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Effect of Onion (*Allium cepa*. Linn) Aqueous Extract on Serum Concentration of LH, FSH and Testosterone Compared with Zinc Sulfate Supplementation in the Rats

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Abstract: The onion (*Allium cepa*) has long been used in traditional medicine is one of the important *Allium* species commonly used in the daily diet and has recently been the source of much interest because of its antithrombotic, hypolipidaemic, hypotensive, diaphoretic, antibiotic, antidiabetic, antiatherogenic and anticancer medicinal properties. Zinc deficiency causes primary testicular failure and altered testicular steroidogenesis. The aim of present study was to evaluation of onion (*Allium cepa*. Linn) aqueous extract on serum concentration of LH, FSH and testosterone compared with Zn sulfate supplementation in the rats. In this experiment, 162 mature male rats (250 g on the average) were acquired from Razi Serum-Producing Institute of Karaj and transferred to keeping place. This design is performed as a factorial experiment 3×3 (3 level of onion extract and 3 level of zinc sulfate complement) in the form of totally random design with 9 groups per 3 replications each containing 6 rats. All of keeping cages were disinfected before performing the experiment. Data showed that the effect of different levels of zinc supplementation and onion extract was significant on the concentrations of these hormones, $p<0.05$. The combined use of onion and Zn was more significant on LH and FSH and no significant on testosterone, $p<0.01$. Treatment group 9 has highest increase in the amount of LH and FSH. The reason of this fact that contrary, the concentration of testosterone showed no increase in the experimental groups treated with onion and Zn supplementation probably can be attribute to the negative feedback effect of this hormone versus LH and FSH.

Key words: Onion (*Allium cepa*. Linn), aqueous extract, Zn supplementation, LH, FSH, testosterone, rat

INTRODUCTION

The gonads are usually considered quiescent organs in infancy and childhood until puberty. The reproductive axis is dependent upon endocrine and paracrine acting hormones to regulate follicle maturation and ovulation in females and to maintain sperm production in males. It is well recognized that the hypothalamic-pituitary-gonadal hormonal axis is transiently activated during the first few postnatal months of human life in gender-specific pattern; levels of gonadotropins and sex hormones are elevated (Burger *et al*., 1991; Andersson *et al*., 1998; Bergada *et al*., 1999).

The onion (*Allium cepa*) has long been used in traditional medicine is one of the important *Allium* species commonly used in the daily diet and has recently been the source of much interest because of its antithrombotic, hypolipidaemic, hypotensive, diaphoretic, antibiotic, antidiabetic, antiatherogenic and anticancer medicinal properties (Augusti, 1996; Lee *et al*., 2008). The biological action of Allium products is ascribed to organosulfur and phenolic compounds. It has been found that administration of onion products to diabetic rats significantly reduced hyperglycaemia (Kumari *et al*., 1995). Furthermore, the role of nutritional factors in reproduction and subfertility is important. Research has shown that onion contains exogenous and endogenous antioxidants such as selenium, glutathione, Vitamins A-C and flavonoids such as quercetin and isorhamnetin (Markham, 1982). These antioxidants protect DNA and other important molecules from oxidation and damage which would otherwise induce apoptosis and could improve sperm health parameters increasing the rate of fertility in men (Kumar *et al*., 2006; Yang *et al*., 2006).

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Understanding human male infertility induced by dietary zinc deficiency is complex because zinc is thought to be involved in several integrated processes associated with reproduction. Hypogonadism and lack of secondary sexual characteristics have been reported in sever severely undernourished young men. These abnormalities responded quickly to dietary supplemental zinc (Prasad, 1991). Clinical studies with adult males experimentally deprived of zinc show that Leydig cell synthesis of testosterone is dependent on adequate dietary zinc (Prasad, 1991). There is also some evidence that zinc is required for normal functioning of the hypothalamic-pituitary-gonadal axis. On the other hand, there is considerable evidence that zinc deficiency causes primary testicular failure and altered testicular steroidogenesis (Endre *et al*., 1990). Zinc is required for the G1 (Prasad and Oberleas, 1973) and S (McKenzie *et al*., 1975) phases of the cell cycle. Perhaps more importantly zinc seems to have a role in the processes required to alter the genetic expression of a cell between the G and S, the Sand Gz and the Gz and M phases of the cell cycle (Chesters, 1978; Marushige and Marushige, 1975; Kvist *et al*., 1988). The aim of present study was to evaluation of androgenic activity of onion on spermatogenesis process. The aim of present study was to evaluation of onion (*Allium cepa*. Linn) aqueous extract on serum concentration of LH, FSH and testosterone compared with Zn sulfate supplementation in the rats.

MATERIALS AND METHODS

In this experiment, 162 mature male rats (250 g on the average) were acquired from Razi Serum-Producing Institute of Karaj and transferred to keeping place. This design is performed as a factorial experiment 3×3 (3 level of onion extract and 3 level of zinc sulfate complement) in the form of totally random design with 9 groups per 3 replications each containing 6 rats. All of keeping cages were disinfected before performing the experiment. All of groups were kept in 12 h light and 12 h darkness conditions with 25-30 temperature and free access to water and food in metal cages placed in Animal Husbandry of Veterinary Faculty of Islamic Azad University, Tabriz Branch.

Fresh onions were used in this experiment and onion extract was obtained through soxhlet apparatus in combination with deionized distilled water within 6 h in 2 successive days at 30°C (to prevent elements and materials of garlic from decomposition). Then, the extract was placed in incubator in order to be concentrated. Certain concentrations of garlic extract were dissolved in pure water and became reachable by rats on a daily basis. Chromium chloride complement was acquired (from Germany Merk) and after measuring certain rat by digital scale was given to mice on a daily basis.

It must be mention that onion extract was give as gavages (gastro-oral) and zinc sulfate complement was dissolved in water in certain amount and it was added to food after steeping and powdering of pellets then the food was mixed, ground and dried and obtained pellets was given to animal. Moreover, during the 1st week of experiment, all groups consumed basal diet in order to adapt with breeding environment conditions then groups were divided as follow:

- Groups 1: Basal diet
- Groups 2: Basal diet + 1 cc fresh onion extract
- Groups 3: Basal diet + 2 cc fresh onion extract
- Groups 4: Basal diet + 15 mg kg^{-1} zinc sulfate complement
- Groups 5: Basal diet + 30 mg kg^{-1} zinc sulfate complement
- Groups 6: Basal diet + 1 cc fresh onion extract+ 15 mg kg^{-1} zinc sulfate complement
- Groups 7: Basal diet + 1 cc fresh onion extract + 0 mg kg^{-1} zinc sulfate complement
- Groups 8: Basal diet + 2 cc fresh onion extract+ 15 mg kg^{-1} zinc sulfate complement
- Groups 9: Basal diet + 2 cc fresh onion extract+ 30 mg kg^{-1} zinc sulfate complement

The groups were treated for 4th week. At the end of 4th week after 12 h starvation, 6 rats were selected randomly from every treatment and their blood sampling was done through decapitation then plasma levels of LH, FSH and testosterone were measured.

Statistical analysis: The results of the research have been statistically analyzed using the linear model of SAS Software. Analysis of variance according to the model:

$$Y_{ijk} = \text{New} + S_i + K_j + (S \times K)_{ij} + E_{ijk}$$

Where:

x_{ij} = All dependent variable
μ = Overall mean
T_i = The fixed effect of perlit levels (i = 1, 2, 3)
e_{ij} = The effect of experimental error

Values of different parameters were expressed as the mean±Standard Deviation ($\bar{X}\pm SD$). When significant difference among means was found, means were separated using Duncan's multiple range tests.

RESULTS AND DISCUSSION

Data showed that the effect of different levels of zinc supplementation and onion extract was significant on the concentrations of these hormones, $p<0.05$ (Table 1). The combined use of onion and Zn was more significant on LH and FSH and no significant on testosterone $p<0.01$. Treatment group 9 has highest increase in the amount of LH and FSH. The reason of this fact that contrary the concentration of testosterone showed no increase in the experimental groups treated with onion and Zn supplementation probably can be attribute to the negative feedback effect of this hormone versus LH and FSH.

Data of the study suggested that onion has significance benefits on LH, FSH and no testosterone. In one study by Khaki *et al.* (2009) revealed that serum total testosterone significantly increased in all the test groups ($p<0.05$) and levels of LH significantly increased only in the group that received the high dose of fresh onion juice ($p<0.05$) but the level of FSH did not differ between the experimental and control groups. The percentage of sperm viability and motility in both test groups significantly increased ($p<0.05$) but the sperm concentration significantly increased only in the group that received the high dose of freshly extracted onion juice ($p<0.05$). It was evident that there was no difference on sperm morphology and testis weight in test groups compared to the control group. In the study, freshly prepared onion juice significantly affected the sperm number percentage of viability and motility it seems that using 4 g kg^{-1} of freshly prepared onion juice is effective in sperm health parameters which is compatible with the research results. Infertility is one of the major problems in couples' lives about 25 and 35% of infertility is attributed to the male and the female's receptivity, respectively (Carlsen *et al.*, 1992). Many environmental and biochemical factors are involved in male and female reproduction (Mosher and Pratt, 1991). The importance of many of these factors is not yet clearly understood. A better understanding of the underlying mechanisms in (sub) fertility and better study results clarifying the effectiveness of nutritional and biochemical factors are important to improve diagnosis and treatment. Smart choices with regard to a better diet might protect the body from many diseases (Cummings and Bingham, 1998). The main advice for a healthy diet is to eat more fruit and vegetables. However, published intervention trials do not yet support this message (Beresford *et al.*, 2006; Schatzkin *et al.*, 2000). Onion and garlic contain a wide variety of phytochemicals and micro constituents such as trace elements, vitamins, fructans, flavonoids and sulphur compounds which may have a protective effect against free radicals. Recently, much attention has been focused on the protective effects of onion against colon cancers in rats (Fukushima *et al.*, 1997; Ross *et al.*, 2006). The present results clearly indicate that *Allium cepa* (onion) has a good effect on LH and FSH in rats.

Table 1: Comparison of mean value of plasma concentration of LH, FSH and testosterone in experimental groups

Prameters	Zinc sulfhate supplementation	LH	FSH	Testosterone
Onion				
Group 1	-	33.41^{a}	0.12^{a}	0.28
Group 2	-	53.81^{b}	0.33^{b}	0.34
Group 3	-	60.45^{a}	0.42^{b}	0.35
p-value	-	*	*	NS
SEM	-	1.02	0.02	0.03
Zinc sulfate				
Group 1	-	5.67^{a}	0.31^{a}	0.30
Group 4	-	39.89^{b}	0.48^{b}	0.32
Group 5	-	40.12^{b}	0.56^{b}	0.36
p-value	-	*	*	NS
SEM	-	2.12	0.05	0.05
Combined administration (onion)				
0 cc	0 (control)	40.69^{a}	0.22^{a}	0.42
	15 mg kg^{-1}	54.32^{bc}	0.46^{bc}	0.75
	30 mg kg^{-1}	55.21^{cd}	0.53^{bc}	0.74
1 cc	0 (control)	72.64^{a}	0.45^{bc}	0.81
	15 mg kg^{-1}	96.96^{d}	0.84^{d}	0.68
	30 mg kg^{-1}	109.85^{d}	0.89^{d}	0.64
2 cc	0 (control)	70.66^{a}	0.76^{cd}	0.79
	15 mg kg^{-1}	79.39^{c}	0.98^{de}	0.56
	30 mg kg^{-1}	139.30^{ab}	1.06^{e}	0.62
p-value	-	**	**	NS
SEM	-	3.08	0.09	0.05

*Significant in 5% level; **Significant in 1% level and NS: No Significant

Meeker *et al.* (2007) found that FSH, LH, inhibin-B testosterone and free T4 levels were associated with human semen parameters. They showed that serum levels of FSH and LH are inversely associated with sperm concentration, motility and morphology. FSH which is a gonadotropin that is produced and secreted by the anterior pituitary, acts on sertoli cells in the seminiferous tubules to initiate spermatogenesis. Sertoli cells secrete inhibin-B which is a protein hormone. The inverse associations of FSH with inhibin-B and with sperm concentration may be due to the feedback effects exerted by inhibin-B on the anterior pituitary to inhibit FSH secretion.

CONCLUSION

The results suggest that FSH, LH and inhibin-B play a role in sperm development (morphology) increasing levels of FSH and LH but decreasing levels of inhibin-B and also suggest that FSH, LH and testosterone have an impact on sperm motion (motility). Testosterone increases sperm motility and LH decreases sperm concentrations, motility and morphology (Meeker *et al*., 2007). These and the data is demonstrate that onion because of having many active components results in increase plasma levels of LH and FSH.

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