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Aorta Adhesion Molecules in Cholesterol-Fed Rats Supplemented with Extra Virgin Olive Oil or Sunflower Oil, in Either Commercial or Modified Forms

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Abstract : Chronic inflammation plays a pivotal role in CVD development, while phytochemicals have been shown to reduce CVD risk. Several studies have correlated olive oil consumption with CVD prevention and CVD risk reduction. However, the effect of individual olive oil macro- or micro-constituents and possible synergisms among them needs to be further elucidated. Herein, extra virgin olive oil (EVOO) lipidic and polar phenolics fractions were evaluated for their effect on inflammatory markers in cholesterol-fed rats. Oils combining different characteristics as to their polar phenolic content and lipid profile were used. Male Wistar rats were fed for 9 weeks on either a high-cholesterol diet (HCD) or a HCD supplemented with oils, either commercially available, i.e. EVOO, sunflower oil (SO), or modified as to their polar phenol content, i.e. phenolics deprived-EVOO (EVOOd), SO enriched with the EVOO phenolics (SOe). Post-intervention, aorta and blood samples were collected. HCD induced dyslipidemia, manifested by serum total cholesterol and low-density lipoprotein cholesterol elevation. Additionally, HCD resulted in higher adhesion molecules' levels in rat aorta. In the case of E-selectin, this increase was attenuated by HCD supplementation with EVOO and EVOOd, while no alterations were observed in SO and SOe groups. No differences were observed between pairs of commercial and modified oils, indicating that oleates may be the components responsible for aorta E-selectin levels lowering. The same was true for vascular adhesion molecule-1 (VCAM-1); augmentation in cholesterol-fed animals was attenuated by EVOO and EVOOd diets, highlighting oleates effect. In addition, VCAM-1 levels were higher in SO group compared to the respective SOe, indicating that in the presence of phenolic compounds linoleic acid have become less prone to oxidation. Intercellular adhesion molecule-1 (ICAM-1) levels were higher in cholesterol-fed rats, however not affected by any of the oils supplemented during the intervention. Overall, EVOO was found superior in regulating adhesion molecule levels in rat aorta compared to SO. EVOO and EVOOd exhibited analogous effects on all adhesion molecules assessed, indicating that EVOO major constituents (oleates) improve E-selectin and VCAM-1 levels in rat aorta, independently from phenolics presence. Further research is needed to elucidate the effect of phenolics and oleates in other tissues.

Keywords : extra virgin olive oil, cholesterol-fed rats, polar phenolics, adhesion molecules
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