EFFECT OF ALPHA-AMYLASE TREATMENT AND EXERCISE ON THE CALCIUM HANDLING BY SARCOPLASMIC RETICULUM

by

Benjamin J. Toderico

Thesis submitted to faculty of

Virginia Polytechnic Institute and State University

in partial fulfillment of the requirements for the degree of

Master of Science

in

The Department of Human Nutrition, Foods, and Exercise

APPROVED:

_____

Jay H. Williams Ph.D., Chairman

_____ _____

Barbara A. Davis Ph.D. David M. Moore D.V.M.

16 June 1999

EFFECT OF ALPHA-AMYLASE TREATMENT AND EXERCISE ON THE CALCIUM HANDLING OF THE SARCOPLASMIC RETICULUM

by
Benjamin J. Toderico

Jay H. Williams, Chairman

Department of Human Nutrition, Foods, and Exercise

(ABSTRACT)

The existence of a glycogen-sarcoplasmic reticulum has been demonstrated by a number of researchers. This complex is suspected to participate in the calcium uptake activities of the sarcoplasmic reticulum (SR). Removal of glycogen particles associated with this complex may alter the calcium handling abilities of the SR. This experiment sought to determine what effect exercise and treatment with α-amylase had on the abilities of the SR to regulate intracellular calcium ($[Ca^{2+}]_i$). Rats were either run on a treadmill for 60 min at a speed of 21 m/min and a 10% grade or were not exercised. Animals were then killed by decapitation after inhalation of CO_2. Left and right gastrocnemius muscles were excised from both groups and underwent SR vesicle preparation to separate the heavy and light SR fractions (HSR and LSR respectively). Left hindlimb muscle homogenate also underwent 60 min incubation with α-amylase to digest glycogen before differential centrifugation. Treatment with α-amylase significantly depressed rate of calcium uptake by LSR and HSR fractions by 22.89% and 25.22% respectively ($p<0.05$). α-Amylase had no effect on SR's rate of calcium release. There was no effect of exercise on calcium uptake or release rates. Glycogen concentration associated with the SR was unaffected by either α-amylase treatment or exercise. These results indicate that treatment with α-amylase decreases the ability of the SR to sequester calcium ions.