Protection of LDL from oxidation by olive oil polyphenols is associated with a downregulation of CD40-ligand expression and its downstream products in vivo in humans.


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BACKGROUND: Recently, the European Food Safety Authority approved a claim concerning the benefits of olive oil polyphenols for the protection of LDL from oxidation. Polyphenols could exert health benefits not only by scavenging free radicals but also by modulating gene expression.

OBJECTIVE: We assessed whether olive oil polyphenols could modulate the human in vivo expressions of atherosclerosis-related genes in which LDL oxidation is involved.

DESIGN: In a randomized, crossover, controlled trial, 18 healthy European volunteers daily received 25 mL olive oil with a low polyphenol content (LPC: 2.7 mg/kg) or a high polyphenol content (HPC: 366 mg/kg) in intervention periods of 3 wk separated by 2-wk washout periods.

RESULTS: Systemic LDL oxidation and monocyte chemoattractant protein 1 and the expression of proatherogenic genes in peripheral blood mononuclear cells [ie, CD40 ligand (CD40L), IL-23α subunit p19 (IL23A), adrenergic β-2 receptor (ADRB2), oxidized LDL (lectin-like) receptor 1 (OLR1), and IL-8 receptor-α (IL8RA)] decreased after the HPC intervention compared with after the LPC intervention. Random-effects linear regression analyses showed 1) a significant decrease in CD40, ADRB2, and IL8RA gene expression with the decrease of LDL oxidation and 2) a significant decrease in intercellular adhesion molecule 1 and OLR1 gene expression with increasing concentrations of tyrosol and hydroxytyrosol in urine.

CONCLUSIONS: In addition to reducing LDL oxidation, the intake of polyphenol-rich olive oil reduces CD40L gene expression, its downstream products, and related genes involved in atherogenic and inflammatory processes in vivo in humans. These findings provide evidence that polyphenol-rich olive oil can act through molecular mechanisms to provide cardiovascular health benefits. This trial was registered at www.controlled-trials.com as ISRCTN09220811.

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