

Beneficial Cardiovascular Effects of the Novel Multi-Bene Food Composition

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1. INTRODUCTION

The high prevalence of elevated blood pressure and serum cholesterol levels is a continuing challenge to preventive public health efforts (1-3). These disorders of the industrialized populations are known to be sensitive to various dietary factors. Results of recent studies and public health policy statements emphasize abundant intake of fruits and vegetables, as well as fat-free and low-fat dairy products with increased intake of potassium, magnesium, calcium, fiber, and protein (3-5). They also emphasize reduced intake of salt (sodium chloride), total fats, saturated fats, and cholesterol (3-5). Unfortunately, population-wide implementation of any effective dietary intervention to combat the above-mentioned disorders has proved to be problematic.

A lot of attention has been called to the mild blood pressure lowering effect of an increased intake of calcium (6). The finding that moderate calcium doses of 890 mg per day, mixed with three daily meals, decreased the intestinal absorption of fat (7) has created surprisingly little interest. A decrease in the intake of dietary saturated fatty acids lowers serum lipoprotein and cholesterol concentrations (8). Interestingly, the calcium supplementation, which increased the fecal fat output, produced a moderate lowering of elevated serum cholesterol (7).

Enrichment of salt or widely used food items has proved to be the method of choice for a population-wide supplementation of iodine, various vitamins, iron and other mineral nutrients. Recently, a marked increase in the levels of potassium and magnesium in a variety of food items has been produced by using potassium- and magnesium-enriched salt alternatives instead of common salt (9,10). The use of such foods produces a remarkable lowering of elevated blood pressure and also other beneficial effects both in hypertensive animals and in man (11-15). The use of the salt alternative also brings about

a decrease in the food sodium levels (10,11,14,15). However, demonstrating the importance of the enrichments, the beneficial health effects are largely maintained even if the sodium levels are intentionally kept constant (11,12). The discovery that L-lysine enhances the saltiness, and masks the unpleasant taste of potassium and magnesium (9), has made it possible to use the potassium-, magnesium-, and L-lysine-containing salt alternative population-wide (9,11).

Our previous studies have demonstrated that the cholesterol-lowering effect of plant sterols can be markedly potentiated by co-administration of calcium, magnesium and potassium in obese Zucker rats (16,17). Given the other expected beneficial effects of the combination, this might be a useful new approach to the treatment of the metabolic syndrome. In the present study, we assessed the effects of the combination of natural plant sterols and mineral nutrients on blood pressure and obesity in the same animal model.

2. METHODS

Obese Zucker rat, an experimental model of the metabolic syndrome, received three different diets in a four-week study (six rats in each group). Blood pressure and heart rate were measured continuously in conscious rats using an implanted telemetric device with a catheter in the abdominal aorta. The following diets were fed to the rats *ad libitum*:

- 1) *Control diet group*: basic dry rat food (Altromin, Lage, Germany)
- 2) *Pathogenic diet group*: 18 % butter (Valio, Helsinki, Finland), 1 % cholesterol (Sigma, St. Louis, MO, USA), 6 % sodium chloride (University Pharmacy, Helsinki, Finland) added to the basic dry rat food

3) *Multi-Bene diet group*: 18 % butter, 1 % cholesterol, 1 % plant sterols, 5 % potassium- and magnesium-enriched, sodium-reduced salt alternative (Pansalt®, Oriola, Espoo, Finland), 0.5 % calcium carbonate and 0.5 % calcium chloride (Sigma, St. Louis, MO, USA) added to the basic dry rat food.

3. RESULTS

Fig. 1. Obese Zucker rats after four weeks on the different diets. Food intakes were equal in all groups. The decrease in body weight was confined to body fat.

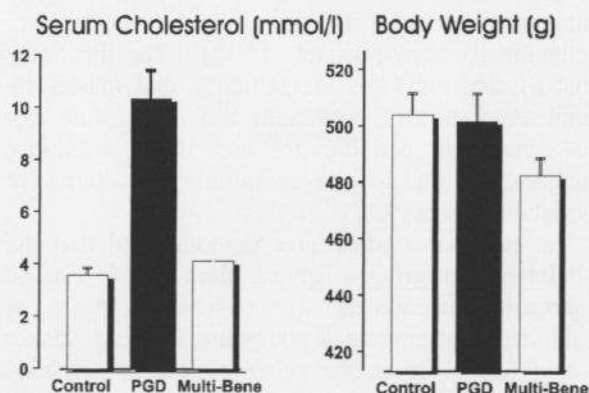
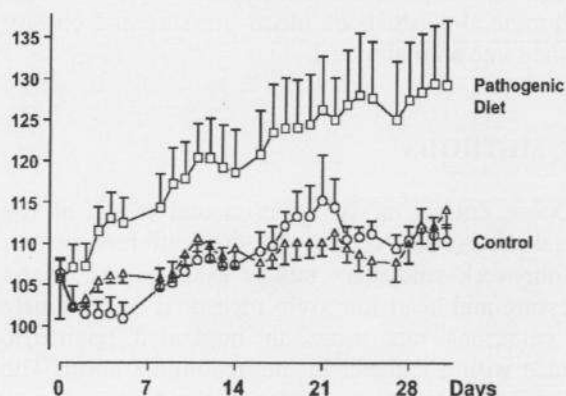


Fig. 2. Mean arterial pressure (mmHg) of the obese Zucker rats during the different diets.



4. CONCLUSIONS

The Multi-Bene composition, applied to an unhealthy diet, is able to produce multiple powerful beneficial effects in the animal model of the

metabolic syndrome. Blood pressure, serum cholesterol and obesity seem to be sensitive to diet composition changes, which can be easily applied also in human diets. In fact, the first clinical studies have already confirmed the cholesterol-lowering effect of Multi-Bene foods (18).

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