

# Abstract

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## **Tocotrienol Suppresses Adipocyte Differentiation and Akt Phosphorylation in 3T3-L1 Preadipocytes.**

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**BACKGROUND:** In vivo studies show that alpha-tocotrienol and gamma-tocotrienol accumulate in adipose tissue. Furthermore, a recent study reports that the oral administration of gamma-tocotrienol from a tocotrienol-rich fraction from palm oil (TRF) decreases body fat levels in rats.

**OBJECTIVE AND METHODS:** The objective of this study was to evaluate the effect of TRF and its components on adipocyte differentiation in 3T3-L1 preadipocytes, which differentiated into adipocytes in the presence of 1.8  $\mu\text{mol/L}$  insulin. TRF suppressed the insulin-induced mRNA expression of adipocyte-specific genes such as PPARgamma, adipocyte fatty acid-binding protein (aP2), and CCAAT/enhancer-binding protein-alpha (C/EBPalpha) compared with the differentiation of 3T3-L1 preadipocytes into adipocytes only in the presence of insulin. To confirm the suppressive effect of TRF, the major components of TRF, such as alpha-tocotrienol, gamma-tocotrienol, and alpha-tocopherol, were investigated.

**RESULTS:** alpha-Tocotrienol and gamma-tocotrienol decreased the insulin-induced PPARgamma mRNA expression by 55 and 90%, respectively, compared with insulin, whereas alpha-tocopherol increased the mRNA expression. In addition, gamma-tocotrienol suppressed the insulin-induced aP2 and C/EBPalpha mRNA expression, triglyceride accumulation, and PPARgamma protein levels compared with insulin. The current results also revealed that gamma-tocotrienol inhibited the insulin-stimulated phosphorylation of Akt but not extracellular signal-regulated kinase (ERK)1/2 in the insulin signaling pathway of 3T3-L1 preadipocytes. Thus, the antiadipogenic effect of TRF depends on alpha-tocotrienol and gamma-tocotrienol, and gamma-tocotrienol may be a more potent inhibitor of adipogenesis than alpha-tocotrienol.

**CONCLUSION:** Therefore, the results of this study suggest that tocotrienol suppresses insulin-induced differentiation and Akt phosphorylation in 3T3-L1 preadipocytes. Furthermore, tocotrienol could act as an antiadipogenic vitamin in the nutrient-mediated regulation of body fat through its effects on differentiation.

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