Rosa Mosqueta Oil Prevents Oxidative Stress and Inflammation through the Upregulation of PPAR-alpha and NRF2 in C57BL/6J Mice Fed a High-Fat Diet

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Resumen

Background: Rosa mosqueta (RM) oil is characterized by high concentrations of antioxidants and alpha-linolenic acid (ALA; 18: 3n-3). We have previously demonstrated in male C57BL/6J mice that RM decreases hepatic steatosis, a condition strongly associated with oxidative stress and inflammation.

Objective: We studied the molecular mechanisms that underlie the role of RM in preventing high-fat diet (HFD)-induced oxidative stress and inflammation.

Methods: Male C57BL/6J mice aged 28 d and weighing 12-14 g were divided into the following groups and fed for 12 wk: control diet (CD; 10% fat, 20% protein, and 70% carbohydrates); CD + RM (1.94 mg ALA . g body weight(-1) . d(-1) administered by oral gavage); HFD (60% fat, 20% protein, and 20% carbohydrates); and HFD + RM. General parameters (body weight, visceral fat, and histology); glucose metabolism [homeostasis model assessment and blood glucose area under the curve (AUC)]; oxidative stress [hepatic nuclear factor (erythroid-derived 2)-like-2 (NRF2) and heme oxygenase 1 (HO-1) concentrations]; and inflammation [hepatic peroxisome proliferator-activated receptor alpha (PPAR-alpha) and acylcoenzyme A oxidase 1 (ACOX1) concentrations, blood tumor necrosis factor alpha (TNF-alpha) and interleukin 1 beta (IL-1 beta) concentrations, and Tnfa and Il1b mRNA expression in liver and visceral adipose tissue] were evaluated.

Results: In the HFD + RM mice, the final body weight (24.8 +/- 1.1 g) was 19% lower than in the HFD mice (30.+/- 6 2.8 g) ($P < 0.05$). Visceral fat was 34% lower in the HFD + RM mice than in the HFD mice ($P < 0.05$). The blood glucose AUC was 29% lower and Tnfa and Il1b expression levels were 47% and 59% lower, respectively, in the HFD + RM mice than in the HFD mice ($P < 0.05$).

HFD + RM mice had 40% less hepatic steatosis (P < 0.05) and lower upregulation of PPAR-alpha (33%), ACOX1 (50%), NRF2 (39%), and HO-1 (68%) protein concentrations than did the HFD mice (P < 0.05).

Conclusions: Our findings suggest that RM supplementation prevents the obese phenotype observed in HFD-fed mice by downregulating inflammatory cytokine expression and secretion and stimulating hepatic antioxidant and fatty acid oxidation markers.

Palabras clave

Palabras clave de autor:rosa mosqueta; inflammation; oxidative stress; PPAR-alpha; NRF2
KeyWords Plus:NF-KAPPA-B; INDUCED HEPATIC STEATOSIS; INSULIN-RESISTANCE; LINOLENIC ACID; ADIPOSE-TISSUE; LIVER-DISEASE; N-3 LCPUFA; ENZYMES; OBESITY; RATS

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