

Research Article

Effect of Organic and Mineral Zinc Supplement in Diet on Reproductive Hormones in Mice

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Abstract: This study was carried out to investigate the effects of various doses of organic and mineral zinc or LH, FSH and testosterone hormones of male mice (Balb/c race). Seventy male mice were divided in seven groups randomly. Samples were fed a normal diet for 35 days. Zinc supplement was added into drink water in 50, 100 and 150 ppm doses in both mineral and organic forms as six treatment groups and one control group. After 35 days blood samples were taken. According to results, LH amount was increased in all groups except 50 ppm mineral but FSH was reduced in 50 ppm mineral and increased in 100 ppm mineral and testosterone was increased in 50 and 150 ppm organic and reduced in 100 ppm mineral. Considering the results, adding organic or mineral zinc into ration can affect male reproduction process dose dependently via affecting reproductive hormones.

Keywords: Diet, mice, organic and mineral zinc, reproductive hormones

INTRODUCTION

Appropriate reproduction is necessary for a profitable livestock industry. Animals should be fed well to become pregnant after inoculation in definite times, be healthy and produce sufficient milk. Therefore, parameters like nutrition, genetics, hormones, disease and etc., must be considered. Nutritional factors which have negative effects on reproduction are minerals, vitamins and proteins deficit and imbalance of dietary energy and so on. Among these, zinc element plays an important role in quality and quantity of semen, genetic disorders and malnutrition.

After iron, zinc is the second trace elements in body which contributes in metabolic actions and enzyme structures. Inadequate or high amounts of this element can endanger the health. Zinc has many beneficial properties such as anti-viral, anti-bacterial, anti-radiation and anti-cancer properties. It is also vital for general growth of all tissues and balances immune system. This element is found mostly in liver cells, kidney, pancreas, prostate, bones, digestion system, teeth, eye, skin, hair and nails so that deficit of it will affect each of these organs. Using zinc as drug or food can cure many diseases, such as foot ulcers, bladder infections, infertility and various burns. In spite of many conducted researches, the mechanism of zinc action is not obvious yet.

Zinc affects sperm maturity and reproductive epithelium of male sexual glands directly. It also affects growth and anatomical development of male sexual organs and its deficiency causes a delay in testicular

development and spermatogenesis. Production of hormones like LH and FSH in animals is affected by zinc deficiency (Dillin *et al.*, 2002). Zinc deficiency in male goats shrinks testicles and decrease their libido (Martin *et al.*, 1997).

Losing appetite due to zinc deficiency reduced secretion of gonadotropin-releasing hormone from hypothalamus, caused incomplete testicular growth, stopped spermatogenesis and led to reproductive disorders in lambs. Furthermore, it reduced testosterone amount by local impact on testis and then disorders in growth, development and action of somniferous tubules (Kumar *et al.*, 2006).

In a study, zinc supplementation as zinc oxide from 50 to 200 ppm didn't affect ejaculation amount of male rabbits but volume of cell mass of was increased in ejaculations of 50, 100 and 150 ppm treatments which showed increase in producing sperm cells in treated animals. This element contributes in structure of important enzymes like Carbonic anhydrase, alcohol dehydrogenase, superoxide dismutase and DNA polymerase (Dillin *et al.*, 2002).

Considering mentioned studies and researches, experiments on effects of zinc on male reproductive system seems necessary. Therefore, this study was carried out to determine the effects of organic and mineral zinc on reproductive physiology of male mice.

MATERIALS AND METHODS

The study was conducted in research laboratory of Islamic Azad University (Isfahan Branch). Seventy

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male mice from Balb/c race were kept for 35 days to adapt to environment. During this period samples had free access to normal light, water and normal diet.

The study was done as completely randomized design with one control and six treatment groups (organic and mineral). Zinc was added to drink water in

50, 100 and 150 ppm doses. Groups 1 to 3 received 50 to 150 ppm mineral zinc whereas 4 to 6 groups received the same doses of organic zinc daily for 15 days. At the end of treatments, blood samples were taken to measure LH, FSH and testosterone hormones. Results were analyzed using one way ANOVA and means were compared using Duncan multiple ranges test at 5% probability level.

RESULTS

According to results, FSH was increased significantly ($p < 0.05$) in 100 ppm mineral group and reduced in 50 ppm mineral but was not changed in other groups. LH concentration of all groups except 50 ppm was increased significantly ($p < 0.05$). Testosterone amount was increased in organic 50 and 150 ppm groups but reduced in mineral 100 ppm significantly (Fig. 1).

DISCUSSION

Spermatogenesis mechanism in testis is depending on harmonized action of hypothalamic-pituitary-testicular axis (Iammarrone *et al.*, 2003). Local factors and sometimes immunological factors are very important here. Among these items, nutrition and supplements like zinc are from factors which can affect secretion process of reproductive hormones (Butler, 2003). Therefore, existence of zinc in ration can affect reproduction parameters. The gonadotropin releasing hormone from hypothalamus affects front pituitary and causes increase in secretion of LH, FSH and then stimulates testosterone secretion (Mitra *et al.*, 1996).

FSH amount was increased in current study by 100 ppm mineral zinc which can play a positive role in spermatogenesis. Also, LH amount of all organic treatments and 100 and 150 ppm of mineral treatments were increased which is very important in releasing testosterone hormone. The amount of testosterone was increased also in 50 and 150 ppm doses of organic zinc which is effective in appearance of secondary sexual traits and reproduction activities.

Simultaneous increase of FSH and LH in serum by 100 ppm mineral shows effect on hypothalamic-pituitary-testicular axis. This can be because of increase in secretion amount of LH and FSH from front pituitary and following increase in testosterone level of serum (Sato and Tsukamoto, 2000). Therefore, increase in serum level of testosterone in 50 and 150 ppm doses of organic has been secondary result of gonad stimulating hormones especially LH. This axis can be affected by concentration controlling factors (negative and positive). Feedback effect of Inhibin is reduced by decrease in stem cells and spermatocytes and then FSH will be increased. On the whole, we can announce that adding organic or mineral zinc can affect hormones of reproductive system dose dependently and thereby affects the process of spermatogenesis and fertility.

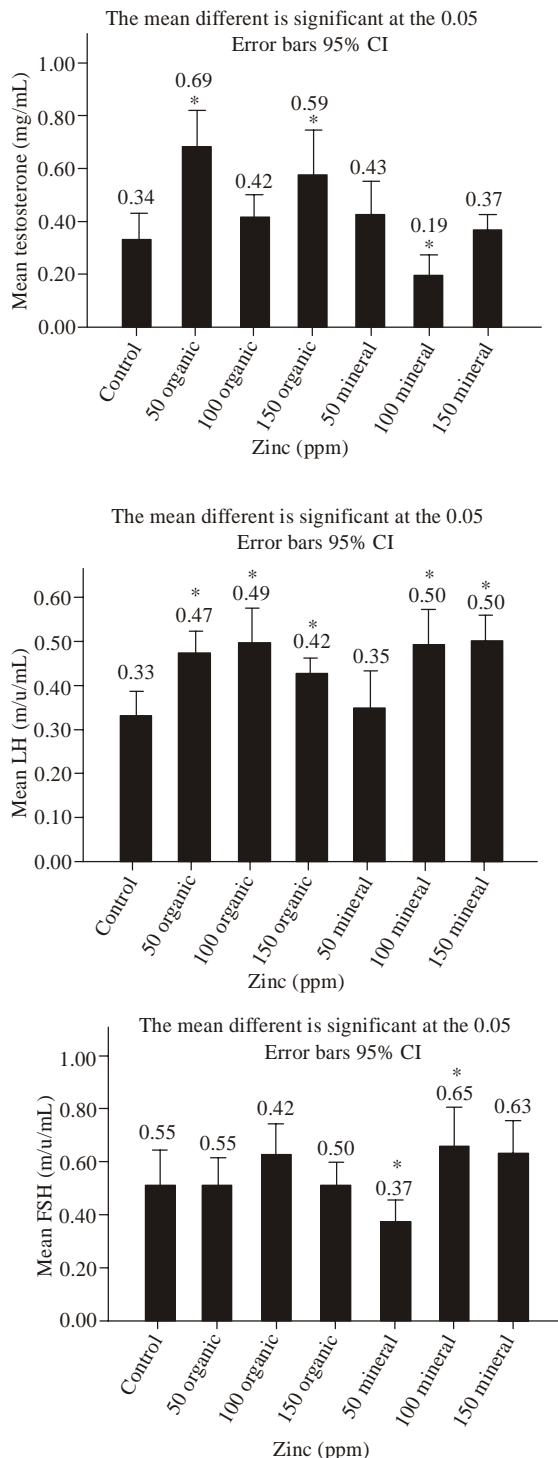


Fig. 1: The concentration of FSH, LH and testosterone hormones in different groups

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