

Does Inhaled Peppermint Essential Oil Affect Blood Pressure?

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Abstract

By far, studies on the effect of oral administration of peppermint essential oil on blood pressure are not consistent, increasing or decreasing. And the effect of inhalation of peppermint essential oil on blood pressure was not reported. This study was designed to clarify the effect of peppermint essential oil inhalation on the blood pressure and autonomic nervous system. Blood pressure and heart rate variability (HRV) as an indicator of autonomic nervous system activity were measured. The systolic and diastolic blood pressure was not changed significantly by inhalation of peppermint essential oil. Standard deviation of normal to normal (SDNN), a parameter of total activity of autonomic nervous system also was not changed significantly. High frequency (HF) power level, an indicator of parasympathetic nervous system activity was not changed by peppermint. These results indicate that action mechanism of peppermint essential oil on blood pressure is different by the method of administration, oral or inhalation.

Keywords: Blood Pressure, Autonomic Nervous System, Heart Rate Variability, Peppermint

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1. Introduction

The essential oil of plants such as juniper, ylang ylang is reported to change behavior, motivation, cardiovascular parameters and the activity of autonomic nervous system.^[1] Inhalation of lavender essential oil prevents stress, anxiety, and depression after childbirth.^[2] And inhalation of bergamot essential oil decreases behavior related depressive disorder.^[3,4]

Peppermint, known as *Mentha balsamea* is a hybrid mint a cross between spearmint and watermint. It is under research for its potential role as a short-term treatment for irritable bowel syndrome.^[5] Its leaves have a cooling effects when applied topically on painful muscle and relieving the muscle pain^[6] It is also known that the leaves of peppermint have anti-itching effects.^[7]

By far, the reports on the effects of peppermint on the blood pressure and autonomic nervous system activity are not abundant.^[8,9] And the effects of peppermint on blood pressure is not consistent.^[8,9] Meamarbashi

reported that oral administration of peppermint essential oil increases the systolic blood pressure and decrease the diastolic blood pressure.^[8]

This study was designed to explore whether inhalation of peppermint essential oil changes the cardiovascular parameters and the activity of autonomic nervous system by measuring the blood pressure and recording the heart rate variability (HRV).

2. Materials and Methods

Ten persons ranging from 20 to 57 years old (mean \pm S.D.: 30 ± 14.5 years old), volunteered to participate in the study. Persons with nasal and breathing disorder were excluded. All participants received explanations of the aims, procedures of the study. The study was performed in accordance with the Declaration of Helsinki of the World Medical Association and Regulations of the Ethics Committee of Chonnam National University.

All measurements were performed in a temperature

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controlled (25°C), quiet, comfortable room. Before measurements were taken, the participants relaxed comfortably for about 10 min in a seated position. Blood pressure measurements were done with electronic blood pressure detector (Omron HEM-7220, Omron Healthcare Co., Kyoto, Japan) Electrocardiogram (ECG) recording in the augmented unipolar limb leads was performed for the analysis of the HRV. HRV was analyzed by means of frequency domain analysis (SA-3000P, Medcore, Seoul, Korea).

To apply peppermint essential oil, 30 μ L of peppermint essential oil was pipetted onto a small cotton pad and the pad was placed near the participant's nostrils. The participants inhaled the essential oil diffused from the cotton pad for 3 min. HRV measurements were performed before and during the application of peppermint oil. Blood pressure were performed before and just after the stimulation of peppermint oil. All data were expressed as mean \pm standard deviation. Student's t-test was used to compare the responses to the peppermint essential oil. Values of $P < 0.05$ were considered statistically significant.

3. Results

The systolic pressure was decreased by peppermint essential oil from 118.8 \pm 7.9 mmHg to 115.6 \pm 8.5 without statistical significance. The diastolic pressure was also decreased from 82.9 \pm 7.3 mmHg to 81.2 \pm 6.1 mmHg by peppermint essential oil. The heart rate was decreased from 78.5 \pm 13.0/min to 80.7 \pm 13.3/min without statistical significance (Table 1). To evaluate the effect of peppermint essential oil on the activity of autonomic nervous system, HRV was recorded and analysed. Standard deviation of normal to normal (SDNN), total activity of autonomic nervous system was changed from 42.8 \pm 22.1 ms to 44.6 \pm 17.5 ms (without statistical significance). High frequency (HF) component was not

Table 1. Effects of peppermint essential oil on the blood pressure and heart rate ($n = 10$)

| | Control | Peppermint |
|---------------------------|-----------------|-----------------|
| Systolic Pressure (mmHg) | 118.8 \pm 7.9 | 115.6 \pm 8.5 |
| Diastolic Pressure (mmHg) | 82.9 \pm 7.3 | 81.2 \pm 6.1 |
| Heart Rate (beats/min) | 78.5 \pm 13.0 | 80.7 \pm 13.3 |

Statistical significance; $P < 0.05$ by Student's t-test

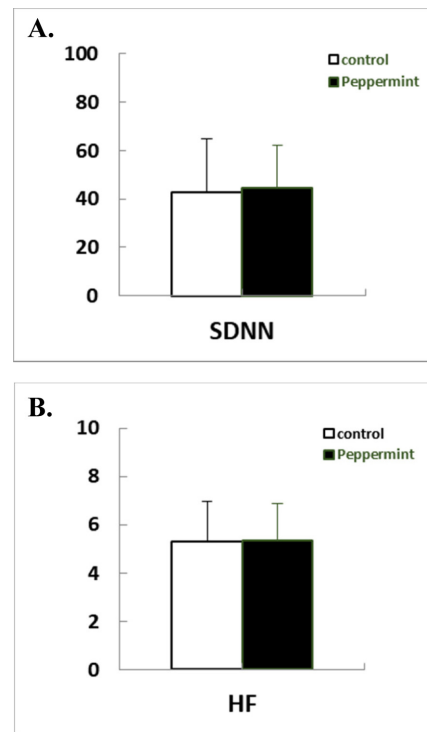


Fig. 1. Effects of peppermint essential oil on standard deviation of normal to normal (SDNN), (A) and high frequency (HF) of heart rate variability (B). Data are expressed as mean \pm Standard deviation, ($n = 10$).

changed by peppermint application (5.3 \pm 1.6 msec²) (Fig. 1).

4. Discussions

Peppermint is a herb which is well known for its painkilling, anti-inflammatory, antispasmodic, and antioxidant effects.^[7] Peppermint aroma is effective on perceived physical workload, temporal workload and anxiety [10]. The other study demonstrated that peppermint aroma is effective in augmenting cognitive performance [11]. Peppermint aroma caused improvement on the tasks related to attentional processes, virtual recognition memory, working memory, and visual-motor response [12].

Blood pressure is regulated by complex mechanisms involved in hypothalamic nuclei, baroreceptors of carotid and aortic bodies and hormones. Inhalation of plant essential oils is reported to affect the blood pres-

sure and heart rate, decreasing or increasing. In the study, inhalation of peppermint essential oil did not affect the blood pressure and did not change the activity of the autonomic nervous system.

Effect of peppermint on blood pressure was previously investigated, but equivocal findings exist even though by the same author [8, 9]. Meamarbashi reported that single dose oral administration of peppermint essential oil increased the systolic blood pressure measured after 5 minutes and one hour respectively, but it did not change the diastolic blood pressure after 5 min and decreased the pressure after one hour [8]. But in other study, he reported that consumption of 500 ml bottle of mineral water for 10 days decreased both of the systolic and diastolic pressure [9]. Systemic absorption by oral administration causes systemic effects because absorbed substances enter the blood circulation. In the study of Meamarbashi, the peppermint may act directly on the systemic arterial smooth muscles or heart.

The discrepancy between this study and previous studies is based on the way of administration. In this study, the inhaled peppermint does not have systemic effects. The inhaled sensory informations are transmitted to the central nervous system through olfactory bulbs and they change the activity of various nuclei such as vasomotor center, emotional and motivational centers in hypothalamus and limbic systems [13-16]. Based on the results of blood pressure in this study, the inhaled peppermint seems not to change the activity of vasomotor centers regulating the blood pressure in the central nervous system.

To evaluate the autonomic nervous system activity quantitatively, analyzing HRV is known to be a valuable method [17]. By time domain analysis of oscillation in R-R intervals, standard deviation of normal to normal (SDNN) reflects the total activity of autonomic nervous system. By frequency domain analysis of oscillation in R-R intervals, High frequency (HF) (0.15 ~ 0.40 Hz) reflects the activity of parasympathetic nervous system, and Low frequency (LF) component (0.04 ~ 0.15 Hz) reflects both sympathetic and parasympathetic nervous activities [18]. In the study, SDNN and HF are not changed by the peppermint essential oil. Same as the interpretation about peppermint effects on blood pressure, the results of HRV imply that inhaled peppermint does not affect the center regarding the activity of autonomic nervous system.

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