The effect of a novel keratin protein supplement vs. casein on lean body mass and exercise performance in male athletes

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Introduction: The protein Keratin, found in nails, feathers, and hair, is naturally high in the thiol-containing amino acid cysteine. Although its amino acid profile is nutritionally sound, these insoluble thiol bonds render keratin indigestible, and thus a poor quality protein. Hydrolysis methods that oxidise cysteine to cysteic acid vastly improve digestibility, creating the potential for a keratin-based protein as a high quality food supplement.

Further, cysteic acid's main metabolic product, taurine, may play significant roles in preventing skeletal muscle wasting and in muscle regeneration. Rats supplemented with a feather-based protein hydrolysate showed a significant increase in lean body mass (LBM) compared to their casein or pea protein fed counterparts. Furthermore, 2-weeks supplementation of this same keratin in humans found no adverse effects at intakes of up to 40 g/day. Since athletes require a high lean muscle to fat mass ratio for optimal training and performance, our study aimed to test the effects of 4-week keratin vs. casein supplementation on the body composition and performance of male athletes.

Methods: Nine trained male cyclists (mean age 29.5 years, range 18–42, mean weight 81 kg, range 62–120, mean height 180 cm, range 167–192, mean initial $VO_{2\ max}$ 62 ml kg min, range 39.2–81.3), recruited via advertising and word-of-mouth, completed a blinded, randomized, cross-over trial; keratin vs. casein supplementation. The two 4-week interventions were separated by a 2-month washout period. Nutritional intake was replicated across both trials, and training sessions were monitored. To determine body composition and aerobic performance, DEXA scans and an incremental exercise test, respectively, were taken before and after each trial. Protein was given daily at 0.8 g per kg of body weight in the form of bars and powder.

Results: A significant increase in mean LBM was observed in both casein and keratin over the 4-week trials ($p = 0.02$). There was a greater increase in mean LBM in the keratin trial, although it did not reach significance ($p = 0.14$). Mean maximal power output (MPO) increased from pre- to post- in both trials, with the casein trial showing a greater increase, although neither were significant ($p = 0.24$ and $p = 0.38$ respectively). No adverse symptoms, health or otherwise, were recorded by participants in either group.

Discussion: Sports-people may benefit from maintaining or increasing LMB. Our results indicate that a keratin-based protein supplement is equivalent to casein in terms of increasing LBM in trained male cyclists, and can be safely and comfortably consumed.

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24

The effects of carbohydrate-electrolyte drinks on physical and mental performance

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Introduction: The purpose of this research was to assess the efficacy of a novel carbohydrate-electrolyte (CE) drink on measures of physical and mental performance.

Methods: In this randomized control trial, participants were randomly selected to receive either the CE beverage or water. 20 college-aged participants (11 females, 9 males) performed a 30-min run on a 400-m track, followed by two Repeated Effort Anaerobic Sprint Test (RAST) protocols, which was proceeded by another 30-min run in order to assess physical performance. To assess mental performance, participants completed pre-tests prior to beginning the exercise protocol and post-tests prior to the final 30-min run of the Stroop Test and the Trail Making Test. Hydration was assessed at four intervals during the study.

Results: The groups were not significantly different in number of laps run during the first 30-min run, however, the CE group ran significantly more laps (9.2 for water, 11.5 for CE, $p = .045$) than the water group during the second 30-min run. On the first RAST test, the CE group had a smaller variation between the slowest and fastest sprint of .86 seconds, while the water group had a variation of 1.48 s between fastest and slowest run time ($p = .022$). There were no significant differences that existed in hydration or cognitive performance metrics between groups.

Discussion: Individuals that received the CE beverage performed markedly better on measures of aerobic and anaerobic performance. The markers of anaerobic fitness (RAST test) indicate that individuals in the CE group had less variance in sprint scores, which meant they were more consistent in their sprint performance than the water group. While prior research had associated cognitive performance with CE beverages, this study found no significant differences between groups on either the Stroop or Trail Making tests. In addition, hydration level in this study appeared to be related to volume of fluid consumed, rather than type of fluid consumed.

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25

Effects of nicotine on repeated anaerobic exercise

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Introduction: Nicotine was added to the World Anti-Doping Agency Monitoring list in 2012. There is not yet definitive evidence that nicotine can positively affect anaerobic performance and only limited data supporting benefit to endurance events. Despite this there is strong evidence suggestive of a doping trend among elite athletes. A varied route of administration and dosing may hold the key to replicating the positive results seen with endurance parameters. This study investigated the effects of nicotine, given through rapidly dissolving oral strips, on repeated anaerobic bouts, motor coordination and reaction time.

Methods: This study utilized a randomized, double-blind, placebo-controlled crossover design. 15 healthy, athletes (23.9 ± 5.4 years, 177 ± 9 cm, 80.3 ± 14.9 kg) were recruited from local sporting clubs. Each participant undertook four sessions (two familiarisation and two intervention sessions Thursday 13 October – placebo and nicotine) 2–7 days apart. Each session included baseline measurements (HR, BP, oxygen saturation, lactate) which were repeated post-intervention (5 mg nicotine via oral strips or placebo; Listerine breath strips) and post-exercise. A Batak protocol to assess reaction time and motor coordination was also undertaken at baseline and following exercise. Exercise testing included a 5 min warm up followed by two 30 s Wingate tests (7.5% body mass resistance) separated by 3 min. Data was collected for each Wingate bout and blood lactate collected 1, 3 and 5 min post-exercise with the peak valued analysed. Verbal encouragement