5. **SUMMARY**

1. The present study was planned to test whether testosterone and estradiol have any gender or region specific effect on enzymes involved in carbohydrate metabolism or ATP turnover in skeletal muscle.

2. Mature male and female rats were gonadectomized and supplemented with testosterone (100µg/100g body weight for males and 5µg/100g body weight for females) or estradiol (5µg/100g body weight for both males and females) for 30 days from day 31 post-castration onwards.

3. Skeletal muscles from temporal region (temporalis), jaw (masseter), brachial region (triceps and biceps), stifle joint (vastus lateralis) and thigh (gracilis) and tarsal joint (gastrocnemius and soleus) were considered for the present investigation.

4. The parameters studied include:
   i) Glycogen, glycogen synthetase, glycogen phosphorylase and blood glucose, to understand the impact of sex steroids in glycogenesis and glycogenolysis.
   ii) Lactate, pyruvate, HK, PFK, G-3-PDH, PK and LDH (NAD and NADH dependent) to understand the impact on glycolytic activity.
   iii) NAD-ICDH, SDH and MDH to understand the impact on TCA cycle.
iv) Certain muscle specific enzymes like CPK, MK, myosin ATPase and ATP contents to understand the impact of sex steroids on ATP turnover.

5. Gonadectomy decreased the activity of key enzymes involved in glycolysis in skeletal muscles taken from all regions in male and female rats except in the temporalis muscle of females. Testosterone supplementation to males and estradiol supplementation to females restored normal activity of glycolytic enzymes. Administration of testosterone to females or estradiol to males had no appreciable effect on these enzymes.

6. The response of glycogenic and TCA cycle enzymes in males to testosterone and that of females to estradiol were consistent with that of glycolytic enzymes. However, administration of testosterone to female rats markedly elevated most of these enzymes.

7. The data on skeletal muscle glycogen and lactate/pyruvate also showed similar trend where gonadectomy induced decrease in the above parameters was enhanced by testosterone/estradiol supplementation as observed in glycogenic and glycolytic enzymes, respectively.

8. Activities of muscle specific enzymes involved in ATP turnover like CPK, myokinase and myosin ATPase decreased due to gonadectomy whereas, testosterone/estradiol replacement enhanced the same, a response similar to that of TCA cycle enzymes.
9. Deprivation of gonadal steroids induced diminution in the ATP concentration was enhanced by testosterone/estradiol administration which was similar to changes as observed in CPK, myokinase and TCA cycle enzymes which are actively involved in ATP production.

10. In general, temporalis muscle appears to be resistant to changes in gonadal steroid status in female rats.

11. Testosterone showed gender specific effect only in enzymes involved in the glycolytic pathway whereas, estradiol exhibited gender specificity in enzymes involved in all the pathways of carbohydrate metabolism and ATP production.

12. The data indicate that **sex steroids are the major stimulants of skeletal muscle energy metabolism**. This shall suggest that testosterone in males and estradiol in females are potent stimulants of skeletal muscle energy metabolism.

13. Gonadal steroids may bring about their influence on skeletal muscle energy metabolism either directly or by modifying the secretion of corticosterone, a known regulator of skeletal muscle carbohydrate metabolism.

14. Sex steroids may also bring about their effects by modifying the actions of insulin, thyroid hormones as their serum titres did not undergo any change in any of the experimental group.
15. **In conclusion**, the present study shows that *skeletal muscle energy* metabolism depends upon sex steroids. Wherein androgens are effective in males and females and estradiol is effective in females only.

16. Further studies on the molecular mechanism by which sex steroids bring about this effect and their interaction with other hormones may enlighten further.