Response of obesity-resistant BALB/c mice to a ketogenic diet

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Introduction. The ketogenic diet (KD) is a high-fat, low-carbohydrate diet in which the body undergoes metabolic adjustments that stimulate ketogenesis, thereby increasing circulating ketone bodies. Loss of body weight is attributed to these adjustments, as well as neuroprotective properties. However, the mechanisms involved are still not fully elucidated. That aim of this work was to evaluate the effect of a ketogenic diet on body composition, feeding behavior and glucose metabolism in mice of the BALB/c strain, a mouse model resistant to obesity.

Materials and methods. BALB/c mice of both sexes, 12 weeks old, were divided into KD and control groups, which received a ketogenic diet (Research Diets) or standard chow (LabDiet 5001), respectively, for 23 days. Throughout the experiment, body weight gain, water and food intake were measured, whereas body mass index (BMI), the percentage of interscapular, inguinal, and visceral adipose tissue and blood β-hidroxybutyrate levels were measured at the end of the protocol. In addition, glucose tolerance tests were carried out at the beginning and at the end of the experiment.

Results. Similar body weight gain (10%) was observed in males and females on KD compared to the control group ($p<0.05$). However, a higher BMI was observed only in males. The KD group consumed 50% less food in both sexes, whereas water consumption was diminished 25% in males and 50% in females, compared to the control ($p= 0.0001$). The estimated energy intake was lower (12 Kcal) in males on ketogenic diet, but not in females. Regarding the metabolic state at day 23, in KD mice levels of β-hidroxybutyrate increased to 0.4 mmol/L in males and 0.7 mmol/L in females. Mice of both sexes on KD showed increased inguinal and visceral fat, when compared to the control group on standard chow. At day 23, the glucose tolerance test showed an increase in the area under the curve, indicating impaired glucose tolerance, in both males and females on KD.

Conclusions. In obesity-resistant BALB/c mice, the consumption of a ketogenic diet for a short period induces a state of nutritional ketosis accompanied by weight gain, increased fat tissue, and impaired glucose intolerance.