The metabolic dysfunction of white adipose tissue induced in mice by a high-fat diet is abrogated by co-administration of docosahexaenoic acid and hydroxytyrosol

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Abstract

Background: Nutritional interventions are promising tools for the prevention of obesity. The n-3 long-chain polyunsaturated fatty acid (n-3 LCPUFA) docosahexaenoic acid (DHA) modulates immune and metabolic responses while the antioxidant hydroxytyrosol (HT) prevents oxidative stress (OS) in white adipose tissue (WAT).Objective: The DHA plus HT combined protocol prevents WAT alterations induced by a high-fat diet in mice. Main related mechanisms.Methods: Male C57BL/6J mice were fed a control diet (CD; 10% fat, 20% protein, and 70% carbohydrates) or a high fat diet (HFD) (60% fat, 20% protein, and 20% carbohydrates) for 12 weeks, without and with supplementation of DHA (50 mg kg(-1)day(-1)), HT (5 mg kg(-1)day(-1)) or both. Measurements of WAT metabolism include morphological parameters, DHA content in phospholipids (gas chromatography), lipogenesis, OS and inflammation markers, mitochondrial activity and gene expression of transcription factors SREBP-1c, PPAR-gamma, NF-kappa B (p65) and Nrf2 (quantitative polymerase chain reaction and enzyme-linked immunosorbent assay).Results: The combined DHA and HT intervention attenuated obesity development, suppressing the HFD-induced inflammatory and lipogenic signals, increasing antioxidant defenses, and maintaining the phospholipid LCPUFA n-3 content and mitochondrial function in WAT. At the systemic level, the combined intervention also improved the regulation of glucose and adipokine homeostasis.Conclusion: The combined DHA and HT protocol appears to be an important nutritional strategy for the treatment of metabolic diseases, with abrogation of obesity-driven metabolic inflammation and recovery of a small-healthy adipocyte phenotype.

Palabras clave

KeyWords Plus:INSULIN-RESISTANCE; OXIDATIVE STRESS; GENE-EXPRESSION; INDUCED OBESITY; RESOLVIN D1; LIVER; INFLAMMATION; OMEGA-3-FATTY-ACIDS; ACTIVATION; DIFFERENTIATION

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