The Effects of Testosterone and Estradiol Administration on Serum Triglyceride Levels in Male Rats

Erfanian S*, Ahmadi R, Yari M, and Eshghjoo S

Abstract--Studies show that sex steroid hormones influence lipid metabolism in body. The main aim of this study was to determine the effects of testosterone and estradiol on serum triglyceride levels in male rats. Male Wistar rats were randomly divided into control, testosterone (10mg/kg/day), and estradiol (200µg/kg/day) receiving animals of 5 in each group. After 7 weeks blood samples were collected using cardiac puncture method. Following serum collection, levels of triglyceride were measured by radioimmunoassay method. Data were statistically analyzed and compared between groups using ANOVA. The results indicated that serum triglyceride levels were significantly decreased in rats receiving testosterone or estradiol compared with control animals (P<0.01). There was no significant difference in serum triglyceride between testosterone and estradiol receiving animals. Our findings show that testosterone as well as testosterone reduce serum triglyceride level.

Keywords--Testosterone, Estradiol, Triglyceride, Rat.

I. INTRODUCTION

TESTOSTERONE is an important sex steroid hormone from the androgen group secreted primarily in the testicles of males and the ovaries of females, although small amounts are also secreted by the adrenal glands. It is also anabolic steroid. Testosterone plays a key role in the development of male reproductive tissues such as the testis and prostate as well as promoting secondary sexual characteristics such as increased muscle, bone mass, and the growth of body hair. In addition, testosterone is essential for health and well-being as well as the prevention of osteoporosis. The effects of testosterone on metabolism have been demonstrated [1] – [5].

Estradiol (E2 or 17β-estradiol, also oestradiol) is a sex steroid hormone of estrogen group. Estradiol is about 10 times as potent as estrone and about 80 times as potent as estriol in its estrogenic effect. It is the predominant estrogen during reproductive years both in terms of absolute serum levels as well as in terms of estrogenic activity. Estradiol is also present in males, being produced as an active metabolic product of testosterone. Estradiol has not only a critical impact on reproductive and sexual functioning, but also affects other organs, including the bones and other systems. Metabolism is also influenced by estradiol [6] – [8].

A triglyceride (TG, triacylglycerol) is an ester derived from glycerol and three fatty acids [9]. Triglycerides are a blood lipid that help enable the bidirectional transference of adipose fat and blood glucose from the liver. Triglycerides are the main constituents of vegetable oil (typically more unsaturated) and animal fats (typically more saturated) [10]. Triglycerides are a major component of human body [11] functioning as a source for body energy.

The present study was carried out to show the effects of testosterone and estradiol on serum levels of triglyceride in male rats.

II. MATERIAL AND METHODS

A. Animals

Adult albino (Wistar) rats weighting 200 -250g were purchased and raised in our colony from an original stock of Pasteur institute (Tehran, Iran). The temperature was at 20 -25°C and animals kept under a schedule of 12h light: 12h darkness (light on at 08: 00 a.m.) with free access to water and standard laboratory chow. Car taken to examine the animals for general pathological symptoms. In all experiments, attention was paid to the regulations of local authorities for handing laboratory animals.

B. Protocol of Study

Male Wistar rats were randomly divided into control, testosterone enanthate (10mg/kg/day), and estradiol valerate (200µg/kg/day) receiving animals of 5 in each group. After 7 weeks blood samples were collected using cardiac puncture method. Following serum collection, levels of triglyceride were measured by radioimmunoassay method.

C. Statistical Analysis

Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 19. Significance was measured using Fisher’s least 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 I and figure 1 show the serum levels of triglyceride in control and experimental rats.

<table>
<thead>
<tr>
<th>Group</th>
<th>TG (mg/dl)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>117.2 ± 15.05</td>
<td>-</td>
</tr>
<tr>
<td>T receiving</td>
<td>55.6 ± 13.66</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>E receiving</td>
<td>78.6 ± 5.89</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

![Fig. 1 serum levels of triglyceride in male rats](image)

Statistical analysis suggests that serum level of triglyceride was significantly decreased in testosterone and estradiol receiving animals compared to control animals (P<0.01). There was no significant difference in serum triglyceride between testosterone and estradiol receiving animals.

IV. DISCUSSION

In this study, we found that testosterone and estradiol administration results in reduced serum level of triglyceride. This finding is consistent with results of previous studies in which it has been shown that testosterone administration improve lipid profile in men with hypogonadism [12]. It has also been shown that dyslipidemia is associated with testosterone, oestradiol and androgen receptor CAG repeat polymorphism in men with type 2 diabetes [13]. The reports indicate that estrogen deprivation in women is associated with unfavorable serum lipid levels [14]. However, in contrast to our finding there are some studies indicating a decrease or no change in serum lipid levels after androgen administration [15] – [17].

Since testosterone and estradiol have pivotal impact on lipid metabolism [1]-[8], it is suggested that estradiol or testosterone administration can enhance metabolism rate in animals leading to decreased serum triglyceride level.

V. CONCLUSION

Conclusively our findings indicate that testosterone or estradiol administration results in reduced serum triglycerid level.

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REFERENCES