



The Effect of Red Onion Extract on Reproductive Hormones in Female Mice

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Abstract Onion (*Allium cepa*) contains many vitamins, minerals and antioxidants which are used in the prevention and treatment of some diseases. The aim of this study was to investigate the effects of red onion on the pituitary-gonadal axis of Balb /C female mice. Mice were divided into five groups after regulating the sexual cycle (control, placebo and the extract in of 50, 100, 200 mg/kg amounts). The extract was injected intraperitoneally every other day for 20 days. The control group received no medication and the placebo group received only physiological serum. At the end of the injections, blood samples were taken from all groups. Hormonal assays including FSH, LH, estradiol and progesterone were performed using ELA method. Obtained data were analyzed using SPSS program, one-way variance analysis and Duncan test at 5% probability level. Results showed significant increases in estradiol level of third experimental group and progesterone level of second experimental group. However, FSH and LH levels remained unchanged in all groups. However, FSH and LH levels remained unchanged in all groups. These results may indicate the phytoestrogenic properties of red onion at dose of 200 mg/kg and its phytoprogestosterone properties at dose of 100 mg / kg. According to the results, onion can be a good alternative to estrogen deficiency in postmenopausal women with diabetes or hypertension. Also, onion extract at a dose of 100 mg / kg can be effective in the treatment of hyperinsulinemia and diabetes.

Keywords Red onion, FSH, LH, Progesterone, Estradiol, Mice

Introduction

Traditional medicine is a science that is inherited from the past and is based on nature. Medicinal plants have a special place in traditional medicine. This group of plants contains an active ingredient which is used to treat or prevent diseases and is mentioned in one of the internationally accredited pharmacopoeias [1]. The importance of medicinal herbs has become clearer today than ever before and scientists in many countries are struggling to identify medicinal plants, their properties, and their effective constituents [2]. Onion (*Allium cepa*) is a biennial plant from the Alliaceae family which was formally introduced by Carl Linnaeus in his book of the Species of Plants (1753). Onion is from the oldest herbs that have a wide range of therapeutic effects. According to researches, red onion can be effective in the treatment of gastrointestinal disorders and intestinal spasm [3]. Onion is a rich source of flavonoids mainly from Quercetin and therefore has high antioxidant properties [4]. Quercetin found in onion juice has been shown to significantly decrease blood glucose levels of diabetic mice but has an adverse effect on insulin levels of healthy mice [5]. Onions are from the vegetables rich in flavonoids and their antioxidant properties inhibit cancer cells [6].



This food contains phytoestrogens of the lignantype [7]. Studies show that phytoestrogens play a protective role against ovarian cancer [8] and also all types of phytoestrogens have the ability to inhibit prostate tumor growth in vitro [9]. Studies have shown that onion extract can induce apoptosis in breast cancer cells by its inhibitory effects on fatty acids [10]. One of the proven properties of onion is its antibacterial and antifungal activity [11]. Researches have shown that quercetin in onion can inhibit the growth of gram-positive bacteria [8]. According to researches, consumption of dried onion lowers blood lipids [11] and raw onion lower blood pressure [10].

Alcoholic extract of onion caused infertility by its negative effect on implantation of female mice [12]. Fresh onion juice increased LH and testosterone levels of male mice and therefore, it can have positive effects on spermatogenesis [13]. One study found that in polycystic ovary syndrome of mice, the onion extract reduced the apoptosis of granulosa cells by increasing the antioxidant levels [14]. Current study was to investigate the effects of red onion on the pituitary-gonadal axis of Balb/C female mice.

Materials and Methods

- Test animals

In this study, seven weeks old laboratory mice (Balb/C race) were prepared from the *Royan Research Institute of Isfahan*. Mice were kept for a week under the right temperature with free access to water and food. The same conditions persisted during the injection period.

- Treatments

Mice were divided into five groups including control group, placebo group and three extract groups. Groups were kept in separate cages.

- Control: without any injection
- Placebo: received normal saline 9% injections
- Three experimental groups: received 50, 100, and 200_{mg/kg} doses of extract in peritoneum

- Extract production

200 g of dried red onion was poured in a sterilized erlen plus one liter of ethylic alcohol. Erlen was kept at ambient temperature for 48 hours. After that, erlen contents were filtered using whatman paper. The dried powder was weighed with whatman paper and by reducing the weight of paper, the weight of residual powder was obtained. The amount of dissolved material was calculated by subtracting the residual powder weight from the original powder weight. In order to prevent the effects of alcohol, the solution was concentrated using rotary method and by adding physiological serum 9% to it, the base extract was prepared. Base extract was used to prepare desire doses (50, 100, and 200 mg/kg).

To regulate the sexual cycle, mice received 0.5 microgram of cloprostenol injection in peritoneum and three days later, 3 microgram of progesterone was injected subcutaneously into all animals. One day after progesterone injection, the extract was injected. Extract injections were done between 8am and 10am for 20 days every other day. Blood samples were taken one day after the last injection to assess the sex hormones.

- Statistical analysis

Obtained data were analyzed using SPSS program, one-way variance analysis and Duncan test at 5% probability level.

Results and Discussion

- FSH levels

Evaluation of FSH levels in the blood serum of mice (mlu /ml) and comparing it with Duncan's test showed that there was no significant difference between FSH levels of treatment groups ($P > 0.05$).



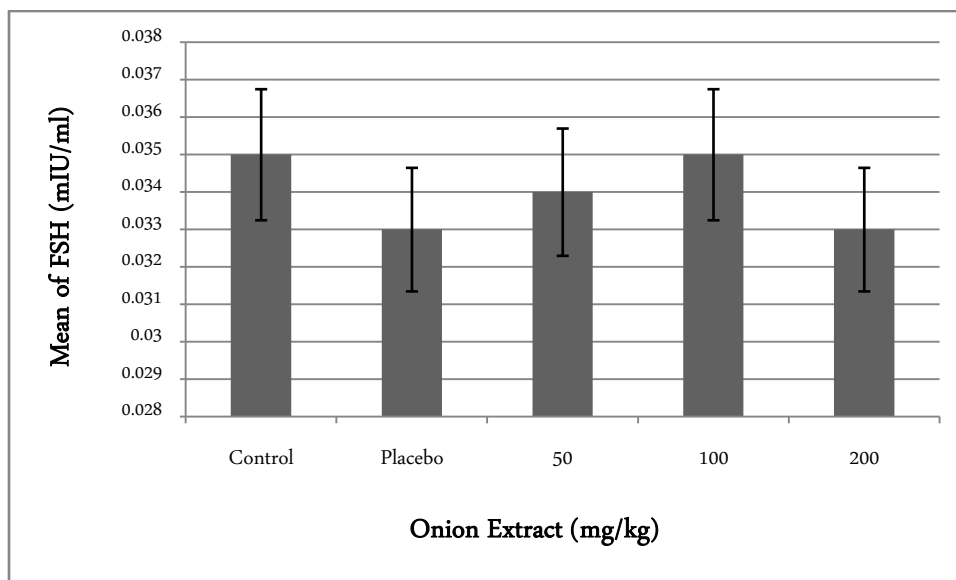


Figure 1: The mean of FSH concentration of various treatment groups

- **LH levels**

Measuring the LH levels of mice (mIU/ml) showed also no significant difference between LH levels of treatment groups ($P > 0.05$).

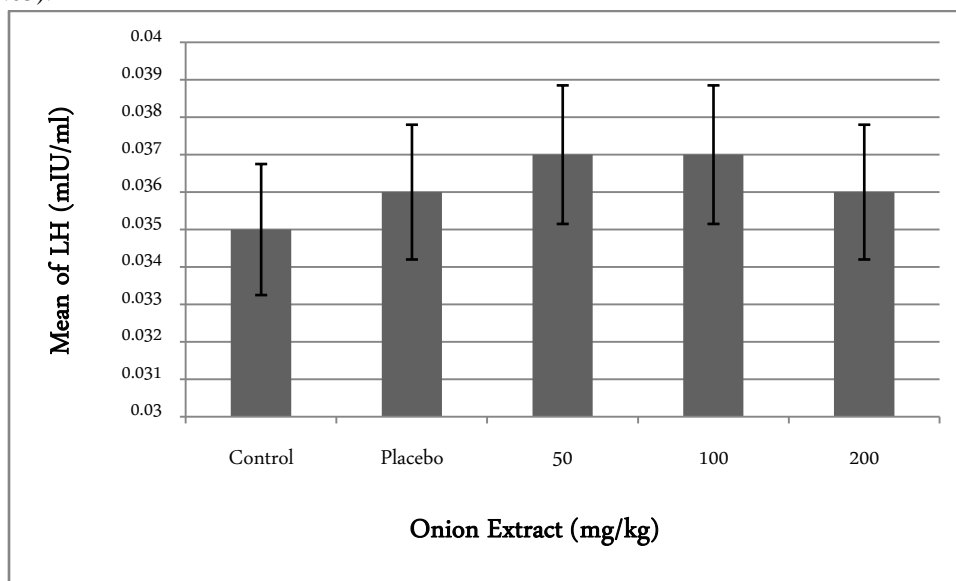


Figure 2: The mean of LH concentration of various treatment groups

- **Estrogen levels**

Mean comparison results showed that third experimental group (200mg/kg) had significantly higher Estrogen levels than other treatment groups ($P < 0.05$).



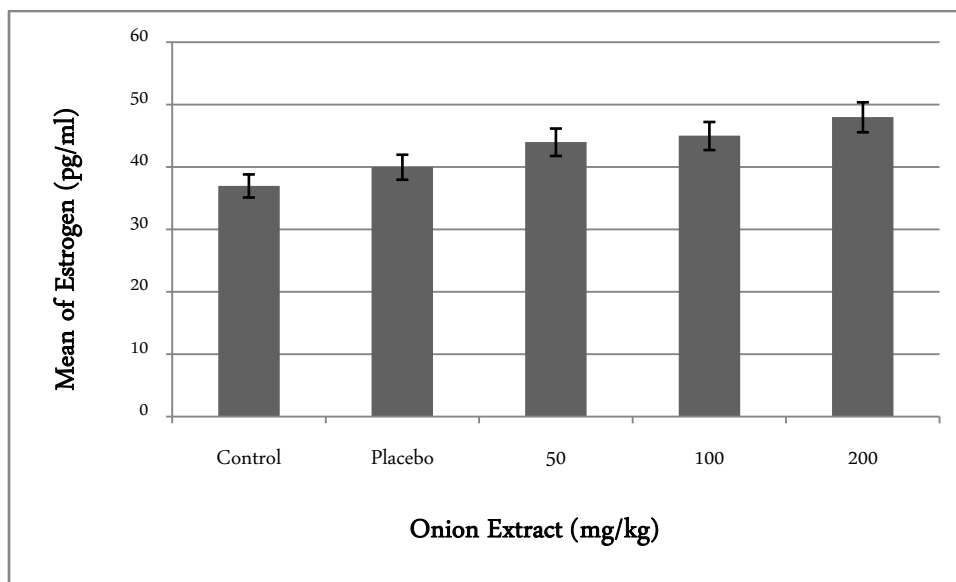


Figure 3: The mean of Estrogen concentration of various treatment groups

- Progesterone levels

Mean comparison results of Progesterone hormone showed a significant increase in Progesterone level of second experimental group (100mg/kg) in proportion to other treatment groups ($P < 0.05$).

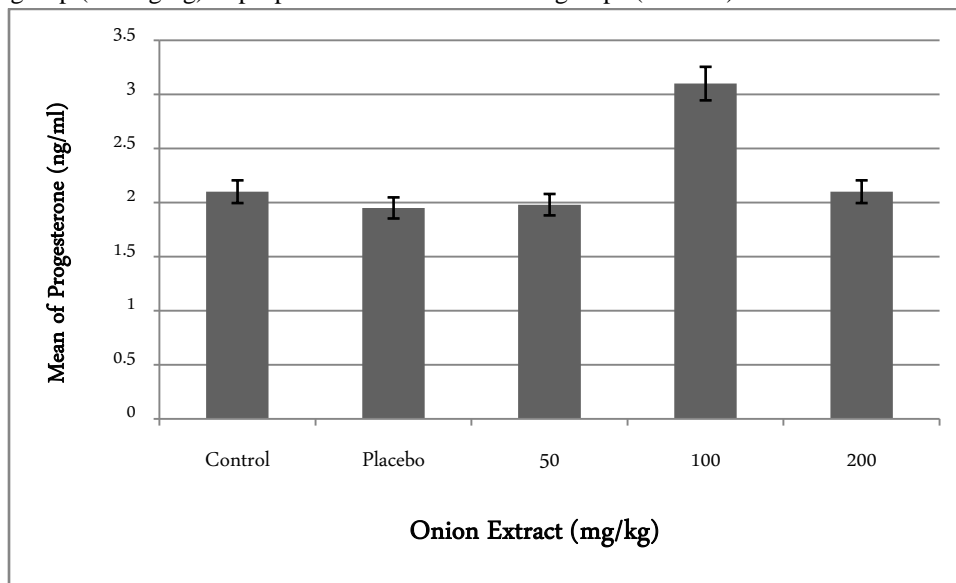


Figure 4: The mean of Progesterone concentration of various treatment groups

Results showed no significant changes in FSH and LH levels. It can be concluded that red onion extract at doses of 50, 100, 200 mg/kg had no effect on pituitary function and secretion of FSH and LH gonadotropins.

The results of this study showed that estrogen was increased significantly in third experimental group (200 mg/kg). Given the unchanged FSH and LH levels, this significant increase in estrogen level could be attributed to the phytoestrogenic properties of onion in this experimental dose. Therefore, it can be concluded that red onion extract at a dose of 200 mg/kg has phytoestrogenic properties. According to the results of this study, progesterone level was increased significantly by second experimental group (100 mg /kg). Considering the decreased number of corpus luteum in this group, progesterone increment could not be related to corpus luteum. Accordingly, red onion extract



at a dose of 100 mg/kg has phyto-progesterone activity. Due to the significant increase in progesterone level and its effects on NOS inhibitors which cause ovulation disorders [15], it can be concluded that the extant progesterone in onion extract at a dose of 100 mg/kg prevents the arginine to affect NO synthesis and this was the main reason for the decrease in yellow body which eventually led to ovulation disorders. Increased estrogen can stimulate the growth of ovaries and follicles, stimulate and maintaining the growth of smooth muscle and epithelial lining of the entire reproductive tract, increase ciliary movements of the oviduct, prepare the endometrium for progesterone effects, Increase delamination of epithelial cells, and stimulate the growth of external genitalia [16]. At the same time, an increase in progesterone results in stimulation of endometrial secretory activity, cervical adherent secretion, stimulation of myometrium during pregnancy, reduction of uterine motions [17]. Each of these changes can affect the reproductive potential. Estrogen and progesterone can regulate gonadotropins secretion by affecting hypothalamus and pituitary glands. High concentrations of progesterone decrease the secretion of GnRH and gonadotropins (negative feedback). Low estrogen concentrations inhibit the release of tonic excretion of gonadotropins, but high concentrations increase GnRH, FSH and LH secretion.

Conclusion

Based on the results of current study and no change in the levels of FSH and LH hormones, it can be concluded that onion extract had phytoestrogenic effect at the dose of 200 mg/kg and phyto-progesterone properties at the dose of 100 mg/kg; it affects the ovarian tissue without affecting the pituitary gland and can interfere with ovulation and pregnancy.

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