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# Antiviral activity of Australian tea tree oil and eucalyptus oil against herpes simplex virus in cell culture

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## Abstract

The antiviral effect of Australian tea tree oil (TTO) and eucalyptus oil (EUO) against herpes simplex virus was examined. Cytotoxicity of TTO and EUO was evaluated in a standard neutral red dye uptake assay. Toxicity of TTO and EUO was moderate for RC-37 cells and approached 50% (TC50) at concentrations of 0.006% and 0.03%, respectively. Antiviral activity of TTO and EUO against herpes simplex virus type 1 (HSV-1) and herpes simplex virus type 2 (HSV-2) was tested in vitro on RC-37 cells using a plaque reduction assay. The 50% inhibitory concentration (IC50) of TTO for herpes simplex virus plaque formation was 0.0009% and 0.0008% and the IC50 of EUO was determined at 0.009% and 0.008% for HSV-1 and HSV-2, respectively. Australian tea tree oil exhibited high levels of virucidal activity against HSV-1 and HSV-2 in viral suspension tests. At noncytotoxic concentrations of TTO plaque formation was reduced by 98.2% and 93.0% for HSV-1 and HSV-2, respectively. Noncytotoxic concentrations of EUO reduced virus titers by 57.9% for HSV-1 and 75.4% for HSV-2. Virus titers were reduced significantly with TTO, whereas EUO exhibited distinct but less antiviral activity. In order to determine the mode of antiviral action of both essential oils, either cells were pretreated before viral infection or viruses were incubated with TTO or EUO before infection, during adsorption or after penetration into the host cells. Plaque formation was clearly reduced, when herpes simplex virus was pretreated with the essential oils prior to adsorption. These results indicate that TTO and EUO affect the virus before or during adsorption, but not after penetration into the host cell. Thus TTO and EUO are capable to exert a direct antiviral effect on HSV. Although the active antiherpes components of Australian tea tree and eucalyptus oil are not yet known, their possible application as antiviral agents in recurrent herpes infection is promising.

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