

based assays to measure cytokines and myokines (Milliplex; Millipore-Sigma). Sample analysis was performed on a multiplex analyzer (Luminex LX200). **RESULTS:** Active resulted in trends toward reduced muscle soreness and improved muscle strength compared to placebo. Active was also associated with transient reductions in serum creatine kinase, MIP-1 $\beta$ , and IL-6. **CONCLUSIONS:** These data support the notion that combined supplementation with curcumin and boswellia serrata may represent an effective means to manage systemic inflammation during consecutive days of training. More research is needed to understand how curcumin and boswellia serrata may be able to manage inflammation in other exercise models.

**354** Board #192 May 29 9:30 AM - 11:00 AM  
**Curcumin Supplementation Alters Inflammatory Cytokines Following Exercise**

Brian K. McFarlin, FACSM, Elizabeth A. Tanner, Melody A. Gary, Asheal A. Davis, John H. Curtis, Jakob L. Vingren, FACSM. *University of North Texas, Denton, TX.*  
 Email: brian.mcfarlin@unt.edu

*Reported Relationships: B.K. McFarlin: Industry contracted research; Research Grant to UNT.*

Nutritional supplementation is often misused as a component of a holistic approach to muscle recovery following exercise. Supplementation that reduces post exercise inflammation or muscle soreness might improve recovery time. **Purpose:** The phase 1 purpose was to evaluate different doses of a curcumin supplement following a bout of eccentric leg press. The phase 2 purpose was to determine if the effective curcumin dose from phase 1, could alter inflammation in an open-label, field-based model. **Methods:** We consented self-reported healthy men and women to participate in the two phases of the study. In phase one, we tested a dose response for curcumin (Longvida) by comparing three doses (200, 400, & 1000 mg/d) to a placebo. In phase two, we evaluated a single dose of curcumin (1000 mg/d) combined with another polyphenol (pomegranate extract; Pomella; 1000 mg/d) endurance exercise model (half-marathon performance). Venous blood samples and analyzed for inflammatory cytokines (IL-1 $\beta$ , IL-6, IL-8, and TNF- $\alpha$ ) using a bead-based multiplex assay and an automated analyzer. Creatine kinase was analyzed using an enzymatic assay on a biochemistry analyzer (ChemWell T). **Results:** The 400 and 1000 mg doses were associated with a reduction in inflammatory cytokines and CK at 24 & 48-h after injury. Only the 1000 mg dose was associated with a reduction in subjective muscle soreness. The 200 mg dose responded in a similar manner as placebo (i.e. no reduction in muscle soreness or inflammation). When curcumin (1000 mg) was combined with pomegranate (1000 mg) in half-marathon runners, we found a significant reduction in inflammatory cytokines at 24-h post-race compared to pre-race. **Conclusions:** The key findings of this study suggest that the effectiveness of an oral curcumin supplement is dose-dependent and also activity-dependent. The combination of curcumin with pomegranate extract appeared to be more effective than curcumin alone at altering inflammation. More research is needed to identify how to incorporate curcumin and pomegranate supplementation into long-term exercise program.

**355** Board #193 May 29 9:30 AM - 11:00 AM  
**Effect Of New Zealand Blackcurrant Extract On Recovery From Exercise Induced Muscle Damage Following Half Marathon Running**

Rianne Costello<sup>1</sup>, Stephen D. Myers<sup>1</sup>, Mark E.T. Willems<sup>1</sup>, Fiona Myers<sup>2</sup>, Nathan A. Lewis<sup>3</sup>, Sam D. Blacker<sup>1</sup>. <sup>1</sup>University of Chichester, Chichester, United Kingdom. <sup>2</sup>University of Portsmouth, Portsmouth, United Kingdom. <sup>3</sup>English Institute of Sport, Bath, United Kingdom.

*(No relevant relationships reported)*

New Zealand blackcurrant (NZBC) is a rich source of polyphenols, namely anthocyanins, which improve blood flow and display anti-inflammatory and anti-oxidant properties that may improve recovery from exercise-induced muscle damage (EIMD). Limited evidence is available as to whether a polyphenol supplement can aid recovery in the days following a half-marathon event. **Purpose:** To examine whether NZBC extract would accelerate recovery after a half-marathon race. **Methods:** Following a double blind, independent groups design, 20 (8 women) recreational runners (mean  $\pm$  SD: age 30  $\pm$  6 years, height 1.73  $\pm$  0.74 m, body mass 68.5  $\pm$  7.8 kg, previous half-marathons 7  $\pm$  2, finishing time 1:56:33  $\pm$  0:18:08 h:min:s) ingested either 2 x 300 mg $\cdot$ day<sup>-1</sup> capsules of a NZBC supplement (CurraNZ<sup>TM</sup>; each containing 105 mg anthocyanin) or a visually matched placebo (PLA) 7-days prior to and 2-days following a half-marathon. Force plates sampling at 1000 Hz recorded countermovement jumps (CMJ) performance variables: jump height (JH), time to take off (TTT) and reactive strength index modified (RSImod) and visual analogue scales for perceived muscle soreness and fatigue were measured pre-, immediately post-, and at 24 h and 48 h after the half-marathon. The CMJ performance variables, muscle soreness and fatigue were analysed using a mixed model ANOVA. **Results:** CMJ variables were reduced immediately after the half marathon ( $P < 0.05$ ) (NZBC; JH 0.19  $\pm$  0.06 and PLA 0.18  $\pm$  0.05 m, NZBC; TTT 0.98  $\pm$  0.16 and PLA 1.03  $\pm$  0.20

s, NZBC; RSImod 0.20  $\pm$  0.08 and PLA 0.18  $\pm$  0.06 ratio) and had returned to baseline by 48 h, with no difference between NZBC and PLA for any variables ( $P > 0.05$ ). Perceived muscle soreness was increased immediately post (NZBC; 6  $\pm$  2 and PLA; 6  $\pm$  2) and had returned to baseline by 48 h, with no difference between NZBC and PLA ( $P = 0.404$ ). Perceived muscle fatigue was increased immediately post (NZBC; 7  $\pm$  2 vs. PLA; 6  $\pm$  2) and had returned to baseline by 48 h, with no difference between NZBC and PLA ( $P = 0.170$ ). **Conclusion:** NZBC extract did not accelerate recovery of CMJ variables or perceptions of muscle soreness or fatigue following a half-marathon in recreational runners, possibly because the event only induced modest changes in the indices of EIMD in the days after the event. **Acknowledgement:** We thank Health Currency Ltd (UK) and CurraNZ (NZ) for supplements.

**356** Board #194 May 29 9:30 AM - 11:00 AM  
**New Zealand Blackcurrant Extract Increases Circulating Hsp32 And Hsp90 $\alpha$  But Doesn'T Affect Circulating Hsp72**

Ben J. Lee<sup>1</sup>, Tessa R. Flood<sup>1</sup>, Ania M. Hiles<sup>1</sup>, Ella F. Walker<sup>1</sup>, Lucy Wheeler<sup>1</sup>, Kimberly M. Ashdown<sup>1</sup>, Mark ET Willems<sup>1</sup>, Matthew R. Kuennen<sup>2</sup>. <sup>1</sup>University of Chichester, Chichester, United Kingdom. <sup>2</sup>High Point University, High Point, NC.  
 Email: b.lee@chi.ac.uk

*(No relevant relationships reported)*

Extracellular heat shock protein 72 (eHSP72) acts as an inflammatory molecule, inducing cytokine production in immune cells, whereas HSP90 $\alpha$  is implicit in recovery and adaptation to cellular stress. Heme oxygenase-1 (eHSP32) protects the vasculature and suppresses inflammation. Each are elevated following exertional heat stress. Polyphenols are proposed to have anti-inflammatory properties, so may affect eHSP responses to exercise. **Purpose:** To determine the effects of 7-days supplementation with New Zealand blackcurrant (NZBC) extract on eHSP72, eHSP90 $\alpha$ , and eHSP32 before and after exertional heat stress. **Methods:** In a randomized double-blind design, 12 men (Age: 28 $\pm$ 6 years, stature: 1.81 $\pm$ 0.07 m, mass: 80.5 $\pm$ 9.8 kg, VO<sub>2max</sub>: 55.6 $\pm$ 6.0 mL $\cdot$ kg<sup>-1</sup> $\cdot$ min<sup>-1</sup>) completed 2 trials. Participants ingested 2x300 mg day<sup>-1</sup> capsules of CurraNZ<sup>TM</sup> (each containing 105 mg anthocyanin) or a visually matched placebo for 7 days (washout 14 days). On day 7, participants ran 60 minutes at 65%VO<sub>2max</sub> in hot ambient conditions (34 $^{\circ}$ C and 40% relative humidity). eHSP72, eHSP90 $\alpha$ , and eHSP32 were measured in EDTA plasma at rest and 20 and 60 minutes after exercise. **Results:** Post exercise eHSP72 concentrations were elevated after the placebo [by 1.98 ng mL<sup>-1</sup> (95% CI: 0.65 - 3.33 ng mL<sup>-1</sup>)] and NZBC trials [by 1.59 ng mL<sup>-1</sup> (95% CI: 0.03 - 3.15 ng mL<sup>-1</sup>)] and remained elevated 60 minutes after exercise [Placebo: by 0.68 ng mL<sup>-1</sup> (95% CI: -0.07 - 1.46 ng mL<sup>-1</sup>); NZBC by 0.51 ng mL<sup>-1</sup> (95% CI: -0.37 - 1.40 ng mL<sup>-1</sup>)]. Basal eHSP90 $\alpha$  concentration was increased following NZBC supplementation [by 5.60 ng mL<sup>-1</sup> (1.85 - 9.51 ng mL<sup>-1</sup>), trial x time interaction,  $F = 3.57$ ,  $p = 0.046$ ,  $np_2 = 0.25$ ], and were elevated at 20 and 60 minutes post exercise in both conditions. Similarly, basal eHSP32 was elevated after NZBC supplementation [by 3.9 ng mL<sup>-1</sup> (95% CI: 0.37 - 7.42 ng mL<sup>-1</sup>), trial x time interaction  $F = 5.62$ ,  $p = 0.01$ ,  $np_2 = 0.34$ ], but were not altered at 20 or 60 minutes after heat stress in either condition. **Conclusion:** We present moderate evidence to support that 7 days of NZBC extract supplementation increases basal eHSP32 and eHSP90 $\alpha$ , with no effect on eHSP72 before or after exercise. Further research is required to determine the functional relevance of these increases. **Acknowledgement:** We thank Health Currency Ltd (UK) and CurraNZ (NZ) for supplements.

**357** Board #195 May 29 9:30 AM - 11:00 AM  
**Does Supplementation With Pedicoccus Acidilactici Probiotics Alter Inflammatory Response To Exercise On Consecutive Days?**

John H. Curtis, Asheal A. Davis, Elizabeth A. Tanner, Melody A. Gary, Jakob L. Vingren, FACSM, Brian K. McFarlin, FACSM. *University of North Texas, Denton, TX.* (Sponsor: Brian McFarlin, FACSM)  
 Email: john.curtis@unt.edu

*(No relevant relationships reported)*

Oral supplementation with probiotics has been reported to treat a variety of common gastrointestinal conditions (i.e. IBS, IBD, etc.); however, probiotics have not been studied for potential sport nutrition applications. Management of post-exercise inflammation, particularly on consecutive days poses a unique challenge to the body and effects future training and performance. **PURPOSE:** The purpose of this study was to investigate if a novel plant based, non-spore forming high temperature (up to 85 $^{\circ}$ C) and acid resistant probiotic strain (*Pedicoccus acidilactici*; NRRL B-50517) may alter post-exercise inflammation. **METHODS:** Subjects were consented for participation using a University IRB approved informed consent form. Subjects were supplemented with either probiotic condition (*Pedicoccus acidilactici*; NRRL B-50517, 8 billion cfu per day; N=6) or placebo condition (maltodextrin; N=5) for 14-d prior to two consecutive days of 45-min of intense, interval exercise (intervals of ladder climbing, cycling, and downhill running). Subjective muscle soreness and muscle strength were

evaluated using a visual analog scale and isokinetic dynamometer respectively. Venous blood samples were collected prior to exercise and 48-h after the final exercise day. Samples were analyzed in duplicate using separate bead-based assays to measure cytokines and myokines (Milliplex®; Millipore-Sigma). Sample preps were analyzed using a multiplex analyzer (Luminex LX200). **RESULTS:** There were trends toward reduced MIP-1 $\alpha$ , MIP-1 $\beta$ , and IL-8 in probiotic compared to placebo during recovery from exercise. There were no obvious trends in any additional outcome measures.

**CONCLUSIONS:** These data support the concept that probiotics may be useful for managing the trafficking of monocytes and other phagocytes during exercise-induced inflammatory responses. More research is needed to determine if a more extensive exercise model may be capable of eliciting probiotic associated improvements in post-exercise inflammation.

**358 Board #196 May 29 9:30 AM - 11:00 AM**  
**Combined Dietary Polyphenol Supplementation Reduces Inflammation Associated Gene Expression Following a Half Marathon Race**

Elizabeth A. Tanner, Melody A. Gary, Asheal A. Davis, Brian K. McFarlin, FACSM. *University of North Texas, Denton, TX.* (Sponsor: Brian McFarlin, FACSM)  
 Email: elizabeth.tanner@unt.edu  
 (No relevant relationships reported)

Prolonged endurance exercise provides a unique model for investigating skeletal muscle damage through the combined effects of oxidative stress and eccentric muscle contraction on differential gene expression with nutritional interventions known to blunt inflammation. Dietary polyphenols (i.e. curcumin, pomegranate, etc.) have been shown to reduce exercise-induced inflammation associated mRNA and protein expression with fewer side effects than NSAIDs. **PURPOSE:** To investigate the effect of a combined curcumin (500-1000 mg/d; Longvida) and pomegranate extract (500-1000 mg/d; Pomella) supplement for 30-days on mRNA expression following a half marathon race. **METHODS:** All protocols were approved by the University IRB committee and participants gave written informed consent. Participants supplemented for 30-days prior to running a half marathon race with either the active (N=6) or no supplement (N=6). Venous blood samples were collected in PAXgene RNA tubes 24-h before (PRE) and 4-h after completing a half marathon. After collection, tubes were stored frozen at -80°C until RNA isolation. PAXgene whole blood was thawed and isolated using a PAXgene Blood miRNA sample processing system (PreAnalytiX) along with a QIAcube automation system (Qiagen). Isolated RNA was analyzed using a 594-plex Human Immunology Panel on a NanoString nCounter platform. Data were normalized to housekeeper genes and reported as log<sub>2</sub> fold change. Detailed pathway and interaction analysis was conducted using Nanostring nSolver software to identify RNA that were significantly affected by the supplement. **RESULTS:** Analysis revealed significant down regulation of nine pro-inflammatory associated mRNA at 4-h post-race with supplementation compared to control. **CONCLUSIONS:** Combined curcumin and pomegranate extract supplementation altered expression of inflammation associated mRNA prior to and following a half marathon race. Based on these findings, it appears that curcumin and pomegranate extract supplementation may positively affect short-term inflammatory response and recovery in endurance athletes and recreationally active individuals participating in half marathon races. More research is needed to determine how to best use these dietary polyphenols as part of a long-term training plan.

**359 Board #197 May 29 9:30 AM - 11:00 AM**  
**Mood: There Are Some Connection Between Probiotics Supplementation On Marathon Runners? A Double Blind Study**

Geovana SF Leite<sup>1</sup>, Valdir de Aquino Lemos<sup>2</sup>, Helena A P Batatinha<sup>1</sup>, Edgar Tavares<sup>2</sup>, Ayane S. Resende<sup>1</sup>, Ricardo A. Fock<sup>1</sup>, José C R Neto<sup>1</sup>, Ronaldo V T dos Santos<sup>2</sup>, Antonio H. Lancha Junior<sup>1</sup>. <sup>1</sup>*University of São Paulo, São Paulo, Brazil.* <sup>2</sup>*Federal University of São Paulo, São Paulo, Brazil.*  
 Email: geovana.leite@usp.br  
 (No relevant relationships reported)

Prolonged exercise may cause Gastrointestinal Symptoms (GIS) as well as rise some negative affects, which may be mitigated by probiotics according to evidences.

**PURPOSE:** Investigate the probiotic effect on mood and GIS after a marathon race. **METHODS:** Twenty seven marathonists were double-blind randomly assigned to either a probiotic group (PR) (35,96 ± 5,81 years, 79,30 ± 10,99 Kg) or placebo (PL) (PL=13 40,46 ± 7,79 years, 72,67 ± 10,20 Kg). PR consumed during 30 days a sachet containing *Lactobacillus Acidophilus* and *Bifidobacterium Lactis* (10x10<sup>9</sup>UFC + maltodextrin 5g/day) while PL received a sachet with maltodextrin (5g/day). GIS were evaluated before the supplementation period (B) and one day before the race (1D) by questionnaires. Brunel Mood Scale (BRUMS) was applied at the B, immediately after the race (AR) and one hour after the race (1H). The data were analyzed in SPSS version 25® using ANOVA two way with repeated measures, "group" and "time"

as factors, and Tukey's post-hoc test ( $p < 0.05$ ). Results were expressed as means ± standard deviation (SD). **RESULTS:** GIS were not different after the supplementation period or between groups. According to BRUMS, PL group showed significant increase of depression (B: 0.23±0.43; AR: 1.30±2.01; 1H: 1±0), anger (B: 0±0; AR: 6.61 ± 1.51; 1H: 5.53±1.33), fatigue (B: 0.69±1.54; AR: 12.15±0.98; 1H: 7.30±0.75), tension (B: 1.46±2.06; AR: 6.38±0.65; 1H: 3.84±0.37) and mental confusion (B: 0.53±0.77; AR: 4.46±0.51; 1H: 2.92±0.27) and decrease of vigor (B: 10.30±2.25; AR: 2±0.91; 1H: 6.76±1.30) when compared with B, AR and 1H. Probiotic group shown significant increase of anger (B: 0,21±0,42; AR: 1,21±0,89; H: 0,14±0,36), fatigue (B: 1±0,87; AR: 4,28±1,43; 1H: 0,71±0,72), tension (B: 0,92±1,20; AR: 1,42±0,64; 1H: 0,71±1,13) and mental confusion (B: 0,28±0,46; AR: 0,42±0,51; 1H: 0,42±0,64) when compared B, AR and 1H. Between groups, for all mood parameters, PL showed significant increase at AR and 1H compared to PR ( $p < 0.05$ ). **CONCLUSION:** *Lactobacillus Acidophilus* and *Bifidobacterium Lactis* (10x10<sup>9</sup>UFC/day) consumption did not seem to have effect on GIS, but it plays a positive role on mood affects in order to attenuating the increase of negative affects and maintaining the vigor state which may influence sport performance. **Financial Support:** CNPq, CAPES/PROEX.

**360 Board #198 May 29 9:30 AM - 11:00 AM**  
**No Acute Effects of Placebo or Open-Label Placebo Supplementation on Strength and Neuromuscular Fatigue**

Dennis P. Kwon, Alina P. Swafford, David H. Fukuda, Jeffrey R. Stout, Matt S. Stock. *University of Central Florida, Orlando, FL.*  
 Email: dkwongolf@knights.ucf.edu  
 (No relevant relationships reported)

**PURPOSE:** We utilized a repeated measures design to examine the acute effects of placebo, open-label placebo, and control treatments on muscle strength and voluntary activation (Experiment #1), as well as neuromuscular fatigue (Experiment #2).

**METHODS:** Following a familiarization session, 21 untrained males ( $n = 11$ ) and females ( $n = 10$ ) visited the laboratory on three occasions to receive placebo, open-label placebo, and control treatments in a randomized, counter-balanced manner. All visits involved a pretest, 15-minute intervention period, and posttest. All visits were at the same time of day. The time between sessions was  $\geq 48$  hours but  $< 1$  week. Laboratory conditions were constant throughout the study, and participants were asked to keep their physical activity levels, dietary habits, and caffeine consumption consistent. In Experiment #1, knee extensor maximal voluntary isometric contraction (MVIC) peak torque and percent voluntary activation were evaluated. In Experiment #2, participants performed 20, six-second MVICs while surface electromyographic signals were detected from the vastus lateralis. Subjective assessments of energy and perceived exertion were also examined.

**RESULTS:** In Experiment #1, there were no differences among interventions for peak torque or voluntary activation, but a main effect revealed that energy levels increased following all treatments ( $p = .016$ ,  $\eta^2 = .257$ ). Experiment #2 demonstrated that placebo and open-label placebo treatments had no influence on neuromuscular fatigue, but there were main effects for declines in absolute ( $p = .001$ ,  $\eta^2 = .675$ ) and normalized peak torque ( $p = .001$ ,  $\eta^2 = .765$ ), normalized electromyographic mean frequency ( $p = .001$ ,  $\eta^2 = .565$ ), neuromuscular efficiency ( $p = .001$ ,  $\eta^2 = .585$ ), and energy levels ( $p = .006$ ,  $\eta^2 = .317$ ).

**CONCLUSIONS:** Compared to a control condition, placebo and open-label placebo treatments had minimal influence on muscle strength, voluntary activation, and fatigue resistance in untrained participants.

**361 Board #199 May 29 9:30 AM - 11:00 AM**  
**Evaluation of the Placebo Effect in Elite and Amateur Athletes**

Andressa F. de Abreu, Domingos R. Pandelo, Jr. *Centro de Alta Performance, Santos, Brazil.*  
 Email: andressaabreu\_82@hotmail.com  
 (No relevant relationships reported)

**Purpose:** The aim of the present study was to test the placebo effect effect. This was made possible by the research design. In this way the impact of the placebo effect could be effectively measured. **Methods:** 22 athletes were selected for the experiment. Out of this total 16 recreational and 6 elite. The test was performed on a cycle ergometer. The tests were performed in 2 days, with a 72-hour interval between one and the other. All tests were performed at the same time of the day. The load of the test was adjusted by the weight of the athlete to work with the same load relative to the weight (watt / kg). The load was kept fixed throughout the test and the test ended after exhaustion and voluntary request of the athlete. During the evaluation, the heart rate was continuously measured and the subjective perception of effort (Borg scale) was measured minute by minute. On the first day the athletes received 30 minutes before the test a supplement. This supplement was placebo. There was no ergogenic feature in the capsule, but they received the information that it was a new, very powerful supplement.