The Effects of Testosterone and Estradiol on Serum Creatine Kinase Level in Male Rats

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Abstract—Studies show that there is association between serum sex steroid levels and liver, muscle or heart functions. Creatine kinase is also a potent marker of heart and liver function. The main aim of this study was to determine the effects of testosterone or estradiol administration on serum level of creatine kinase in male rats.

Male Wistar rats were randomly divided into control, olive oil receiving, testosterone (50mg/kg/day) receiving and estradiol (2µg/kg/day) receiving groups of 5 rats in each. After a period of 7 weeks, blood samples were collected using cardiac puncture method. Following serum collection, serum creatine kinase levels were measured by spectrophotometry. Data were statistically analyzed and compared between groups using ANOVA. Our findings showed that serum level of creatine kinase was significantly decreased in testosterone or estradiol receiving compared with control animals (p<0.05). There was no significant difference in serum level of creatine kinase level of olive oil receiving rats and control group. Our finding indicates that enhanced serum testosterone or estradiol level can lower the serum creatine kinase level and may lead to plausible changes in heart, kidney or muscle normal function.

Keywords—Testosterone, Estradiol, CK.

I. INTRODUCTION

SEX steroid hormones influence the function of various organs including muscular system, digestive system and heart[1]. Testosterone is a hormone from the androgen group primarily secreted in the testicles of males. Estradiol is the predominant sex hormone present in females. It is also present in males, and at a higher level because it is being constantly produced. Estradiol can be converted to testosterone. Estradiol and testosterone are sex hormones which have anabolic effects [2],[3]. Studies show that there is association between testosterone level and function of tissues of various types [4].Creatine kinase (CK) is an enzyme expressed by various tissues. Serum levels of CK are abnormally changed in kidney, heart and liver or other disorders[5], [6]. Kidney and liver damage have been also observed when serum testosterone level is higher than normal , indicating the effects of testosterone on liver and kidney function [7]-[9].

Despite many reports indicating the effects of sex steroid hormones on liver, heart and muscle function [10]-[13], there are still conflicting data concerning the effects of androgens on biochemical functions of liver, heart and muscle. The current study was carried out to determine the effects of testosterone and estradiol administration on serum creatine kinase level in male rats.

II. MATERIAL AND METHODS

A. Animals

Adult male Wistar rats weighting were purchased from an original stock of Pasteur Institute (Tehran, Iran). They were housed in plexy glass solid bottom cages with wood shavings for bedding. The temperature was at 22 ±2°C and animals kept under a schedule of 12h light: 12h darkness (lights on at 08:00 a.m.). The animals had free access to the standard laboratory pellet feed (Pars company, Tehran, Iran) and water ad libitum.

B. Protocol of study

This work was conducted in Laboratory Complex of IAU – HB (Hamadan, Iran). Animals were randomly divided into control, olive oil receiving, testosterone enanthate (50mg/kg/day) and estradiol valerate (2µg/kg/day) receiving groups of 5 rats in each. 7 weeks after hormone administration, blood samples were collected and serum levels of creatine kinase were measured using spectrophotometry method. All animal experiments were carried out in accordance with the guidelines of Institutional Animals Ethics Committee.

C. Statistical Analysis

All values are presented as mean±SEM. Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 19. Significance was measured using Game’s Howell significant for the exact P values and significant differences are noted in the results. Differences with P<0.05 were considered significant.

III. RESULTS

Table 1 represents creatine kinase level in control, olive oil receiving, testosterone, and estradiol receiving groups. Statistical analysis suggests that serum creatine kinase level was not significantly changed in olive oil receiving rats compared with control animals; however, serum creatine kinase level was significantly decreased in testosterone or estradiol receiving rats compared to control animals (P<0.05).

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In our study, serum level of creatine kinase was not significantly changed in olive oil receiving animals indicating that the injection method did not influence the result. It has also been shown that the enhanced serum testosterone or estradiol level is followed by reduced serum creatine kinase level. In accordance with this study, some other studies have shown that serum creatine kinase level is significantly decreased after administration of steroids [14]. Low serum creatine kinase values also has been reported in contraceptive steroid users [15]. However, in contrast to our finding there are studies showing that chronic administration of sex steroids influence glucose oxidation through modulation of insulin receptor expression and IRS-1 serine phosphorylation in target tissues of ovariectomized mice on a high-fat diet. Am J Physiol Endocrinol Metab. 15;303(4):E445-56.

This finding clearly indicates the potentially damaging effects of enhanced testosterone or estradiol level on liver, heart or muscle tissues.

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REFERENCES


