ABSTRACT

In Vivo Metabolic Effects of Bitter Yam (*Dioscorea Polygonoides*) Proprietary Preparation and Integrity of Organs in Animal Models of Hypercholesterolemia.

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The Jamaican bitter yam (*Dioscorea polygonoides*) is one of the wild yam varieties found in Jamaica and is traditionally used to make "roots tonic". It is also known to have high levels of saponins, which are a wide variety of phytochemicals naturally present in plants. Previous studies done in our laboratories have shown that the Jamaican Bitter Yam possesses hypocholesterolemic properties with associated lipoprotein redistribution. This study deals with investigation of the metabolic effects of the consumption of a proprietary preparation made from the Jamaican bitter yam, based on preliminary research done on this yam species, on major organs of the body.

Preliminary results indicated that supplementation of the diet with the Jamaican bitter yam at a concentration of 5% resulted in organ damage both in genetically modified hypercholesterolemic mice and non-genetically modified (normal) mice. Serum total cholesterol levels were significantly increased in both hypercholesterolemic groups when compared with normal controls, at the end of the feeding period. Significant increases in lipid peroxidation were observed in the heart and kidneys of mice fed diets supplemented with the bitter yam when

compared with mice fed unsupplemented diets. Significant decreases were observed in glutathione peroxidase activity in the kidneys and heart of mice fed supplemented diets when compared with mice fed unsupplemented diets. Significant changes in catalase activity were seen in the kidneys of mice fed supplemented diets. A significant decrease was also observed in the kidneys of the non-genetically modified mice fed supplemented diets when compared with non-genetically modified mice fed unsupplemented diets. Serum analyses showed significant increases in aspartate aminotransferase, total bilirubin magnesium and phosphorus levels in the serum of normal mice fed bitter yam supplemented diets. Significant increases in were seen in blood urea nitrogen, the serum of mice fed diets supplemented with bitter yam

In the second section of the study, hypercholesterolemia induction led to the liver enlargement. Mice fed diets supplemented with bitter yam proprietary preparation experienced a reduction in liver weight when compared with hypercholesterolemic controls. Hypercholesterolemic mice showed significant increases in cholesterol levels in the serum. Supplementation of the diets of these mice with bitter yam proprietary preparation at a concentration of 2% resulted in the greatest reduction in total cholesterol and LDL cholesterol levels in the serum when compared to hypercholesterolemic controls. Lipid peroxidation analysis showed damage to the liver, heart and brain of hypercholesterolemic controls. Supplementation of the diet with 2%, 1% or 0.5% bitter yam proprietary preparation resulted in a reduction in lipid peroxide levels in these organs, which

suggests that bitter yam proprietary preparation supplementation resulted in a reduction in damage to these organs. Conjugated dienes analysis also revealed that there were some levels of damage to the heart and the brain but not the liver. Bitter yam proprietary preparation supplementation resulted in significant reductions of the levels of conjugated dienes in these organs.

In section three of the study, hypercholesterolemia resulted in liver enlargement. Serum total cholesterol, LDL cholesterol and atherogenic index were significantly increased in hypercholesterolemic mice. Bitter yam proprietary preparation supplementation and a dietary change to a normocholesterolemic diet resulted in significant decreases in these parameters. Lipid peroxidation analysis showed that there were damages to the livers, hearts and brains of hypercholesterolemic control mice. Supplementation of the diet with bitter yam proprietary preparation and a dietary change from a hypercholesterolemic to a normocholesterolemic diet reversed the damages caused by hypercholesterolemia. Liver function parameters such as alkaline phosphatase and gamma-glutaryl transpeptidase showed signs of possible liver damage. Other liver function parameters, however, were not affected by hypercholesterolemia induction. Catalase activity was significantly increased in the kidneys in the state of hypercholesterolemia. There were significant decreases in the activity of this enzyme in the kidneys of mice fed supplemented diets. Glutathione reductase activity was significantly increased in all groups except hypercholesterolemic mice fed basal diet when compared to the normal controls. Significant increases in glutathione s-transferase activities were

seen in the spleen of hypercholesterolemic mice fed diets with and without bitter yam proprietary preparation supplementation when compared with normal mice fed a basal diet. The activity of this enzyme was also elevated in the kidneys of hypercholesterolemic mice fed a basal diet supplemented with bitter yam proprietary preparation. Liver total cholesterol was significantly increased in hypercholesterolemic mice fed a hypercholesterolemic diet. Both hypercholesterolemic mice fed diets with and without bitter yam proprietary preparation supplementation had faecal total cholesterol levels that were significantly higher than the other groups.

Based on the results obtained, it was determined that the optimal dosage for supplementation of bitter yam proprietary preparation is 2%, as this was the concentration that resulted in the highest reduction in serum total cholesterol without any adverse effects on major organs. In the final section of the study, lipid peroxidation analyses and organ function parameters revealed that supplementation of the diet with 2% bitter yam proprietary preparation did not result in any further damage to organs caused by hypercholesterolemia, and helped to some extent in reversing or preventing organ damage.

Keywords: Bitter Yam; Hypercholesterolemic; Organ Function; Damage