A067 Comparison of antioxidant activity of licorice to commercial antioxidants in 2% hydroquinone cream

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Antioxidants are an effective strategy for protection of the skin against UV-mediated oxidative damage. Some of chemical antioxidants have side effects. More recently, researchers have focused on developing safe and more effective antioxidants from natural sources. Hydroquinone, which is known for its high sensitivity to oxidation, has chosen as an indicator for comparison of the antioxidative activity of licorice to commercial antioxidants in 2% w/w hydroquinone cream (1,2). Powdered dry root of licorice was extracted with methanol. The extract of licorice was tested for antioxidative activity in comparison with commercial antioxidants [sodium metabisulfite and butylated hydroxy toluene (BHT)] at 0.1, 0.5, 1 and 2% w/w in 2% w/w hydroquinone cream. The systems were incubated in a darkroom at 25 C for three months. The physical stability percentage of hydoquinone remaining after two weeks, one, two and three months was determined by UV spectrophotometry at 289 nm. The experiments revealed that the higher percentages of remaining hydroquinone were observed in the presence of higher antioxidant concentrations, but some of formulations showed lower physical stability, especially in the presence of 1 and 2% BHT. The systems containing licorice extract at all concentrations showed more activity than sodium metabisulfite and BHT ($P<0.001$). The preparations containing extract showed good physical formulation stability with over 65% of hydroquinone remaining during three months. The results showed that licorice extract can be used as a natural antioxidant for substances that are oxidation-susceptible.

References: 1. Manosroi, A. et al. (1999) J. Cosmet. Sci. 50: 221-229. **2.** Leung, A.Y. et al. (1996) Encyclopedia of common natural ingredients used in food, drugs and cosmetics. John Wiley & Sons Inc. New York.

A068 A triterpene from Korean mistletoe and its apoptosis-inducing activity

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Mistletoe is a common name for many species of semi-parasitic plants which grow on deciduous trees all over the world. European mistletoe (*Viscum album* L.) has been shown to possess a variety of biological activities such as antitumor and immunomodulating activity and the mistletoe extract is widely used in cancer therapy. It has been reported that the mistletoe preparations exhibited direct cytotoxicity against tumor cells in culture. These investigations also revealed that the most active component responsible for these biological activities was present in a protein fraction whereas some activity was still found in unidentified protein-free fraction. In addition, comparing with a number of foreign researches on European mistletoe extracts, Korean mistletoe (*Viscum album* var. *coloratum*) has limited subjects on certain lectins and their related compounds.

Under these backgrounds, we tried to isolate the cytotoxic low-molecular compounds from the Korean mistletoe. In *in vitro* analysis of cytotoxic activity using RAW 264.7 murine tumor cells, dichloromethane extract of Korean mistletoe showed significant activity against tumor cells. An active compound, which was designated as VD-3, was isolated from the extract by repeated silicagel chromatography. VD-3 exhibited strong cytotoxicity against RAW 264.7 as well as Colon 26-M3.1, NIH-3T3 and B16-BL6 tumor cells while it was not cytotoxic to normal cells (murine splenocytes). Tumor cells treated with VD-3 showed typical patterns of apoptotic cell death, such as apparent morphological changes and DNA fragmentation. In addition, VD-3 enhanced the activity of D4-DGI as well as caspase-3, a cytosolic enzyme of tumor cells, during apoptosis induction.

VD-3 was identified as *epi*-oleanolic acid by spectral data and it was confirmed by chemical synthesis. These results indicated that Korean mistletoe contains a highly cytotoxic compound against tumor cells, and the most responsible low-molecular compound for the activity is *epi*-oleanolic acid.