DIFFERENTIAL EFFECTS OF HIGH-CARBOHYDRATE AND HIGH-FAT DIET COMPOSITION ON METABOLIC CONTROL AND INSULIN RESISTANCE IN RATS

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Abstract: The rise in obesity and diabetes has increased the interest on controlling diet habits. High-fat diet (HFD) and high-carbohydrate diets (HCD) have shown potential benefit for weight management, however their detrimental effects on blood lipids and insulin resistance still remain not well understood. It is known that the macronutrient component of diets is critical for the metabolic control and insulin action. Even so, the largest research focus in nutrition has been oriented towards the impact of dietary fat on metabolism. This tendency had ignored the importance of the quality of carbohydrate in the diet. However, some have showed that slowly fermentable carbohydrates induce body weight reduction and lower body fat content. In previous reports, we have showed beneficial effects of native banana starch (NBS) supplementation on rats and diabetic patients for reducing body weight and insulin resistance. In this study, our aim was to compare the effects of diets with high content of NBS or readily digestible carbohydrate, as well as high-fat diet on metabolic control and insulin resistance in Wistar rats. Thirty six animals were divided in 5 groups of 6 rats each one receiving: a) Control diet (CD), b) high-saturated-fat diet (HSFD), high-unsaturated-fat diet (HUFD), high-digestible-carbohydrate diet, (HDCD), high-resistant starch diet (HRSD). All diets were administered during 8 weeks. Body weight and food consumption were recorded. At the end of treatment, animals were sacrificed and liver and blood samples were obtained. Body weight AUC, was reduced in all animal groups diets in comparison with control diet (DN), however no statistical significance was reached. Calorie intake was similar in both n HFD and CD, but the rats with HCD showed higher calorie consumption than animals on the other diets, (p <0.01). In spite of this, the HRSD showed the lower levels of serum and hepatic lipids in comparison with other groups, and the insulin resistance index (HOMA-IR) value was similar to that of the CD group. The most important reduction on fasting glycemia was observed in the HUFD group which also showed the lowest HOMA-IR values, inclusive than the CD. The HDCD exhibited the higher insulin resistance joined to the highest hepatic cholesterol content. Impaired renal function markers were augmented in the HSFD associated to high-lipid liver content. In conclusion, although HRSD exhibited the highest consumption, did not increase body weight, reduced hepatic and serum lipids and did not modify insulin sensitivity. In both, HFD and HCD, the constituents were more important factor than calories intakes for metabolic disturbance and insulin resistance.

Key words: high-fat diet, high-carbohydrate diet, obesity, resistant starch, insulin resistance.

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