

# Abstract

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## The two faces of $\alpha$ - and $\gamma$ -tocopherols: an in vitro and ex vivo investigation into VLDL, LDL and HDL oxidation.

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**BACKGROUND:** Vitamin E and its derivatives, namely, the tocopherols, are known antioxidants, and numerous clinical trials have investigated their role in preventing cardiovascular disease; however, evidence to date remains inconclusive. Much of the in vitro research has focused on tocopherol's effects during low-density lipoprotein (LDL) oxidation, with little attention being paid to very LDL (VLDL) and high-density lipoprotein (HDL). Also, it is now becoming apparent that  $\gamma$ -tocopherol may potentially be more beneficial in relation to cardiovascular health.

**OBJECTIVES:** Do  $\alpha$ - and  $\gamma$ -tocopherols become incorporated into VLDL, LDL and HDL and influence their oxidation potential in an in vitro and ex vivo situation?

**DESIGN:** Following (i) an in vitro investigation, where plasma was preincubated with increasing concentrations of either  $\alpha$ - or  $\gamma$ -tocopherol and (ii) an in vivo 4-week placebo-controlled intervention with  $\alpha$ - or  $\gamma$ -tocopherol. Tocopherol incorporation into VLDL, LDL and HDL was measured via high-pressure liquid chromatography, followed by an assessment of their oxidation potential by monitoring conjugated diene formation.

**RESULTS:** In vitro: Both tocopherols became incorporated into VLDL, LDL and HDL, which protected VLDL and LDL against oxidation. However and surprisingly, the incorporation into HDL demonstrated pro-oxidant properties. Ex vivo: Both tocopherols were incorporated into all three lipoproteins, protecting VLDL and LDL against oxidation; however, they enhanced the oxidation of HDL.

**CONCLUSIONS:** These results suggest that  $\alpha$ - and  $\gamma$ -tocopherols display conflicting oxidant activities dependent on the lipoprotein being oxidized. Their pro-oxidant activity toward HDL may go some way to explain why supplementation studies with vitamin E have not been able to display cardioprotective effects.

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