1860 *Board #148* **May 31** **9:00 AM - 10:30 AM**

The Effects of Hydration State and Resistance Exercise on Markers of Muscle Damage

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PURPOSE: It is well established that resistance exercise can damage muscle tissue. Two common circulating markers of muscle damage, myoglobin (Mb) and creatine kinase (CK) may be attenuated by fluid ingestion post-exercise. The purpose of this study was to examine the combined effect of resistance exercise and hydration state on muscle damage.

METHODS: Seven healthy resistance-trained males (age = 23±4 y, body mass = 87.8±6.8 kg, body fat = 11.5±5.2%) completed three identical resistance exercise bouts, six sets of up to ten repetitions of the back squat, in different hydration states: euhydrated (HY0), hypohydrated by ~2.5% body mass (HY2.5), and hypohydrated ~5.0% body mass (HY5). Subjects achieved desired hydration states via controlled water deprivation, exercise-heat stress, and fluid intake. Both Mb and CK were measured during euhydrated rest (PRE). Mb was also measured immediately post-exercise, one hour (+1H) and two hours (+2H) post-exercise; CK at 24 h, and 48 h post-exercise.

RESULTS: Body mass decreased 0.2±0.4%, 2.4±0.4%, and 4.8±0.4% during HY0, HY2.5, and HY5, respectively. Mb concentrations increased significantly ($p<0.05$) PRE (44.7±19.0, 60.9±48.9, and 55.2±27.9 ng·ml-1) to +1H (93.5±59.3, 118.7±55.4, and 133.7±48.7 ng·ml-1), and +2H (97.1±67.2, 108.5±52.9, and 126.9±51.9 ng·ml-1) for HY0, HY2.5, and HY5, respectively, but were not significantly different between trials. CK concentrations remained within the normal resting range at all time points.

CONCLUSION: These results indicate that hypohydration did not alter the resultant muscle damage following the resistance exercise challenge.

1861 *Board #149* **May 31** **9:00 AM - 10:30 AM**

Non-injurious Stretch-shortening Contractions: Age Effects on Muscle Physiology and Morphology

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Age impairs the ability of skeletal muscle to adapt to loading even in the absence of fiber degeneration. Nevertheless, the mechanisms accounting for this reduced adaptation are not fully understood. Experiments using stretch-shortening contractions (SSC) provide a model to investigate skeletal muscle adaptation in response to non-injurious contractions in old animals.

PURPOSE: To investigate the effect of a non-injurious SSC exposure on the temporal skeletal muscle response of young and old rodents.

METHODS: Left dorsiflexor muscles of young (12 wks) and old (30 mo), male Fischer Brown Norway Hybrid rats were exposed to an acute protocol of 80 maximal SSC in vivo. The contra-lateral limb (right) served as an intra-animal control. Changes in muscle morphometry were quantified at 6, 24, 48, 72, and 120 hours post exposure. The left and right tibialis anterior muscles (LTA & RTA) were excised and weighed. Transverse sections (12 µm) were prepared and stained using Harris Hematoxylin & Eosin. Tissue sections were assessed using a standardized quantitative morphometric point-counting method.

RESULTS: LTA muscle wet-weight was increased compared to the RTA muscle wet-weight by 12% in the young rats at 6h recovery ($p<0.05$), and the LTA muscle wet-weight was increased compared to the RTA muscle wet-weight by 10% in old rats at 24h recovery ($p<0.05$). Stereological indices for cellular interstitium, indicative of cellular infiltrates, was increased at 72h in the young ($p<0.0001$) and old ($p<0.05$) LTA when compared to the RTA. Aging increased cellular interstitium, as cellular interstitium was greater in the old versus the young LTA at 72h ($p<0.05$). Non-cellular interstitium, indicative of edema, was increased in the LTA of old rats when compared to young rats at 120h recovery ($p<0.05$). There were no degenerative myofibers observed following the SSC exposure.

CONCLUSIONS: Together these data indicate that muscles exposed to non-injurious SSCs have different characteristics than that typically reported for lengthening contraction-induced muscle injury. Nevertheless, muscle of old rodents has a delayed adaptation that may be influenced by infiltrating cells as well as non-cellular events, indicative of inflammation.

1862 *Board #150* **May 31** **9:00 AM - 10:30 AM**

Difference of Muscle Damage Magnitude Between Arm Leg Eccentric Exercises: Influence of Muscle Volume

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Responses to eccentric exercise as a magnitude of muscle damage were reported different between leg and arm muscles without being further elucidated.

PURPOSE: The aim of this study was to investigate the differences in the magn of muscle damage between maximal arm and leg eccentric exercises in the same subjects and to determine the effects of muscle volume on such differences.

METHODS: Twelve sedentary male volunteers, aged 22-30 years, performed 3 15 maximal eccentric actions of the knee extensors (LEG) and elbow flexors (AR the angular velocity of 30°/sec, separately. The volumes of the muscles were esti by magnetic resonance imaging (MRI). Range of motion (ROM), isometric peak torque (IPT), delayed onset of muscle soreness (DOMS), serum creatine kinase a (CK) and myoglobin concentration (Mb) were evaluated before, after and on the 2nd, 3rd, 7th days following exercise. Total Work (TW) during the eccentric exer was recorded and corrected by muscle volume (TWc). Repeated measures ANOV Wilcoxon signed ranks tests were used to compare the results.

RESULTS: Eccentric TW during the exercises was greater ($p < 0.01$) for LEG (7341±46 joule) compared with ARM (2915±180 joule). In contrast, TWc was greater ($p<0.01$) for A (23.7±1.5 joule/cm3) than for LEG (6.6±0.4 joule/cm3). Increases in CK on the 2nd 3rd a 7th days ($p<0.01$) and increases in Mb on the 1st, 2nd, 3rd and 7th days following the exer were significantly ($p<0.01$) higher for ARM than LEG. DOMS and ROM were also great ($p<0.05$) for ARM compared to LEG on the 2nd and 3rd days. Decline in IPT following th exercises was bigger ($p<0.05$- $p<0.01$) for all test occasions compared with LEG.

CONCLUSIONS: The results of this study demonstrate that the magnitude of mu damage is greater and the recovery is slower following maximal eccentric exercis the elbow flexors than of the knee extensors for sedentary males. This may be due more total eccentric work per muscle area in the elbow flexors.

C-31 Free Communication/Poster – Hydration an Fluid Balance in Sport

MAY 31, 2007 7:30 AM - 12:30 PM
ROOM: Hall E

1863 *Board #151* **May 31** **8:00 AM - 9:30 AM**

Influence Of Menstrual Cycle Phase On Drinking Respon In Physically Active Females

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Introduction: Reproductive hormones influence body fluid regulation, although the have been no studies examining the effect of menstrual cycle phase on drinking response during exercise.

PURPOSE: To determine whether differences exist in ad-lib ingestion of water wl consumed during exercise during different phases of the menstrual cycle. Secondai we examined whether fluid consumption differed between a flavored fitness water (FW) and water (W) during the follicular phase (F).

METHODS: 20 women (mean age: 32.8 ± 9.0 y), who exercise on a regular basis, completed three trials consisting of one hour of interval exercise on the treadmill, stationary bicycle, and elliptical trainer (20 minutes on each) under warm environme conditions (WBGT: 24.3 ±1.9° C). During each trial, the women were given a coded, unmarked bottle of either FW or W to drink ad-lib during the exercise session. Two trials were scheduled during F (Days 1-4) and a third trial during the luteal phase (L) the menstrual cycle (Days 18-22) during which subjects received only water (WL). T order of trials was randomized. Nude body weights were recorded pre- and post-exer and all fluid containers were weighed pre- and post-consumption. To assess sweat electrolytes, sterile absorbent patches were placed on the women's forearms during tl W and WL trials after 20 minutes of exercise and were removed at the end of the exe period. Sweat rates were calculated and corrected for fluid consumption and urine output. Sweat samples were analyzed for sodium and potassium concentrations (flam photometry). ANOVA was used to test for differences among FW, W and WL ($P<0.0$

RESULTS: There was no difference in sweat rates among the three trials (FW = 9 ± 227 mL/h; W = 821 ± 192 mL/h; WL = 896 ± 227 mL/h). Mean consumption dui exercise was 668 ± 373 mL for FW, 564 ± 359 mL for W, and 589 ± 336 mL for W. ($P= 0.055$). When consuming water, there was a trend for a difference in sweat sod concentrations: L, 44.3 ± 19.2 mEq/L and F, 39.2 ±18.7 mEq/L ($P=0.08$).

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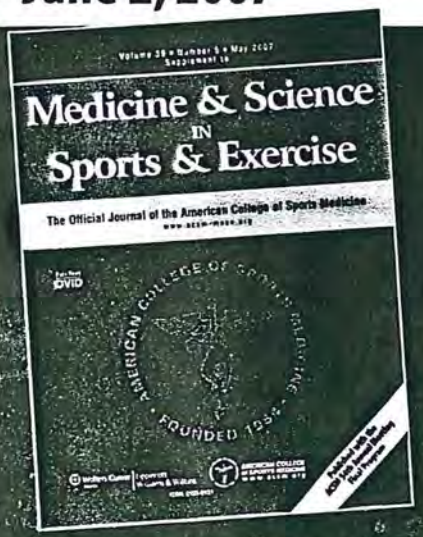

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