet cells exceeded 90%. Recipient mice exhibited normoglycemia (<11 mm glucose) for 30 days. In addition, weight gain negatively correlated with blood glucose level. The findings verified diabetes reversal in caprine islet recipient mice. A significant drop in non-fasting blood glucose level (from 23.3 ± 5.4 to 8.04 ± 0.44 mm) and simultaneous increase in serum insulin level (from 0.01 ± 0.001 to 0.56 ± 0.17 $\mu\text{g/l}$) and body weights (from 23.64 ± 0.31 to 25.85 ± 0.34 g) were observed ($P < 0.05$). Immunohistochemical analysis verified insulin production in the transplanted islets. Conclusions: Purified caprine islets were demonstrated to successfully sustain viability and functionality for controlling blood glucose levels in an immunosuppressed mouse model of diabetes. These results suggest the use of caprine islets as an addition to the supply of xenogeneic islets for diabetes research.

Keyword: Caprine islets; Streptozotocin-injected mice; Type 1 diabetes; Xenotransplantation