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Anti-inflammatory activity of clove (Eugenia caryophyllata) essential oil in human dermal fibroblasts

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Abstract

Context: Clove (Eugenia caryophyllata Thunb. [Myrtaceae]) essential oil (CEO) has been shown to possess antimicrobial, antifungal, antiviral, antioxidant, anti-inflammatory and anticancer properties. However, few studies have focused on its topical use.

Objective: We investigated the biological activity of a commercially available CEO in a human skin disease model.

Materials and methods: We evaluated the effect of CEO on 17 protein biomarkers that play critical roles in inflammation and tissue remodelling in a validated human dermal fibroblast system, which was designed to model chronic inflammation and fibrosis. Four concentrations of CEO (0.011, 0.0037,

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1 of 4 5/18/2021, 10:10 AM

0.0012, and 0.00041%, v/v) were studied. The effect of 0.011% CEO on genome-wide gene expression was also evaluated.

Results and discussion: CEO at a concentration of 0.011% showed robust antiproliferative effects on human dermal fibroblasts. It significantly inhibited the increased production of several proinflammatory biomarkers such as vascular cell adhesion molecule-1 (VCAM-1), interferon γ -induced protein 10 (IP-10), interferon-inducible T-cell α chemoattractant (I-TAC), and monokine induced by γ interferon (MIG). CEO also significantly inhibited tissue remodelling protein molecules, namely, collagen-I, collagen-III, macrophage colony-stimulating factor (M-CSF), and tissue inhibitor of metalloproteinase 2 (TIMP-2). Furthermore, it significantly modulated global gene expression and altered signalling pathways critical for inflammation, tissue remodelling, and cancer signalling processes. CEO significantly inhibited VCAM-1 and collagen III at both protein and gene expression levels.

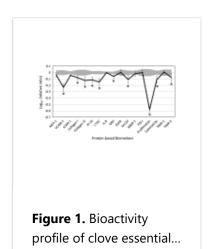
Conclusions: This study provides important evidence of CEO-induced anti-inflammatory and tissue remodelling activity in human dermal fibroblasts. This study also supports the anticancer properties of CEO and its major active component eugenol.

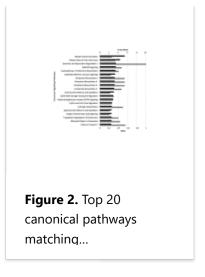
Keywords: Anti-inflammation; cancer signalling; collagen III; eugenol; immune response; interferon γ -induced protein 10; interferon-inducible T-cell α chemoattractant; monokine induced by γ interferon; skin health; vascular cell adhesion molecule-1.

Figures

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2 of 4 5/18/2021, 10:10 AM





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3 of 4 5/18/2021, 10:10 AM