Investigating the modulating sffects of Afriplex GRT Extract on vascular function and antioxidant status in obese Wistar rat

By

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Abstract

Introduction Obesity is associated with the development of metabolic syndrome, a conglomerate of cardiometabolic risk factors, which synergistically result in cardiovascular diseases (CVDs), the major leading cause of death worldwide. The indigenous South African plant Rooibos (Aspalathus linearis), contains polyphenolic phytochemicals such as aspalathin, which is unique to Rooibos and has been associated with its health promoting properties. These include antidiabetic, anti-inflammatory, antioxidant, anti-obesity and cardiovascular benefits. Not much is known about the health promoting properties of Afriplex GRTTM, an aspalathin-rich Rooibos extract. It is hypothesised that Afriplex GRT™ may ameliorate the development of hypertension, vascular dysfunction and oxidative stress in a model of obese Wistar rats. Aim To investigate the ameliorative effect of Afriplex GRT™ extract on blood pressure, vascular function and oxidative stress in diet-induced obese Wistar rats. Methods Adult male Wistar rats were randomly divided into 5 experimental groups (n=10/group) and fed a Control or high-fat-diet (HFD), to induce obesity over a period of 16 weeks. Rats in the HFD and Control groups received the aspalathin-rich extract supplemented at 60 mg/kg/day from week 10 to 16. A Captopril (50 mg/kg/day) group was included as a positive control. Food and water intake, body weight, blood glucose, blood pressure, intraperitoneal (IP) fat mass, liver weight, leptin levels and vascular reactivity was measured. Western blotting of proteins involved in vascular function such as eNOS, AMPK and PKB were performed in aortic tissue. Antioxidant status and oxidative stress were determined in the liver tissue of experimental groups. This was done by measuring the activities of the primary antioxidant enzymes superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), and performing the thiobarbituric reactive substances (TBARS) assay which measures malondialdehyde as an indicator of lipid peroxidation. Results and Discussion HFD animals presented with increased food intake, leptin levels, body weight, glucose levels, IP fat and liver mass compared to Control animals. Furthermore, HFD animals

had decreased fluid intake and increased blood pressure vs the Control animals. Additionally, they presented with a downregulation in total and phosphorylated PKB and AMPK expression. HFD rats also had reduced SOD, CAT and GPx activity, increased malondialdehyde (MDA) levels and phosphorylated eNOS levels vs Control animals. Supplementation with GRT extract significantly decreased body weight, leptin levels, IP fat, liver mass and improved glucose metabolism. Furthermore, it increased vasodilation, total eNOS expression, AMPK phosphorylation according to the AMPK ratio, whereas it decreased blood pressure. Additionally, it upregulated SOD, CAT and GPx activity and decreased MDA levels in the liver. Captopril decreased blood pressure, increased vasodilation and upregulated PKB, AMPK and eNOS expression. Therefore, supplementation with GRT extract alleviated the plethora of cardiovascular risk factors presented by the HFD animals. Conclusion The HFD model demonstrated detrimental effects on cardiovascular health. Treatment with the Afriplex GRTTM extract improved glucose metabolism, vascular function and antioxidant status in the HFD animals. Therefore, Afriplex GRT™ extract may be a potential therapeutic agent against obesity-related vascular dysfunction, impaired glucose homeostasis, elevated blood pressure and oxidative stress