CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S0422

Project Title
The Effect of Testosterone Depletion on Superoxide Radical Production in Gastrocnemius Muscles

Abstract

Objectives/Goals
It is now known that oxidative stress is one of the major causes of the initiation, progression, and consequences of diabetes mellitus, including heart disease, diabetic neuropathy, and nephropathy. People with several chronic diseases including diabetes are known to have lower levels of testosterone. My objective was to test the hypothesis that testosterone depletion will lead to oxidative stress.

Methods/Materials
To check for oxidative stress, aconitase activity was measured; aconitase is an iron and sulfur containing enzyme that is inactivated by the superoxide radical. Fumarase activity was measured to serve as a negative control; fumarase is a sulfur containing enzyme that is not inactivated by the superoxide radical. Aconitase activity was measured by monitoring the formation of cis-aconitic acid from isocitric acid by following the absorbance at 240 nm in 50 mM Tris-HCl, pH 7.4 containing 600 uM manganese chloride and 20 mM isocitrate at room temperature (RT). Fumarase activity was measured by following the increase in absorbance at 240 nm at RT using 30 mM potassium phosphate buffer, pH 7.4, and 100 uM L-malic acid. To express fumarase and aconitase activity as a function of protein (specific activity), the protein content of the muscle samples was determined using the Biorad Assay Kit.

Results
In the castrated samples, aconitase activity was significantly lower compared to the control group. The enzyme activity returned to the control levels in the muscle samples of the castrated animals that were supplemented with testosterone. Fumarase activity was not affected. Therefore, testosterone depletion does cause oxidative stress as demonstrated by the loss of aconitase activity in the testosterone depleted group.

Conclusions/Discussion
The results supported my hypothesis. My conclusion is that testosterone depletion indeed causes oxidative stress. Supplementation with this androgen in testosterone depleted animals ameliorated the production of the superoxide radical, and thus oxidative stress.

Summary Statement
Testosterone depletion causes oxidative stress.

Help Received
Used lab equipment at Charles Drew University under the supervision of Dr. Sindhu