

Essential Oils in Several Herbs Inhibit Human LDL oxidation

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Objectives

The first aim of the study was to investigate an important role of atherosclerosis thus antioxidants from the essential oils in several herbs inhibit the oxidative modification of low-density lipoprotein (LDL). In the second part we investigated multiple favorable effects on cellular cholesterol metabolism and cholesterol synthesis of essential oil from *Melissa officinalis* (MO). Finally we investigated the effect of MO essential oil on the serum lipid levels in apolipoprotein E mice to obtain the fundamental data for development of the nutraceuticals using herb essential oils.

Materials and Methods

o Materials

Essential oils in several herbs were obtained from Dr. Kuen-Woo Park's research group.

o Methods

LDL was isolated from the fresh human serum according previously described (Lee et al., 2003). Oxidation of LDL was conducted as previously described (Zhang et al., 1997). TBARS was used as an index of LDL oxidation. The transcription levels of the LDL receptor and the 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase were measured by RT-PCR. The work was carried out on human liver HepG2 cells. In the third part of this study, apolipoprotein E mice were divided in groups each containing 6 animals either male or female. The tested mice were administrated orally with essential oils in MO everyday for 4 weeks. Each mouse received orally essential oil in 0.25 g MO/mouse per day and control group received water. The mice were fasted overnight (12-19 h), the then blood sample were collected in purple-topped EDTA tubes once a week. The plasma was separated from the blood after centrifugation, and then total cholesterol and triglyceride levels were measured enzymatically.

Results and Discussion

Oxidation of LDL is believed to play a key role in atherogenesis. Antioxidants from the medicinal plants inhibit the oxidative modification of LDL. Due to the abundance of antioxidative flavonoids and polyphenolics in essential oils isolated from several herbs, we hypothesized that tree different oils extracted from medicinal plants MO, *Agastache rugosa* (AR), *Plantago asiatica* (PA) may have beneficial health promoting effects. For this reason, a sufficient protection of LDL by essential oils may provide protection from atherosclerosis. We examined the protective effect of essential oils in several herbs against Cu²⁺-mediated human LDL oxidation. AR and PA essential oils inhibited LDL oxidation in a concentration-dependent manner. MO essential oils at low concentration effectively prevent LDL oxidation. We incubated MO essential oils with human HepG2 cells and examined the expression of key genes in cholesterol metabolism. The expression of the HMG-CoA reductase significantly reduced by exposure of MO essential oils but LDL receptor expression was unchanged. In vitro test, our data suggest MO essential oils may decrease cholesterol biosynthesis and suppressed LDL oxidation may be one of mechanism about protection from atherosclerosis. In addition, we investigated the effect of MO essential oil on the serum lipid levels in apolipoprotein E mice. After 2 week of feeding, serum triglyceride level was reduced by consumption of MO essential oil but total cholesterol level in serum was not affected by consumption of MO essential oil. All results suggest that consumption of essential oils can afford desirable health benefits in prevention of atherosclerosis.

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