

Nutrition Summit 2018: Effects of guava leaf extract on glucose and lipid homeostasis in diet-induced insulin-resistant C57BL/6J mice - Wen- Dee Chiang - Tunghai University

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Abstract

Metabolic syndrome mentions to the simultaneous presence of the numerous metabolic abnormalities conditions, impaired glucose tolerance, dyslipidemia, including abdominal obesity hypertension and other symptoms. These metabolic abnormalities are usually a symbol of many chronic diseases, cardiovascular disease, including type 2 diabetes and hypertension. Obesity is mainly because of the excessive intake of energy by resulting in unnecessary accumulation of body fat. That described by Bays to the persons with diabetes, hypertension and dyslipidemia are respectively 84%, 79% and 82% have overheavy or obese phenomenon, indicating the close association between obesity and metabolic syndrome. Based on the above, an unnecessary amount of body the fat will lead to the occurrence of insulin resistance, representing the importance of obesity improvement for the prevention and improvement of metabolic syndrome.

Peroxisome proliferator started receptor γ (PPAR- γ), exactly and preferentially expressed in adipocytes, is mainly responsible for the regulation of the insulin sensitivity, inflammation, cell differentiation and insulin sensitivity. PPAR- γ can be regulated by fatty acid, drugs and affect the lipid and glucose metabolism related to the gene expression.

Guava leaf has usually been used as a traditional folk herb for the diabetes patients in Oriental republics. In new year, the anti hyperglycemic and anti-metabolic condition activities of guava leaves extract has been reported in animal mock-ups and human clinical studies. in the present study was mechanisms of GvEx on metabolic disease development was to comprehensively assessed in the white adipose, hepatic and skeletal muscle tissues of high fructose high-fat nourished insulin-resistant C57/BL6J mice.

Materials & Methods

Plant material and GvEx preparation

Plant material and GvEx preparation were was described in our earlier study (Liu et al., 2014). Briefly, Jen Ju Pa leaves were collected at the period between in the initial appearance and the observable opening of the flower buds. The plant materials were taxonomically recognized and the data have been deposited at the Fengshan Tropical

Horticultural Experiment Branch, Taiwan Agricultural Research Institute Council of Agriculture, Executive Yuan). Guava leaf extraction was performed with the best extraction conditions which were derived from a response surface of methodology.

Animals

Ten week old male C57BL/6J mice were found from Taiwan NLAC. All mice were housed in a climate controlled room with 20-24°C temperature, 40-60% humidity, 12 hour dark and light cycle, and free access to the normal chow and water at the farming college of Tunghai university. According to the result of our preceding in vitro study, 200 and 400µg/ml GvEx (ED50 in vitro), respectively, showed knowingly increased the rate of the glucose uptake in both normal and insulin resistant cells.

Induction of insulin resistance and GvEx treatment

To induce insulin resistance, the C, P, TL, TM, TH groups were fed with high fat diet and 30% (w/v) fructose was added to the drinking water. These mice were gavage controlled with their relatively treatment at the start of high fructose high fat feeding.

Biochemical measurement

The concentrations of serum triglycerides (TG), , glutamate oxaloacetate transaminase (GOT), cholesterol (CHOL) and glutamate pyruvate transaminase (GPT) levels were determined by regular biochemistry assays using the corresponding commercial enzyme kit on a Biochemical Analyser.

Homeostatic model assessment-insulin resistance (HOMA-IR)

The HOMA model is a method used to the quantify insulin resistance and β -cell function from fasting serum glucose and the insulin attentions. The model has been was widely used since it was first published. After 14 h fasting, the blood glucose and insulin in the attentions of the mice were obtained and used to HOMA-IR calculation.

Hematoxylin-eosin (HE) stain

HE stain is the most widely used the method in histology and histopathology analysis. It is a relatively simple

method to demonstrate a wide range of cytoplasmic and nuclear, extracellular matrix features on the paraffin or frozen sections. Liver matters were harvested and fixed in 10% neutral formalin, embedded in paraffin, cut into 6- μ m-thick sections on slides, and stained with the hematoxylin and eosin. Before immunostaining, deparaffinization was performed by the xylene and graded ethanol to distilled water

Results

Supplementation of GvEx meaningfully decreased to the body weights of high fructose high fat fed mice. The mean body weights were no difference between all groups at the beginning of the study. After 10 weeks of treatment, mean body weights were significantly lowest in TH (30.8 ± 2.2 g), followed by TM (31.8 ± 2.7 g) and P (32.3 ± 1.9 g) as compared to C (34.4 ± 2.3 g), suggesting the beneficial effect of GvEx on lowering body weight. In addition, preserved with the high dose GvEx significantly decreased the weights of the epididymal fat and white adipose tissue (sum of perirenal fat, abdominal fat, and epididymal fat) in high-fructose-high-fat fed mice. A previous report was indicated that in high fat diet induced the obese mice, treated with different dose of Psidium guajava leaves extract decreased in the body weight and visceral fat accumulation, and the lowering activity was dose depended.

Effects of GvEx on the improvement of metabolic syndrome

Several studies have indicated with that high fructose and high fat diet can be inducing insulin resistance, hyperinsulinemia even the diabetes and hyperglycemia. The main reasons which cause due to the occurrence of these symptoms include. Diet induced increase in the blood triglyceride heights would decrease the number of activated insulin receptor thus reducing insulin sensitivity. Chronic inflammation and high oxidative stress status caused by high fructose and high fat diet would reduce by the levels of phosphorylated insulin receptor, and decrease the amount of adiponectin expression in adipose tissue, thus lowering to the insulin compassion and disturbing homeostasis of glucose and lipid metabolism

According to the above results, we suggested to that GvEx could recover the high fructose high fat diet induced the metabolic syndrome status stimulating lipid and glucose metabolism-related signalling in adipose, skeletal muscle tissues and liver.

Conclusion

We evaluated the effects of the GvEx on development of metabolic syndrome status in high fructose high fat diet induced in insulin resistant C57BL/6J mice. Our results showed that the administration of high dose GvEx had preventive belongings to the against accumulation of lipid and the ameliorated insulin resistance. The mechanism for this act was by the enhancing of glucose and lipid metabolism related signals in liver and skeletal muscle tissues and adipose.

Note: This work is partly presented at 21st World Congress on Nutrition & Food Sciences July 09-10, 2018 Sydney, Australia.