

ABSTRACT

The metabolic and morphological effects of inositol hexakisphosphate (IP6) and inositol combination on streptozotocin-induced type 2 diabetes mellitus Sprague-Dawley rats

Shadae Renae Foster

Inositol hexakisphosphate (IP6) and inositol individually regulate insulin secretion but their combined use in the management of diabetes deserves investigation. This research was aimed at analyzing the supplementary effects of combined IP6 and inositol in streptozotocin-induced type 2 diabetes mellitus (DM) rats.

Thirty male Sprague-Dawley rats were used in this study. High-fat diet and streptozotocin were used to induce type 2 diabetes in 18 of these rats. They were classified as being type 2 DM based on a positive response to an anti-diabetic drug response test and hyperglycaemia. The diabetic rats were randomly divided into three groups (six rats per group) namely: diabetic untreated control (DC), the combination treated group (650 mg/kg body wt. /day; IP6+INO) and glibenclamide treated group (10 mg/kg body wt. /day; Glib). The high-fat diet control (HFC) group and normal control (NC) group were injected with citrate buffer only. Measurements of the non-fasting blood glucose level, body weight changes, food and fluid intake and faecal samples were collected weekly. At the end of the trial, blood samples and some major organs (heart, spleen, kidneys, liver and intestine) were collected for the measurement of lipid composition, lipid peroxidation, oxidative responses, digestive and transport enzymes, histological, haematological and blood chemical parameters as well as some enzymes of carbohydrate and lipid metabolism.

A type 2 diabetic model was successfully developed. Both glibenclamide and the combination significantly lowered the blood glucose concentration ($P < 0.05$). Treatment with the combination resulted in significantly improved; body weights, insulin sensitivity, liver and kidney antioxidant status among the diabetic rats ($P < 0.05$). Serum leptin level was significantly increased which resulted in reduced food and fluid intake in the combination treated group ($P < 0.05$). Faecal triglycerides and hepatic HDL cholesterol levels were significantly increased while, serum total cholesterol and triglyceride, and hepatic triglycerides were significantly reduced in the combination treated group compared with the diabetic control group ($P < 0.05$). Aspartate amino transferase and alanine amino transferase activities suggested that there was no hepatic damage in the combination treated group. This was confirmed by liver histological studies. Serum creatinine, uric acid and blood urea nitrogen levels indicated that the kidney's integrity was preserved. Serum amylase activity was significantly reduced in the diabetic control group but improved in the combination treated diabetic group. Serum electrolyte and intestinal ATPase activities were unaffected. Liver glucose-6-phosphate dehydrogenase activity was significantly ($P < 0.05$) increased in the combination treated group compared to the diabetic control group.

The combination may be effective in the management of type 2 diabetes and associated metabolic disorders.

Keywords: Shadae Renae Foster; phytic acid; IP6; inositol; diabetes mellitus; leptin; lipid; oxidative stress; amylase.