Abstract


α-Tocopherol modulates human umbilical vein endothelial cell expression of Cu/Zn superoxide dismutase and catalase and lipid peroxidation

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BACKGROUND: Recent studies suggest the potential of α-tocopherol as a gene regulator, possibly through peroxisome proliferator-activated receptor γ (PPARγ) activation due to the structural similarity of α-tocopherol to a PPARγ ligand, troglitazone. Other investigators have suggested that a link exists between induction of the antioxidant enzymes Cu/Zn superoxide dismutase (SOD) and catalase and PPARγ activation.

OBJECTIVE AND METHODS: This study was designed to examine whether α-tocopherol modulates expression of Cu/Zn SOD and catalase in human umbilical vein endothelial cells through redox-sensitive transcription factors, PPARγ, and nuclear factor-κB (NF-κB).

RESULTS: α-Tocopherol treatments showed significant increases in both PPARγ (1.4- to 2.2-fold, P < .01) and NF-κB p50 (1.3- to 1.5-fold, P < .005) DNA binding activities compared with vehicle control. Significant increases in Cu/Zn SOD mRNA levels (6.0-fold, P < .005) and catalase mRNA (8.0-fold, P < .005) and its protein levels (2.3-fold, P < .005) and lipid peroxidation levels (5.3-fold, P < .005) were observed at the lowest concentration (10 μmol/L) of α-tocopherol treatments. Both mRNA and protein levels of these 2 antioxidant enzymes were positively associated with lipid peroxidation (P < .05).

CONCLUSIONS: α-Tocopherol may play a role not only in preventing against oxidative damage as an exogenous antioxidant by scavenging free radicals and superoxide but also in modulating the expression of the endogenous antioxidant enzymes as a gene regulator through PPARγ and NF-κB in the vascular cells. The α-tocopherol-mediated gene expression is either stimulatory or inhibitory, depending on its oxidative status or its concentrations.

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