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Effects of a 6-week Low-Carbohydrate High-Fat Diet on Lipid Profiles in Competitive Recreational Distance Runners

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Low-Carbohydrate High-Fat (LCHF) diets have become very popular among athletes due to recent research suggesting performance and numerous health benefits. However, few studies have examined the chronic effects of LCHF diets on the blood lipid profile and other cardiovascular disease risk factors in athletic populations. **PURPOSE:** To examine the effect of a 6-week LCHF diet (69% kcals from fat, 6% carbohydrates), compared to a diet higher in carbohydrate and lower in fat (HCLF; 56% kcals from carbohydrate, 28% fat) on fasting lipids – triglycerides (TG), LDL-C, HDL-C, total cholesterol (TC), VLDL, TG/HDL-C Ratio, TC/HDL-C Ratio, glucose and glycated hemoglobin (HbA1c), in competitive recreational distance runners. **METHODS:** Seven male athletes (age 35.6 ± 8.4 years, height 178.7 ± 4.1 cm, weight 68.6 ± 1.6 kg; VO_{2max} 61.9 ± 6.1 ml/kg/min) consumed an ad libitum LCHF and ad libitum HCLF diet in a random order, each for 6 weeks in a crossover design. Plasma lipids were measured on day 4, 14, 28, and 42 of each diet. **RESULTS:** The LCHF diet significantly increased TC (mean \pm SD; LCHF 197.4 ± 26.3 mg/dl, HCLF 153.4 ± 1.3 mg/dl; %Diff = 25.1%; $p = 0.001$), LDL-C (LCHF 108.3 ± 20.6 mg/dl, HCLF 73.5 ± 2.8 mg/dl; %Diff = 38.3%; $p = 0.001$), HDL-C (LCHF 70.6 ± 3.5 mg/dl, HCLF 60.6 ± 2.1 mg/dl; %Diff = 15.3%; $p = 0.015$), and decreased TG (LCHF 73.9 ± 4.4 mg/dl, HCLF 97.0 ± 10.9 mg/dl; %Diff = 26.9%; $p = 0.005$), VLDL (LCHF 18.5 ± 3.5 mg/dl, HCLF 19.4 ± 2.2 mg/dl; %Diff = 4.9%; $p = 0.004$), TG/HDL-C Ratio (LCHF 1.1 ± 0.1 mg/dl, HCLF 1.8 ± 0.2 mg/dl; %Diff = 44.4%; $p = 0.001$) in relation to the HCLF diet. Changes in plasma glucose (LCHF 83.3 ± 4.0 mg/dl, HCLF 88.7 ± 2.4 mg/dl; %Diff = 6.3%; $p = 0.107$) and HbA1c (LCHF $4.9 \pm 0.1\%$, HCLF $4.9 \pm 0.1\%$; %Diff = 0.2%; $p = 0.821$) did not differ between diets. **CONCLUSION:** Healthy well-trained male distance runners 20-50 years of age demonstrated an exaggerated hypercholesteremic response to a 6-week ad libitum LCHF diet. Despite high TC and LDL-C concentrations, the LCHF diet reduced TG, VLDL, TG/HDL-C Ratio, and increased HDL-C, suggestive of a lower risk of cardiovascular disease. This paradox of hypercholesterolemia in well-trained endurance athletes chronically consuming a LCHF needs to be further investigated to determine whether the blood lipid changes represent an increased or decreased risk of cardiovascular disease.

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