was significantly increased at IP, 30P, 1H and 2H, while MCP-1 was significantly elevated at all post-exercise time-points (p<0.05). CCR2 expression was significantly lower at IP, 1H, 2H and 5H (p<0.05). CD11b expression was significantly greater at IP (p=0.014), and 1H (p=0.009). TNFα and GCR expression did not differ from baseline at any time-point. Plasma cortisol concentrations did not appear to be related to CCR2 expression.

CONCLUSION: Results indicates that both HVY and VOL protocols stimulate a robust pro-inflammatory response. However, no differences were noted between resistance exercise training paradigms.

1462 Board #115  June 2, 8:00 AM - 9:30 AM  
Effects Of A Three-day Period Of Intense, Intermittent Exercise On Oxidative Stress And Inflammation.  
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(No relationships reported)

It is documented that strenuous and prolonged exercise induces oxidative stress and inflammation, with the associated muscle damage and fatigue compromising performance. Little is known about the oxidative effects of intense, intermittent exercise, as performed daily by elite athletes competing in team sports.

PURPOSE: To assess the short-term effects of a 3-day period of intense, intermittent exercise on biomarkers of oxidative stress and inflammation in trained athletes.

METHODS: Ten trained athletes (age: 32.11±1.91yrs; mass: 66.33±1.95kg; maximal oxygen uptake (VO2max): 51.44±1.59mL·kg·min⁻¹) completed a high-intensity, intermittent exercise protocol (90-minute intermittent treadmill run, 70% VO2max) on three consecutive days and were compared to a control group (N=10). Blood samples were collected immediately post (T1) and post (T2) the 3-day exercise protocol, then 21h- (T3) and 42h-post-exercise (T4); and assayed for Total Antioxidant Status (TAS), Thiobarbituric Acid Reactive Substances (TBARS), Interleukins (IL-6, IL-8 and IL-10), C-Reactive Protein (C-RP) and Lactate Dehydrogenase (LDH). Data were corrected for plasma volume change; results presented as M±SE.

RESULTS: No significant differences were observed between the exercise and control group at T1 (TAS: 1.20±0.14mmol.L⁻¹ vs. 1.18±0.11mmol.L⁻¹; LDH: 302.14±16.24U.L⁻¹ vs. 295.27±32.61U.L⁻¹; TBARS: 6.21±1.09μM vs. 5.88±1.00μM; IL-6: 0.67±0.70μg/ml v. 1.12±0.28μg/ml). The 3-day exercise period caused a significant increase in LDH (413.24±35.27U.L⁻¹ vs. 433.56±31.07U.L⁻¹, P=0.029), IL-6 (2.54±35.05pg/ml, P=0.037) and TBARS (7.00±0.61μM, P=0.042) at T2, with the effects of TBARS remaining above baseline at T4 (6.43±0.79μM, P=0.043). TAS increased post-exercise with a significant difference observed between groups at T2 (1.86±0.21mmol.L⁻¹ vs. 2.00±0.13mmol.L⁻¹, P=0.006). T3 (1.86±0.28mmol.L⁻¹ vs. 1.30±0.14mmol.L⁻¹, P=0.010) and T4 (1.71±0.22mmol.L⁻¹ vs. 1.17±0.13mmol.L⁻¹, P=0.014). IL-8, IL-10, and C-RP did not differ between groups.

CONCLUSIONS: A 3-day period of intense, intermittent exercise increased oxidative stress and upregulated antioxidants in trained athletes, confirming the current model that exercise-induced oxidants play an important role in intercellular signaling pathways of endogenous antioxidants.

1463 Board #116  June 2, 8:00 AM - 9:30 AM  
Effects Of A Natural Combination Medicine On Exercise-induced Muscle Soreness  
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Muscle soreness is a common effect of eccentric exercise which is accompanied by an inflammatory response in muscle tissue. The preparation Traumeel (Tr14) is composed of 14 diluted biological and mineral components and indicated immunomodulatory effects in various recent studies.

PURPOSE: The present investigation examined potential effects of Tr14 on exercise-induced muscle soreness.

METHODS: A total of n = 96 (Tr14: n=48, placebo: n=48) healthy, untrained male volunteers were enrolled in this double-controlled clinical trial. The subjects performed a 45 minute, intensive downhill run on a treadmill (10% decline) at 80% of VO2max. All analyses (subjective pain score, muscle damage markers, antigenstimulated cytokines and lymphotoxin activation markers) were performed preexercise and at several time points thereafter (immediately post, 3 hours, 48 hours and 72 hours post). The area under the curve with respect to the increase (AUC) of the subjective pain score and the muscle damage marker creatine kinase (CK) were defined as primary outcome measures.

RESULTS: The muscle damage markers CK and LDH were lower in the Tr14 group (1.5± 1.5 x10⁶ vs. 1.6± 2.1 x10⁶, p<0.05 and 6.6 ± 9.8 x10⁶ vs. 9.9 ± 9.1 x10⁶, p<0.06 respectively). Similarly, there was a lower ICAM1 expression (3.0 ± 30.9 x10⁶ vs. 1.1 ± 1.9 x10⁶, p<0.05) and a less pronounced lymphotoxin (9.3 ± 16.3 x10⁶ vs. 1.8 ± 1.8 x10⁶, p<0.05) in the Tr14 group. Furthermore, CD69 and IL-18 showed the same trend as above (4.2 ± 26.9 vs. 3.2 ± 39.8 and 1.0 ± 3.2 x10⁶ vs. 1.7 ± 2.4 x10⁶ respectively, both p<0.1). Neutrophil granulocytes and IL-12p70 showed a lower (2.2 ± 2.0 x10⁶ vs. 2.7 ± 2.9 x10⁶, p=0.1 and 2.8 ± 47.0 x10⁶ vs. 9.7 ± 43.6 x10⁶, p=0.05 respectively) and GM-CSF a higher AUC score in the Tr14 group (13.0 ± 5.9 x10⁶ vs. 4.2 ± 34.9 x10⁶, p<0.01). Additionally, a lower expression of BDNF was found in the Tr14 group (9.5 ± 115.0 x10⁶ vs. 4.1 ± 7.7 x10⁶, p<0.05).

CONCLUSION: Tr14 affected muscle damage markers and selected immune system parameters after eccentric exercise. However, the evaluation of the subjective pain score showed no differences between the verum and placebo group.

FUNDING: This investigator initiated clinical trial was financially supported by Biologische Heilmittel Heel GmbH (Baden-Baden, Germany).

1464 Board #117  June 2, 8:00 AM - 9:30 AM  
Profiling Kynurenine (KYN) As A Potential Immunological Marker For Overtraining Syndrome (OTS) In Elite Rowers  
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(No relationships reported)

OTS is characterized by a disturbed stress-recovery balance with long lasting loss of performance, elevated susceptibility to infections, chronic fatigue and mental depression in the absence of clinically defined diseases. Immune system hyperactivity is a common feature of both functional overreaching (FO) in response to high exercise loads followed by tissue remodeling, and non-functional overreaching (nFO) leading eventually to severe OTS. The tryptophan catabolite KYN acts as an immune regulator in an attempt to resume immune homeostasis by activating Treg cells. Adversely such a stimulated KYN pathway generates neurotoxic substances impairing mental health. A correlation of high KYN and low tryptophan has been demonstrated in several disease phenotypes related to increased plasmacytid dendritic cells (pDC), the most important cell type to induce Treg cells.

PURPOSE: We showed earlier that KYN in OTS-patients (PTS) is elevated compared to healthy recreational athletes (HRA). Here we aimed to elucidate the context of KYN with various markers of immune status and results of questionnaires during a world cup season of elite rowers (ER).

METHODS: Venous serum was drawn from 11 ER in between two world cup races and at off-season while KYN in PTS and HRA served as controls. Neopterin, Ferritin, TNFα, IL-1β, IL-2R, IL-6, HMGB1, and IL-10 of ER were measured using commercial immunoassay systems and relevant markers for pDC, and Treg cells (CD25+/CD4+, sCD25, HLA-DR on monocytes and CD123 on pDC) were determined by flow cytometry. KYN was defined using a non-commercial colorimetric assay, and EBF76 was applied to monitor stress and recovery balance.
RESULTS: Average KYN in PTS was increased by 33.6% compared with HRA (3.16 nmol/ml, SD 0.45 vs. 2.38 nmol/ml, SD 0.48, p<0.0001) and 31.4% respectively 20.9% with ER in off- or high season (2.42 nmol/ml, SD 0.5, p<0.01; 2.63 nmol/ml, SD 0.7, p<0.05). Proinflammatory and EBF-stress markers significantly increased during high season while anti-inflammatory and recovery markers augmented during off-season.

CONCLUSIONS: While intense ongoing exercise loads challenge the immune system comprehensively, these triggers hardly affect the KYN pathway in successfully competing rowers, probably because the immune homeostasis can be regained, which is different to OTS-patients.

1465 Board #118  June 2, 8:00 AM - 9:30 AM
Interaction Between Vascular Inflammation Markers and Exercise-Induced Stress Hormones in Obese Males
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PURPOSE: To examine the interaction between exercise-induced stress hormones [epinephrine (E), norepinephrine (NE) and cortisol (COR)] and vascular inflammation markers [soluble intercellular adhesion molecule-1 (sICAM-1), soluble vascular cell adhesion molecule-1 (sVCAM-1), and soluble E-selectin (sE-selectin)] following different intensities of exercise in obese men.

METHODS: As a cross-over design, 15 physically inactive (physical activity < 2 days per week) obese (BMI > 30 kg/m²) men between the ages of 18-30 years participated in the study. Participants performed a single bout of cycling exercise (average energy expenditure ~ 300 kcal) at two different intensities in random order (low: 50% and high: 80% of maximal heart rate). Overnight fasting blood samples were collected at baseline, immediate post-exercise (IPE), 1-hr PE, and 24-hr PE. All data were analyzed by an analysis of variance with repeated measures along with the Bonferroni multiple comparisons. The linear regression analysis was used to examine the interaction between exercise-induced hormones and vascular inflammation markers (p < .05).

RESULTS: sICAM-1, sVCAM-1, E, OR NE did not change, while sE-selectin at 1-hr PE (10.25±1.07 ng/mL) significantly decreased (p < 0.045) from baseline (12.2±1.39 ng/mL). COR at IPE (262±1.23±1.09 ng/mL) significantly lower than 1-hr PE (189.35±31.11 ng/mL) during high-intensity exercise. In contrast, COR at IPE (187.52±31.09 ng/mL) during low-intensity exercise did not change. sVE-cadherin at 1-hr PE during low-intensity exercise (r² = .34, p < .02), whereas COR and sVCAM-1 had a positive relationship at IPE during high-intensity exercise (r² = .36, p < .02).

CONCLUSION: sE-selectin was favorably reduced following exercise, and changes in cortisol were exercise-intensity-dependent. Although sICAM-1 and sVCAM-1 did not significantly change following exercise, a significant interaction between cortisol and these cell adhesion molecules suggests that cortisol is one of the responsible exercise-induced hormones that may be associated with cell adhesion molecule metabolism.

1466 Board #119  June 2, 8:00 AM - 9:30 AM
Salivary Biomarkers in Response to an Acute Bout of Exercise Before and After Training Program
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There is increasing interest in the mechanisms and biomarkers through which physical activity influence health across the lifespan. Studies that require phlebotomy are challenging for investigations involving children. Not surprisingly, there is growing interest in the use of saliva in pediatrics for exercise-related biomarker discovery. Very little is known about the relationship of key potential salivary biomarkers (SaBs) and exercise during childhood.

PURPOSE: To evaluate the effect of acute intense bout of exercise and a training program on 3 SaBs known to be related to stress/inflammation: 1) salivary cortisol- marker of HPA axis activity; 2) salivary α-amylase (sAA)- a surrogate marker for autonomic activity; and 3) salivary uric acid (sUA) which recently has been suggested to be an indicator of the inflammatory response to physical exercise.

METHODS: 23 normal weight healthy adolescents (14-17 y/o, 12 girls) completed 8-week exercise program (1 hour/session, 3 days/week). VO2 max was assessed, before and after the exercise program by ramp-type progressive ergometer until exhaustion. Saliva was collected at baseline, 20 and 40 min following the completion of the ramp test. An exercise effect, a training effect and gender differences were assessed using repeated measure ANOVA.

RESULTS: Cortisol levels increased in response to a brief bout of exercise (baseline 0.125±0.02; 40min post 0.24±0.04µg/dl, p=0.002). No training or gender effects were found. sAA did not change in response to the acute exercise. However, sAA baseline levels decreased following the training program in both genders (p=0.007). sUA levels increased in both genders in response to the acute exercise (girls, p<0.0001; boys, p=0.001). Training effect was shown only in girls with 16% decrease in sUA in the post-training state (p=0.036).

CONCLUSION: The 3 SaBs yielded novel information about exercise in children. Specific effects of an acute bout of exercise as well as training and gender differences in sUA were observed. SaBs may prove to be useful in gauging the impact of exercise training programs in children and adolescents and may be particularly useful for large-scale studies and to minimize participant burden when multiple measurement time points are required.

Supported by NIH Grant P01HD-048721

1467 Board #120  June 2, 8:00 AM - 9:30 AM
Effects Of The Menstrual Cycle And Aerobic Exercise On Salivary Secretory Immunoglobulin A.
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Exercise has been shown to enhance the immune system and many women perform aerobic exercise in daily life. Although, prolonged strenuous exercise results in a temporary immune suppression and athletes are susceptible to upper respiratory tract infection after exercise. The salivary secretary immunoglobulin A (SigaA) level, which is a marker for oral-respiratory mucosal immunity, shows a difference between sexes and women experience more upper respiratory symptoms than men. However studies carefully monitoring the influence of the menstrual cycle are rare. As female hormonal status varies according to the menstrual cycle, the effect of exercise on the salivary SigaA level might be different.

PURPOSE: To examine the effect of the menstrual cycle on salivary SigaA levels at rest and in response to an acute bout of aerobic exercise.

METHODS: Eight healthy recreationally active females completed a cycling test at 70% VO2peak for 45 mins at two time points of the menstrual cycle: during the mid-follicular phase (day 8 ± 2) and the mid-luteal phase (day 21 ± 2). All participants have a regular menstrual cycle and never take oral contraceptives. Timed unstimulated saliva samples were obtained before, immediately post exercise and 1 h post exercise and analyzed for salivary SigaA. We measured the concentrations of salivary SigaA and female sex hormone using enzyme immunoassays.

RESULTS: The menstrual cycle did not significantly modify the levels of Saliva SigaA at rest (follicular: 110.4 ± 30.2 vs. luteal: 126.7 ± 58.8 µg/mL, NS) and in response to aerobic exercise. Saliva SigaA concentration and SigaA secretion rate were unchanged by both the menstrual phase and aerobic exercise. Saliva flow rate was slightly reduced at post-exercise from pre-exercise (pre: 0.47 ± 0.31 vs. post: 0.37 ± 0.24 mg/min, NS) but not significantly altered by the menstrual cycle.