



Effect of *Lavandula officinalis* Extract on Thyroid hormones in Mice

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Abstract *Lavandula officinalis* is a plant with many unknown effects on organism physiology. Previous articles about it were focused on some available and routine effects on brain and not specifically about other physiological realities. This study examines effect of hydroalcoholic extract of *Lavandula officinalis* on thyroid hormones. In this study 50 mature mice (Balb/C) were applied. They treated with *Lavandula officinalis* hydro alcoholic extract in three doses. 50,100 and 200 mg/kg, and two groups of them were control group without any injection and placebo group with normal saline injection. After 20 days (10 times every other day) blood was taken. After that serum of every tube has separated and TSH, T₃ and T₄ were measured by auto analyzer apparatus. Data were analyzed with SPSS and Excel software and t-student test. The results indicated that lavender hydro alcoholic extract caused increased some thyroid hormones. It was proved that thyroxine (T₄) hormone was increased compared with control group while T₃ and TSH concentration did not change. Based on the results obtained in this study, the extract can be dose-dependently effective in the activity of the thyroid gland and increase the secretion of thyroid hormones. These changes can have several adverse physiological effects.

Keywords Lavender, T₄, T₃, TSH, Mice

Introduction

Due to the increasing population and the growing need for natural and cheap resources to treat human deficiencies and diseases, the use of plants for treatment will be cost-effective. On the other hand, the increase in thyroid, liver and gastrointestinal disorders due to unsafe and unprincipled use of herbs has increased in recent years. Due to the importance of the concentration of thyroid hormones to determine the effects of various substances and diseases on the body and especially changes in the body's metabolism, it can be used as an indicator of the amount and type of effect of the unknown substance on the body.

Lavender, a plant of the genus *Lavender*, has been used since ancient times in various civilizations. [1, 2]. Lavender is an evergreen plant with a violet flower is identified by slender leaves on both sides of the stem [3, 4]. The aerial parts of the plant are used for therapeutic purposes and to produce perfumes and colognes. Its extract is green and bitter and has a pleasant aroma [5]. Previous research on the plant has focused on the nervous system, and its effects on the nervous system, pain treatment, stress, depression and sedation have been proven. [6]. But other side effects on blood cells, especially white blood cells, were needed.

It has antibacterial properties. The most important constituents of extract respectively are: linalyl acetate and linalool (to60%), geraniol, coumarin, flavonoids, borneol, sterol, trapezoid, butyric acid, valeric acid [1]. Most of the past researches about this plant have focused on its effects on neurons and nervous system operation and positive effects



in pain reduction emotional, stress, anti-anxiety and anti-depression effects [7]. But there was a vacancy place of experimental research about its effects on the liver. The liver is considered as one of the vital organ in the body that has a key role in the regulation of many physiological phenomena and any disorder in its operation causes a collection of physiologic, anatomic, and kinds of different diseases. The study of liver operation also have been considered by researchers [8].

Thyroid hormones play an essential role in the health and metabolism of the body and any change in the concentration of these hormones can cause many physiological effects. Regulation of basal metabolic rate is the main effect of thyroid hormones [9]. These hormones increase the metabolism of sugars and fats. They also stimulate protein; therefore, thyroid hormones are essential for normal growth. In the case of hyperthyroidism due to excessive secretion of thyroid hormones, increased activity of cells or organs of the body may, for example, lead to increased heart rate or increased intestinal activity, increased frequency of defecation or even diarrhea.

On the other hand, if the production of thyroid hormones, known as hypothyroidism, decreases, the function of the body's cells and organs slows down. If you have hypothyroidism, for example, your heart rate may be slower than normal, and bowel function may decrease, causing constipation [10].

Due to the role of medicinal plants in regulating many physiological processes in this study effects of *Lavandula officinalis* hydroalcoholic extract on the thyroid hormones concentration were evaluated and for this purpose the mature female mice Balb/C were studied for 20 days.

Materials and Methods

In this study 50 mature female mice Balb/C in weight range between 28-30 gr, were used that provided from laboratory animal section of isfahan university of medical sciences. Animals were kept in 5 groups including 10 mice until time of experiment in standard cages and same condition with temperture range between 20-22^C and light cycle 12 hours lighting, 12 hours darkness. Sufficient water and food provided them and except in experiment time had access to food and water readily. Fresh flowers of *Lavandula officinalis* was referred to agricultural biotechnology institute of Iran's central region, located at NajafAbad-Isfahan road, and freshly harvested *Lavandula officinalis* were collected in order to obtain extract and were dried in far from sun light. Extraction and vaporizing to gain proper concentration, gained extraction was green and strong fragrance of lavender [11].

50 mice divided into the 5 groups with 10 mice. The control group without any drug treatment, Placebo group which treated 10 times every other day with normal saline and 3 experimental groups that respectively received intraperitoneal 50, 100 and 200 mg/kg doses of *Lavandula officinalis* hydroalcoholic extract and after 20 days (10 times, every other day) then blood was taken and were kept in laboratory condition for 20 minutes and were centrifuged for 15 minutes with 2000 rpm. After that serum of every tube has separated and concentration of T₃, T₄ and TSH hormones were measured using Eliza method and Monibind Kit. Data were analyzed with SPSS and Excel softwares and t-student test. Significant difference between experimental and control groups considered with P value equal P≤0.05.

Results:

- T₄ levels

The results show that the concentration of T₄ in the treatment group of 200 mg/kg has a significant increase compared to the control group (Fig. 1).



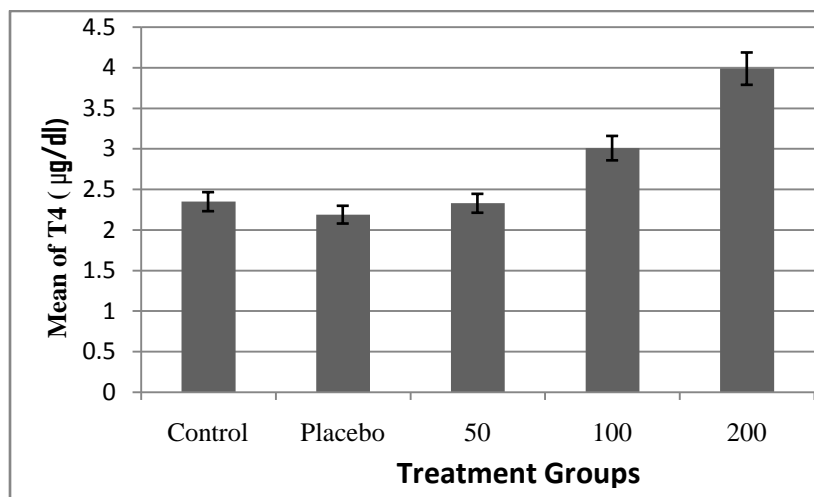


Figure 1: The T₄ concentration in all groups

- T₃ levels

T₃ concentrations in the treatment groups showed a nonsignificant difference compared to the control group (Fig2).

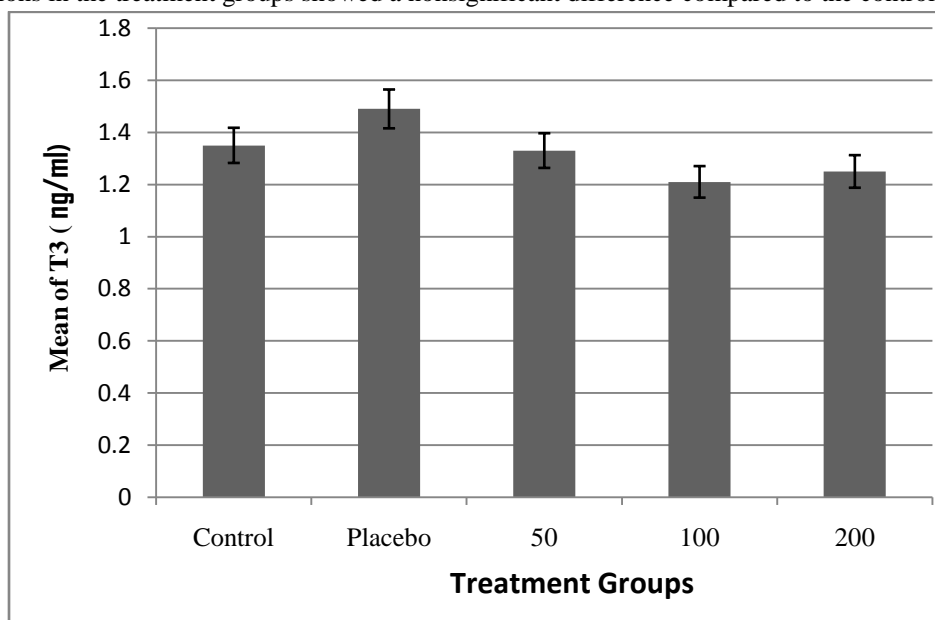


Figure 2: The T₃ concentration in all groups

- TSH levels

TSH concentration decreased in the treatment groups but did not differ significantly compared to the control group (Fig 3).



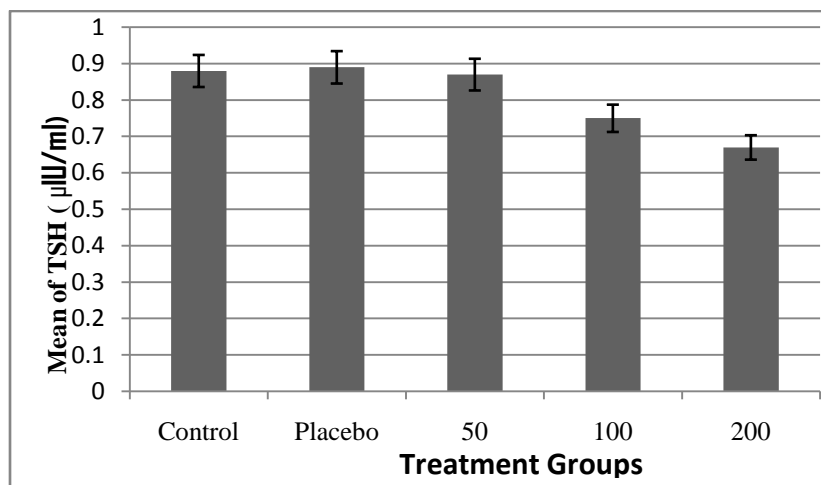


Figure 3: The TSH concentration in all groups

Discussion

Thyroid hormones affect actions of the most body tissues. These hormones control development and maturity process [12] and action of some organs like heart, stomach, liver [13] and neural system. Thyroid gland is the biggest and one of the most important glands of body which its hormones (T_3 and T_4) are very important for growth, development and metabolism.

Thyroid hormones (T_3 and T_4) are dividing from thyrosin amino acid. About 95% of thyroid secreting hormones are T_4 (thyroxin) whereas T_3 plays the main role. The main part of T_3 is obtained from converting T_4 to T_3 in peripheral tissues like liver, kidney and placenta. Some tissues like brain and hypophysis can also convert T_4 to T_3 but obtained hormone cannot be entered to blood and remains there. On the whole, 80% of blood's T_3 is made in liver and 20% in thyroid. Secreting Thyroid Stimulating Hormone (TSH) controls releasing thyroid hormones.

Thyrotrophine Releasing Hormone (TRH) secreted from hypothalamus adjusts TSH releasing from hypophysis somehow [14]. In this study, TSH was increased significantly. Previous studies show that marshmallow's root extract can affect endocrine actions via releasing hypothalamushypophysis axis which is probably because of increase in TSH (Booth, 1998). Scientist have shown that extract of marshmallow's root can affect the action of hypophysis gland via controlling receptor conjunction and affect T_3 , T_4 and TSH.

The results of this study showed that the amount of T_4 in the treatment group receiving 200 had a significant increase, which could indicate hyperthyroidism. A high T_4 supports the diagnosis of hyperthyroidism. In current study, T_4 which is a hormone with the ability to bind with the nuclear receptors resulting the gene expression, increased significantly in 200mg/kg group. Several researches suggest that the lack of these hormones can lead to the low fertility [13].

Based on the results obtained in this study, the amount of TSH in the groups receiving the extract shows a slight decrease. TSH can be likened to the "engine" of the thyroid gland, which determines the amount of thyroid hormone that is synthesized and released into the body. TSH commands the thyroid to produce more T_4 and T_3 . Thyroid-releasing hormones (at the command of TSH) act throughout the body. If the thyroid is very active, the secretion of T_4 and T_3 will increase, so the pituitary gland will release less TSH and compensate.

Therefore, a low TSH may be a sign of hyperthyroidism (a condition in which your thyroid gland produces large amounts of the hormone).

Hyperthyroidism is caused by increased levels of T_3 and T_4 in the bloodstream. When the thyroid gland increases the secretion of these hormones, there is a feeling of restlessness, sleep problems, gastrointestinal upset, sweating.

Conclusion

Based on the results obtained in this study, the extract can be dose-dependently effective in the activity of the thyroid gland and increase the secretion of thyroid hormones. These changes can have several adverse physiological effects.



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