

TNF-Alpha and MDA Levels in Hearts of Cholesterol-Fed Rats Supplemented with Extra Virgin Olive Oil or Sunflower Oil, in Either Commercial or Modified Forms

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Abstract : Oxidative stress is a major mechanism underlying CVDs while inflammation, an intertwined process with oxidative stress, is also linked to CVDs. Extra virgin olive oil (EVOO) is widely known to play a pivotal role in CVD prevention and CVD reduction. However, in most studies, olive oil constituents are evaluated individually and not as part of the native food, hence potential synergistic effects as drivers of EVOO beneficial properties may be underestimated. In this study, EVOO lipidic and polar phenolics fractions were evaluated for their effect on inflammatory (TNF-alpha) and oxidation (malondialdehyde/MDA) markers, in cholesterol-fed rats. Thereat, oils with discernible lipidic profile and polar phenolic content were used. Wistar rats were fed 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). After 9 weeks of dietary intervention, heart and blood samples were collected. HCD induced dyslipidemia shown by increase in serum total cholesterol, low-density lipoprotein cholesterol (LDL-c) and triacylglycerols. Heart tissue has been affected by dyslipidemia; oxidation was indicated by increase in MDA in cholesterol-fed rats and inflammation by increase in TNF-alpha. In both cases, this augmentation was attenuated in EVOO and SOe diets. With respect to oxidation, SO enrichment with the EVOO phenolics brought its lipid peroxidation levels as low as in EVOO-fed rats. This suggests that phenolic compounds may act as antioxidant agents in rat heart. A possible mechanism underlying this activity may be the protective effect of phenolics in mitochondrial membrane against oxidative damage. This was further supported by EVOO/EVOOd comparison with the former presenting lower heart MDA content. As for heart inflammation, phenolics naturally present in EVOO as well as phenolics chemically added in SO, exhibited quenching abilities in heart TNF-alpha levels of cholesterol-fed rats. TNF-alpha may have played a causative role in oxidative stress induction while the opposite may have also happened, hence setting up a vicious cycle. Overall, diet supplementation with EVOO or SOe attenuated hypercholesterolemia-induced increase in MDA and TNF-alpha in Wistar rat hearts. This is attributed to phenolic compounds either naturally existing in olive oil or as fortificants in seed oil.

Keywords : extra virgin olive oil, hypercholesterolemic rats, MDA, polar phenolics, TNF-alpha

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