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Stereological Analysis of Rat Skeletal Muscle Following Dietary Antioxidant Supplementation and Stretch-Shortening Cycle Exercise: 851: 2:30 PM - 2:45 PM

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Previous data has demonstrated that aging impedes the ability of skeletal muscle to adapt to repetitive stretch-shortening cycle (SSC) exercise. Our lab has hypothesized that oxidative stress may impair the resolution capacity of the inflammatory process and participate in the observed mal-adaptation in aged-skeletal muscle.

PURPOSE: To determine if two different dietary antioxidant regimens improve the ability of aged skeletal muscle to adapt to chronic-S SC exercise training.

METHODS: Nine Fischer 344 x Brown Norway rats (30 months) were randomly assigned to a Vitamin C (2% by weight) & E (30,000 I. U.) supplemented group (N = 4) or Curcumin group (1% by weight) (N = 5). Dorsiflexor muscles of the left limb in all animals were exposed 3 times per week for 4.5 weeks to a protocol of 80 maximal SSCs per exposure *in vivo* (14 total exposures). Twenty four hours following the final exposure rats were weighed, anesthetized and exsanguinated. The left (exercised) and right (non-exercised) tibialis anterior muscles were excised, weighed, sectioned, quick-frozen, and stored at -80°C. Transverse sections (12 µm) were cut, mounted on pre-coated microscope slides, and stained using a routine procedure with H&E. Stereological methods, consisting of point and intercept counts from tissue sections (evaluated on a Leica DMLB microscope at 40x magnification), were used to quantify the degree of inflammation, myofiber degeneration and modifications to the interstitial space in muscle from each group.

RESULTS: Stereological analyses from Vitamin C & E or Curcumin supplementation revealed that there were no changes in the volume density of normal myofibers or the presence of degenerative myofibers or cellular infiltrates resulting from repetitive-SSC exercise. However, there was a significant increase in the volume density of non-cellular interstitium, indicative of edema, in the exercised limb of the Curcumin-treated animals compared to the non-exercised limb ($p<0.05$); no such change was evident in the Vitamin C & E supplemented group. In contrast, a recent study from our lab that employed the same experimental protocol to unsupplemented young and aged animals demonstrated a significant increase in the volume density of cellular interstitium in aged-skeletal muscle only; this was indicative of latent inflammation.

CONCLUSIONS: Antioxidant supplementation appears to maintain (possibly even augment) the adaptive profile in aged-skeletal muscle exposed to repetitive-SSC exercise. This seems to be accomplished by buffering oxidative stress and allowing for an internal-cellular environment capable of resolving the inflammatory process.