Effects of Inhaling the Vapor of Lavandula burnatii super-Derived Essential Oil and Linalool on Plasma Adrenocorticotropic Hormone (ACTH), Catecholamine and Gonadotropin Levels in Experimental Menopausal Female Rats

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The effects of inhaling the vapor of Lavandula burnatii super-derived essential oil and one of the main components of lavender oil, linalool on plasma adrenocorticotropic hormone (ACTH), catecholamine and gonadotropin levels in menopausal model rats under ether-inhalation were studied. The increased plasma ACTH levels induced by ether-inhalation tended to decrease by pre-inhalation of Lavandula burnatii super and linalool vapor was induced the decrease of ACTH level. The decrease in adrenaline, noradrenaline and dopamine levels induced by ether-inhalation tended to recover, especially, the dopamine level significantly recovered to the normal level by the inhalation of Lavandula burnatii super and linalool vapor. However, the increased plasma gonadotropin levels in ovariectomized retired female rats (menopausal model rats) was significantly decreased by the inhalation of linalool. These results suggest that lavender oil or one of the main components, linalool may contribute to relieving tension and may be applicable to the treatment of menopausal disorders in human beings.

Key words lavender oil; linalool; adrenocorticotropic hormone (ACTH); dopamine; gonadotropin

Lavender is one of the most common of the various herbs known to have sedative and hypnotic effects on rodents and humans, and it has been reported to have anti-neurodepressive effects.1,2) Recently, inhalation of the vapor of many herbal oils has been used for aromatherapy.3–5) We previously reported that pentetrazol or nicotine-induced convulsion in mice was inhibited by the inhalation of vapors of Lavandula angustifolia.6) In this study, we selected Lavandula burnatii super-derived essential oil from the five main lavender oils. It has a good fragrance and lower cost than other lavender oils, but contains in a high level of linalool.7) Elisabetsky et al., already reported that linalool showed hypothermic, hypnotic and anti-convulsive effects in mice.8) In women, especially, the function of the ovaries decreases with aging, causing a hormone imbalance based on increasing gonadotropin and decreasing estrogen.9) Ether-inhalation is one experimental animal model for stress.10) After ether-inhalation, an increase in adrenocorticotropic hormone (ACTH) and decrease in catecholamine level in plasma is induced. These observations are based on acceleration of the turnover of catecholamine in the central nervous system.11) These phenomena, namely plasma ACTH and catecholamine levels, follow the same movement in human depression.12) Accordingly, climacterium syndrome shows many symptoms including autonomic nervous system disorder or depression.13) In this study, we report the assessment of the effects of lavandula burnatii super-derived essential oil and linalool on plasma ACTH, catecholamine and gonadotropin (lutinizing hormone: LH, follicle-stimulating hormone: FSH) levels in an experimental menopausal model using female rats under ether-inhalation.

MATERIALS AND METHOD

Wistar female retired rats that had delivered 3 or 4 times were obtained from Nihon Ikagaku Laboratory (Tokyo), and ovariectomy (OVX) was carried out under Nembutal anesthesia. These rats were housed at a constant temperature (23±1°C) and a constant relative humidity (55±5%), with a constant light cycle (lights on from 6:30 a.m. to 6:30 p.m.). Food and water were available ad libitum. One month after OVX, the rats were used for our experiment. Lavender oils were purchased from Kenso Igakusha (Tokyo) and linalool was obtained from Wako Pure Chemical Ind., Ltd. (Tokyo). The inhalation apparatus was a plastic cage (H13×W21×L32 cm with a cover). Cotton was soaked in two doses (0.3 or 0.7 ml) of lavender oil or linalool and placed in a plastic cage. The temperature in the experiment room was 23±1°C. Inhalation of lavender oil and linalool vapor was performed twice (at 1100, 1500 h) a day for three days. One trial involved 20 min inhalation according to the method of Jirovetz et al.13) After a 10 min final inhalation on the 3rd day, rats inhaled ether (cotton soaked 3 ml) vapor for 20 min. The procedure of ether inhalation was carried out according to the method of Ina et al.14) After 20 min, rats were decapitated and blood samples were obtained. A plasma sample was obtained by centrifugation (3000 rpm×15 min). ACTH and gonadotropin were determined by radioimmunoassay. Catecholamine was determined by HPLC (SRL, Hino, Tokyo).

Statistical analysis was performed by Student’s t-test or Dunnett’s test.

RESULTS AND DISCUSSION

Ether-inhalation induced an increase in plasma ACTH level. The increased plasma ACTH levels tended to decrease after the inhalation of lavender vapor. On the other hand, linalool significantly induced a decrease in ACTH level. Catecholamine levels were decreased with the inhalation of ether vapor. The inhalation of lavender oil vapor restored catecholamine levels to near normal. Linalool affected the noradrenaline and dopamine levels. These results are shown in Table 1. Gonadotropin levels, especially the LH level, were

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In this report, we considered that _vandula angustifolia_ previously demonstrated an anti-convulsive effect of _reydovan_. 

Plasma ACTH and Catecholamine Levels in Experimental Menopausal Female Rat have been used for aromatherapy. The use of essential lavender or linalool vapor may apply to relieving the tension significantly decreased by the inhalation of linalool. Lavender had a weaker effect on LH level than linalool. Neither lavender nor linalool vapor inhalation had any influence on FSH levels (Table 2). Recently, many herb-derived essential oils have been used as sedative, analgesic or hypnotic agents and as mild anxiolytic.

<table>
<thead>
<tr>
<th>LH (ng/ml)</th>
<th>FSH (ng/ml)</th>
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<tbody>
<tr>
<td>RT</td>
<td>1.8±0.11</td>
</tr>
<tr>
<td>O VX</td>
<td>12.1±1.04**</td>
</tr>
<tr>
<td>Ether</td>
<td>11.4±1.17**</td>
</tr>
<tr>
<td>L a.b.u.s.</td>
<td>10.8±2.01</td>
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<tr>
<td>Linalool</td>
<td>9.1±1.50</td>
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<table>
<thead>
<tr>
<th>LH (ng/ml)</th>
<th>FSH (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT</td>
<td>1.8±0.15*</td>
</tr>
<tr>
<td>O VX</td>
<td>6.3±1.79*</td>
</tr>
</tbody>
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**REFERENCES**