

**Modificado** em 31 Outubro 2012

**Physical signs of dehydration in the elderly.** Shimizu M, Kinoshita K, Hattori K, Ota Y, Kanai T, Kobayashi H, Tokuda Y. Intern Med (Tokyo) 2012;51(10):1207-10.

It is widely recognised that dehydration is a common condition in the elderly and that it is a frequent cause of hospitalization among older people, in spite of efforts by caregivers to prevent its development. Successful prevention strategies will require early identification of individuals at increased risk, which in turn means that knowledge of simple but reliable signs of mild dehydration is required. In this study, various physical signs were examined as clinical signs of dehydration in elderly. In this study, 27 consecutive elderly patients who were admitted to the Department of Medicine were evaluated. Based on a definition of dehydration as a calculated serum osmolality of more than 295 mOsm/kg, 9 patients were classified as dehydrated (mean osmolality of 310 mOsmol/kg) and 18 as non-dehydrated (mean osmolality of 279 mOsmol/kg). All patients were observed for physical signs of dehydration: decreased consciousness level; dry axilla; dry mouth; sunken eyes; decreased skin turgor; delayed capillary refill time. Blood and urine chemistry analyses were also compared between the two groups. For the physical signs, dry axilla had moderate sensitivity (44%) and good specificity (89%) to detect dehydration. Sunken eyes and delayed capillary refill time also showed relatively good specificity (83%). As expected, the mean serum sodium concentration in the dehydrated group (146 mmol/l) was higher ( $p < 0.05$ ). In 12 runners attaining peak  $T_{re}$   $\geq 39.8$  degrees C, running speed did not differ significantly when  $T_{re}$  was below or above this threshold ( $208 \pm 15$  vs.  $205 \pm 24$  m min<sup>-1</sup>;  $P = 0.532$ ). Running velocity was the main significant predictor variable of  $T_{re}$  at 21 km ( $R^2 = 0.42$ ,  $P < 0.05$ ) and normothermic runners ( $T_{re}$ ).

### **Effect of milk-based carbohydrate-protein supplement timing on the attenuation of exercise-induced muscle damage**

Emma Cockburn, Emma Stevenson, Philip R. Hayes, Paula Robson-Ansley, and Glyn Howatson: *Appl. Physiol. Nutr. Metab.* 35(3): 270–277 (2010).

Exercise-induced muscle damage (EIMD) leads to decrements in muscle performance and increases in intramuscular enzymes measured in the plasma, and to delayed onset of muscle soreness (DOMS), partly due to the activation of degradative pathways. It has been shown that milk-based carbohydrate-protein (CHO-P) can limit changes in markers of EIMD, possibly by attenuating protein degradation and (or) increasing protein synthesis. However, the timing of supplementation has received limited attention, and this may alter the response. This study examined the effects of acute milk-based CHO-P supplementation timing on the attenuation of EIMD. Four independent matched groups of 8 healthy males consumed milk-based CHO-P before (PRE), immediately after (POST), or 24 h after (TWENTY-FOUR) muscle-damaging exercise. Active DOMS, isokinetic muscle performance, reactive strength index (RSI), and creatine kinase (CK) were assessed immediately before and 24, 48, and 72 h after EIMD. POST and TWENTY-FOUR demonstrated a benefit in limiting changes in active DOMS, peak torque, and RSI over 48 h, compared with PRE. PRE showed a possible benefit in reducing increases in CK over 48 h and limiting changes in other variables over 72 h. Consuming milk-based CHO-P after muscle-damaging exercise is more beneficial in attenuating decreases in muscle performance and increases in active DOMS at 48 h than ingestion prior to exercise.

### **On-ice sweat rate, voluntary fluid intake, and sodium balance during practice in male junior ice hockey players drinking water or a carbohydrate-electrolyte solution.**

Palmer MS, Logan HM, Spriet LL.: *Applied Physiology, Nutrition, and Metabolism*, 2010, 35(3): 328-35

Language: eng

Country: Canada

Department of Human Health and Nutritional Sciences, University of Guelph, ON N1G 2W1, Canada.

This study evaluated the repeatability of hydration and sweat measurements taken during on-ice hockey practices with players drinking only water, and determined whether having only a carbohydrate-electrolyte solution (CES) to drink during practices decreased fluid intake or affected other hydration and (or) sweat measures. All testing was conducted on elite players of an Ontario Hockey League team ( $\pm$ -SE; mean age, 17.6  $\pm$  0.3 years; mean height, 182.9  $\pm$  1.4 cm; mean body mass, 83.0  $\pm$  1.7 kg). Players were studied 3 times over the course of 6 weekly on-ice practices ( $\pm$ -SE; mean playing time, 1.58  $\pm$  0.07 h; mean temperature, 11.4  $\pm$  0.8 degrees C; mean relative humidity, 52%  $\pm$  3%). There was strong repeatability of the measured hydration and sweat parameters between 2 similar on-ice practices when players drank only water. Limiting the players to drinking only a CES (as opposed to water) did not decrease fluid intake during practice ( $\pm$ -SE; mean CES intake, 0.72  $\pm$  0.07 L.h<sup>-1</sup> vs. mean water intake, 0.82  $\pm$  0.08 L.h<sup>-1</sup>) or affect sweat rate (1.5  $\pm$  0.1 L.h<sup>-1</sup> vs. 1.5  $\pm$  0.1 L.h<sup>-1</sup>), sweat sodium concentration (72.4  $\pm$  5.6 mmol.L<sup>-1</sup> vs. 73.0  $\pm$  4.4 mmol.L<sup>-1</sup>), or percent body mass loss (1.1%  $\pm$  0.2% vs. 0.9%  $\pm$  0.2%). Drinking a CES also improved sodium balance (-2.1  $\pm$  0.2 g.h<sup>-1</sup> vs. -2.6  $\pm$  0.3 g.h<sup>-1</sup>) and provided the players with a significant carbohydrate (43  $\pm$  4 g.h<sup>-1</sup> vs. 0  $\pm$  0 g.h<sup>-1</sup>) during practice. In summary, a single field sweat test during similar on-ice hockey practices in male junior hockey players is sufficient to evaluate fluid and electrolyte balance. Also, a CES does not affect voluntary fluid intake during practice, compared with water, in these players. The CES provided some salt to offset the salt lost in sweat, and carbohydrate, which may help maintain physical and mental performance in the later stages of practice.

### **Beneficial effects of ice ingestion as a precooling strategy on 40-km cycling time-trial performance.**

Ihsan M, Landers G, Brearley M, Peeling P.: International Journal of Sports Physiology and Performance

201006 5(2):140-51 .School of Sport Science, Exercise and Health, University of Western Australia, Crawley, WA, Australia.

**Purpose:** The effect of crushed ice ingestion as a precooling method on 40-km cycling time trial (CTT) performance was investigated.

**Methods:** Seven trained male subjects underwent a familiarization trial and two experimental CTT which were preceded by 30 min of either crushed ice ingestion (ICE) or tap water (CON) consumption amounting to 6.8 g x kg<sup>(-1)</sup> body mass. The CTT required athletes to complete 1200 kJ of work on a wind-braked cycle ergometer. During the CTT, gastrointestinal (Tgi) and skin (Tsk) temperatures, cycling time, power output, heart rate (HR), blood lactate (BLa), ratings of perceived exertion (RPE) and thermal sensation (RPTS) were measured at set intervals of work.

#### **Results**

: Precooling lowered the Tgi after ICE significantly more than CON (36.74 +/- 0.67 degrees C vs 37.27 +/- 0.24 degrees C, P .05). The CTT completion time was 6.5% faster in ICE when compared with CON (ICE: 5011 +/- 810 s, CON: 5359 +/- 820 s, P

#### **Conclusions**

: Crushed ice ingestion was effective in lowering Tgi and improving subsequent 40-km cycling time trial performance. The mechanisms for this enhanced exercise performance remain to be clarified.

## **Increase of total body water with decrease of body mass while running 100 km nonstop--formation of edema?**

Knechtle B, Wirth A, Knechtle P, Rosemann T.: Research Quarterly for Exercise and Sport, 2009, 80(3):593-603 . St. Gallen Health Center, St. Gallen, Switzerland.

We investigated whether ultraendurance runners in a 100-km run suffer a decrease of body mass and whether this loss consists of fat mass, skeletal muscle mass, or total body water. Male ultrarunners were measured pre- and postrace to determine body mass, fat mass, and

skeletal muscle mass by using the anthropometric method. In addition, bioelectrical impedance analysis was used to determine total body water, and urinary (urinary specific gravity) and hematological parameters (hematocrit and plasma sodium) were measured in order to determine hydration status. Body mass decreased by 1.6 kg (p

### **Can changes in body mass and total body water accurately predict hyponatremia after a 161-km running race?**

Lebus DK, Casazza GA, Hoffman MD, Van Loan MD.: Clinical Journal of Sport Medicine , 2010, 20(3):193-9

Sports Medicine Program, University of California Davis Medical Center, Sacramento, California, USA.

**Objectives:** To relate changes in body mass, total body water (TBW), extracellular fluid (ECF), and serum sodium concentration ([Na]) from a 161-km ultramarathon to finish time and incidence of hyponatremia. **Design:** Observational. **Setting::** The 2008 Rio Del Lago 100-Mile (161-km) Endurance Run in Granite Bay, California.

**Participants**

: Forty-five runners. **MAIN OUTCOME MEASUREMENTS:** Pre-race and post-race body mass, TBW, ECF, and serum [Na].

**Results**

: Body mass and serum [Na] significantly decreased 2% to 3% (P

**Conclusions**

: Hyponatremia occurred in over half of the 161-km ultramarathon finishers but was not predicted by change in body mass. The combination of pre-race TBW and percentage changes in TBW and ECF explained 87.5% of the variation in the incidence of hyponatremia. **CLINICAL SIGNIFICANCE:** Exercise-associated hyponatremia can occur simultaneously with dehydration

and cannot be predicted by weight checks at races.

### **Effect of various carbohydrate-electrolyte fluids on cycling performance and maximal voluntary contraction.**

Ganio MS, Klau JF, Lee EC, Yeargin SW, McDermott BP, Buyckx M, Maresh CM, Armstrong LE.: International Journal of Sport Nutrition and Exercise Metabolism, 2010, 20(2):104-14. Human Performance Laboratory, University of Connecticut, Storrs, CT, USA.

The purpose of this study was to compare the effects of a carbohydrate-electrolyte plus caffeine, carnitine, taurine, and B vitamins solution (CE+) and a carbohydrate-electrolyte-only solution (CE) vs. a placebo solution (PLA) on cycling performance and maximal voluntary contraction (MVC). In a randomized, double-blind, crossover, repeated-measures design, 14 male cyclists (M  $\pm$  SD age 27  $\pm$  6 yr, VO<sub>2</sub>max 60.4  $\pm$  6.8 ml  $\times$  kg<sup>-1</sup>  $\times$  min<sup>-1</sup>) cycled for 120 min submaximally (alternating 61%  $\pm$  5% and 75%  $\pm$  5% VO<sub>2</sub>max) and then completed a 15-min performance trial (PT). Participants ingested CE+, CE, or PLA before (6 ml/kg) and every 15 min during exercise (3 ml/kg). MVC was measured as a single-leg isometric extension (70 degree knee flexion) before (pre) and after (post) exercise. Rating of perceived exertion (RPE) was measured throughout. Total work accumulated (KJ) during PT was greater (p

### **Glycemic index and endurance performance.**

Donaldson CM, Perry TL, Rose MC.: International Journal of Sport Nutrition and Exercise

Metabolism,

2010, 20(2):154-65. States Dept. of Human Nutrition, University of Otago, Dunedin, New Zealand.

The aim of this review is to provide an up-to-date summary of the evidence surrounding glycemic index (GI) and endurance performance. Athletes are commonly instructed to consume low-GI (LGI) carbohydrate (CHO) before exercise, but this recommendation appears to be based on the results of only a few studies, whereas others have found that the GI of CHO ingested before exercise has no impact on performance. Only 1 study was designed to directly investigate the impact of the GI of CHO ingested during exercise on endurance performance. Although the results indicate that GI is not as important as consuming CHO itself, more Research in this area is clearly needed. Initial Research investigating the impact of GI on postexercise recovery indicated consuming high-GI (HGI) CHO increased muscle glycogen resynthesis. However, recent studies indicate an interaction between LGI CHO and fat oxidation, which may play a role in enhancing performance in subsequent exercise. Despite the fact that the relationship between GI and sporting performance has been a topic of Research for more than 15 yr, there is no consensus on whether consuming CHO of differing GI improves endurance performance. Until further well-designed Research is carried out, athletes are encouraged to follow standard recommendations for CHO consumption and let practical issues and individual experience dictate the use of HGI or LGI meals and supplements before, during, and after exercise.

### **An isocaloric glucose-fructose beverage's effect on simulated 100-km cycling performance compared with a glucose-only beverage.**

Triplett D, Doyle JA, Rupp JC, Benardot D.: International Journal of Sport Nutrition and Exercise Metabolism, 2010, 20(2):122-31. Dept. of Kinesiology and Health, Georgia State University, Atlanta, GA.

A number of recent Research studies have demonstrated that providing glucose and fructose together in a beverage consumed during exercise results in significantly higher oxidation rates

of exogenous carbohydrate (CHO) than consuming glucose alone. However, there is insufficient evidence to determine whether the increased exogenous CHO oxidation improves endurance performance. The purpose of this study was to determine whether consuming a beverage containing glucose and fructose (GF) would result in improved cycling performance compared with an isocaloric glucose-only beverage (G). Nine male competitive cyclists ( $32.6 \pm 5.8$  years, peak oxygen uptake  $61.5 \pm 7.9$  ml  $\times$  kg<sup>-1</sup>  $\times$  min<sup>-1</sup>) completed a familiarization trial and then 2 simulated 100-km cycling time trials on an electronically braked Lode cycle ergometer separated by 5-7 d. During the randomly ordered experimental trials, participants received 36 g of CHO of either G or GF in 250 ml of water every 15 min. All 9 participants completed the 100-km time trial significantly faster when they received the GF beverage than with G ( $204.0 \pm 23.7$  vs.  $220.6 \pm 36.6$  min;  $p = .023$ ). There was no difference at any time point between trials for blood glucose or for blood lactate. Total CHO oxidation increased significantly from rest during exercise but was not statistically significant between the GF and G trials, although there was a trend for CHO oxidation to be higher with GF in the latter stages of the time trial. Consumption of a CHO beverage containing glucose and fructose results in improved 100-km cycling performance compared with an isocaloric glucose-only beverage.

### **Influence of beverage temperature on exercise performance in the heat: a systematic review.**

Burdon CA, O'Connor HT, Gifford JA, Shirreffs SM.: International Journal of Sport Nutrition and Exercise Metabolism, 2010, 20(2):166-74.

States

Discipline of Exercise and Sport Science, University of Sydney, Sydney, Australia.

**PURPOSE:** Increased core temperature ( $T_{(c)}$ ), impaired cardiovascular function, and dehydration contribute to fatigue during prolonged exercise in the heat. Although many studies have examined mechanisms addressing these factors, few have investigated the effect of cold beverage temperature on thermoregulation and exercise performance in the heat. **METHODS:** Citations from MEDLINE (Ovid), Sport Discus (EBSCOhost), AUSPORT and AusportMed (Informit), Web of Science, and SCOPUS were identified from the earliest record until September 2008 using the search terms: drink temperature, beverage temperature, fluid temperature, water temperature, and cold fluid combined with body temperature and



thermoregulation. To be included, studies needed to assess core or rectal temperature during exercise in moderate or hot environmental conditions. After quality rating was completed by two reviewers, the difference in mean T<sub>c</sub> and exercise performance was calculated. **RESULTS:** Ten studies meeting search inclusion criteria were available for analysis. Three were excluded because sufficient detail or statistical data were not reported. A meta-analysis was not performed because the studies were deemed too different to group. Three of the remaining 7 studies found modulated T(c) with cold beverage consumption, and from the 4 that conducted exercise performance tests, performance improved by 10% with cold fluids. **CONCLUSION:** Cold fluid may attenuate T(c) rise and improve exercise performance in the heat; however, study findings are mixed. Research using well-trained athletes and fluid-ingestion protocols replicating competition scenarios is required. Potential sensory effects of cold fluid in maintaining motivation also need to be assessed as a mechanism underpinning improved performance.

### **Fluid consumption and sweating in National Football League and collegiate football players with different access to fluids during practice.**

Godek SF, Bartolozzi AR, Peduzzi C, Heinerichs S, Garvin E, Sugarman E, Burkholder R.: Journal of Athletic Training

,  
2010 Mar-Apr  
45(2):128-35.

Chester University, West Chester, PA 19383, USA.

Hypothesis: Considerable controversy regarding fluid replacement during exercise currently exists. Objective: To compare fluid turnover between National Football League (NFL) players who have constant fluid access and collegiate football players who replace fluids during water breaks in practices. Design: Observational study. Setting:

Respective preseason training camps of 1 National Collegiate Athletic Association Division II (DII) football team and 1 NFL football team. Both morning and afternoon practices for DII players were 2.25 hours in length, and NFL players practiced for 2.25 hours in the morning and 1 hour in the afternoon. Environmental conditions did not differ.

Patients and other participants

: Eight NFL players (4 linemen, 4 backs) and 8 physically matched DII players (4 linemen, 4 backs) participated. Intervention(s): All players drank fluids only from their predetermined individual containers. The NFL players could consume both water and sports drinks, and the DII players could only consume water.

Main outcome measure(s)

: We measured fluid consumption, sweat rate, total sweat loss, and percentage of sweat loss replaced. Sweat rate was calculated as change in mass adjusted for fluids consumed and urine produced.

Results

: Mean sweat rate was not different between NFL ( $2.1 \pm 0.25$  L/h) and DII ( $1.8 \pm 0.15$  L/h) players ( $F(1,12) = 2$ ,  $P = .18$ ) but was different between linemen ( $2.3 \pm 0.2$  L/h) and backs ( $1.6 \pm 0.2$  L/h) ( $t(14) = 3.14$ ,  $P = .007$ ). We found no differences between NFL and DII players in terms of percentage of weight loss ( $t(7) = -0.03$ ,  $P = .98$ ) or rate of fluid consumption ( $t(7) = -0.76$ ,  $P = .47$ ). Daily sweat loss was greater in DII ( $8.0 \pm 2.0$  L) than in NFL ( $6.4 \pm 2.1$  L) players ( $t(7) = -3$ ,  $P = .02$ ), and fluid consumed was also greater in DII ( $5.0 \pm 1.5$  L) than in NFL ( $4.0 \pm 1.1$  L) players ( $t(7) = -2.8$ ,  $P = .026$ ). We found a correlation between sweat loss and fluids consumed ( $r = 0.79$ ,  $P$

Conclusions

: During preseason practices, the DII players drinking water at water breaks replaced the same volume of fluid (66% of weight lost) as NFL players with constant access to both water and sports drinks.

## **Thermoregulatory responses and hydration practices in heat-acclimatized adolescents during preseason high school football.**

Yeargin SW, Casa DJ, Judelson DA, McDermott BP, Ganio MS, Lee EC, Lopez RM, Stearns RL, Anderson JM, Armstrong LE, Kraemer WJ, Maresh CM.: Journal of Athletic Training, 2010 Mar-Apr 45(2):136-46. Indiana State University, Terre Haute, IN 47809, USA.

Context: Previous researchers have not investigated the thermoregulatory responses to multiple consecutive days of American football in adolescents. Objective: To examine the thermoregulatory and hydration responses of high school players during formal preseason football practices.

Design  
:

n

Observational study.

Setting

: Players practiced outdoors in late August once per day on days 1 through 5, twice per day on days 6 and 7, and once per day on days 8 through 10. Maximum wet bulb globe temperature averaged 23 +/- 4 degrees C.

Patients and other participants

: Twenty-five heat-acclimatized adolescent boys (age = 15 +/- 1 years, height = 180 +/- 8 cm, mass = 81.4 +/- 15.8 kg, body fat = 12 +/- 5%, Tanner stage = 4 +/- 1).

Main outcome measure(s)

: We observed participants within and across preseason practices of football. Measures included gastrointestinal temperature (T(GI)), urine osmolality, sweat rate, forearm sweat composition, fluid consumption, testosterone to cortisol ratio, perceptual measures of thirst, perceptual measures of thermal sensation, a modified Environmental Symptoms Questionnaire, and knowledge questionnaires assessing the participants' understanding of heat illnesses and hydration. Results were analyzed for differences across time and were compared between younger (14-15 years, n = 13) and older (16-17 years, n = 12) participants.

Results

: Maximum daily T(GI) values remained less than 40 degrees C and were correlated with maximum wet bulb globe temperature ( $r = 0.59$ ,  $P = .009$ ). Average urine osmolality indicated that participants generally experienced minimal to moderate hypohydration before (881 +/- 285 mOsmol/kg) and after (856 +/- 259 mOsmol/kg) each practice as a result of replacing approximately two-thirds of their sweat losses during exercise but inadequately rehydrating between practices. Age did not affect most variables; however, sweat rate was lower in younger participants (0.6 +/- 0.2 L/h) than in older participants (0.8 +/- 0.1 L/h) ( $F(1,18) = 8.774$ ,  $P = .008$ ).

Conclusions

: Previously heat-acclimatized adolescent boys (T(GI)

## **Influence of hydration on physiological function and performance during trail running in the heat.**

Casa DJ, Stearns RL, Lopez RM, Ganio MS, McDermott BP, Walker Yeargin S, Yamamoto LM, Mazerolle SM, Roti MW, Armstrong LE, Maresh CM.: Journal of Athletic Training, 2010 Mar-Apr 45(2):147-56.

Department of Kinesiology, University of Connecticut, Storrs, CT 06269-1110, USA.

**Context:** Authors of most field studies have not observed decrements in physiologic function and performance with increases in dehydration, although authors of well-controlled laboratory studies have consistently reported this relationship. Investigators in these field studies did not control exercise intensity, a known modulator of body core temperature. **Objective:** To directly examine the effect of moderate water deficit on the physiologic responses to various exercise intensities in a warm outdoor setting.

**Design**

: Semirandomized, crossover design.

**Setting**

: Field setting. Patients or Other

**Participants**

: Seventeen distance runners (9 men, 8 women; age = 27 +/- 7 years, height = 171 +/- 9 cm, mass = 64.2 +/- 9.0 kg, body fat = 14.6% +/- 5.5%).

**Intervention**

(s): Participants completed four 12-km runs (consisting of three 4-km loops) in the heat (average wet bulb globe temperature = 26.5 degrees C): (1) a hydrated, race trial (HYR), (2) a dehydrated, race trial (DYR), (3) a hydrated, submaximal trial (HYS), and (4) a dehydrated, submaximal trial (DYS).

**Main Outcome Measure(s):**

For DYR and DYS trials, dehydration was measured by body mass loss. In the submaximal trials, participants ran at a moderate pace that was matched by having them speed up or slow down based on pace feedback provided by researchers. Intestinal temperature was recorded using ingestible thermistors, and participants wore heart rate monitors to measure heart rate.

**Results**

: Body mass loss in relation to a 3-day baseline was greater for the DYR (-4.30% +/- 1.25%) and DYS trials (-4.59% +/- 1.32%) than for the HYR (-2.05% +/- 1.09%) and HYS (-2.0% +/- 1.24%) trials postrun (P

**Conclusions**

: A small decrement in hydration status impaired physiologic function and performance while trail running in the heat.

## **Maintained total body water content and serum sodium concentrations**

**despite body mass loss in female ultra-runners drinking ad libitum during a 100 km race.**

Knechtle B, Senn O, Imoberdorf R, Joleska I, Wirth A, Knechtle P, Rosemann T.: Asia Pacific Journal of Clinical Nutrition, 2010  
19(1):83-90.  
Facharzt FMH für Allgemeinmedizin, Gesundheitszentrum St. Gallen, Vadianstrasse 26, 9001 St. Gallen, Switzerland.

We investigated in 11 female ultra-runners during a 100 km ultra-run, the association between fluid intake and prevalence of exercise-associated hyponatremia in a cross-sectional study. Athletes drank ad libitum and recorded their fluid intake. They competed at 8.0 (1.0) km/h and finished within 762 (91) min. Fluid intake was 4.1 (1.3) L during the race, equal to 0.3 (0.1) L/h. Body mass decreased by 1.5 kg (p

**The effects of progressive dehydration on strength and power: is there a dose response?**

Hayes LD, Morse CI.: European Journal of Applied Physiology, 2010, 108(4):701-7. Department of Exercise and Sports Science, Manchester Metropolitan University, Hassall Road, Alsager, ST7 2HL, UK.

This study examined the effect of exercise- and heat-induced dehydration on strength, jump capacity and neuromuscular function. Twelve recreationally active males completed six resistance exercise bouts (baseline and after each 5 exposure sessions) in an increasing state of hypohydration obtained by repeated heat exposure and exercise sessions (5 periods of 20 min jogging at up to approximately 80% age predicted heart rate maximum at 48.5  $\pm$  0.48 degrees C, relative humidity 50  $\pm$  4%). Relative to starting values, body mass decreased 1.0  $\pm$  0.5, 1.9  $\pm$  0.7, 2.6  $\pm$  0.8, 3.3  $\pm$  0.9 and 3.9  $\pm$  1.0% after exposure 1, 2, 3, 4 and 5, respectively. However, plasma volume remained constant. No significant differences existed amongst trials in vertical jump height, electromyography data or isokinetic leg extension at a

rate of 120 degrees s(-1). Isometric leg extensions were significantly reduced (P

### **Carbohydrate exerts a mild influence on fluid retention following exercise-induced dehydration.**

Osterberg KL, Pallardy SE, Johnson RJ, Horswill CA.: Journal of Applied Physiology, 2010, 108 (2):245-50.

Gatorade Sports Science Institute, Barrington, IL 60010, USA.

Rapid and complete rehydration, or restoration of fluid spaces, is important when acute illness or excessive sweating has compromised hydration status. Many studies have investigated the effects of graded concentrations of sodium and other electrolytes in rehydration solutions; however, no study to date has determined the effect of carbohydrate on fluid retention when electrolyte concentrations are held constant. The Purpose of this study was to determine the effect of graded levels of carbohydrate on fluid retention following exercise-induced dehydration. Fifteen heat-acclimatized men exercised in the heat for 90 min with no fluid to induce 2-3% dehydration. After a 30-min equilibration period, they received, over the course of 60 min, one of five test beverages equal to 100% of the acute change in body mass. The experimental beverages consisted of a flavored placebo with no electrolytes (P), placebo with electrolytes (P + E), 3%, 6%, and 12% carbohydrate solutions with electrolytes. All beverages contained the same type and concentration of electrolytes (18 meq/l Na(+), 3 meq/l K(+), 11 meq/l Cl(-)). Subjects voided their bladders at 60, 90, 120, 180, and 240 min, and urine specific gravity and urine volume were measured. Blood samples were taken before exercise and 30, 90, 180, and 240 min following exercise and were analyzed for glucose, sodium, hemoglobin, hematocrit, renin, aldosterone, and osmolality. Body mass was measured before and after exercise and a final body mass was taken at 240 min. There were no differences in percent dehydration, sweat loss, or fluid intake between trials. Fluid retention was significantly greater for all carbohydrate beverages compared with P (66.3 +/- 14.4%). P + E (71.8 +/- 9.9%) was not different from water, 3% (75.4 +/- 7.8%) or 6% (75.4 +/- 16.4%) but was significantly less than 12% (82.4 +/- 9.2%) retention of the ingested fluid. No difference was found between the carbohydrate beverages. Carbohydrate at the levels measured exerts a mild influence on fluid retention in postexercise recovery.

**Acute effects of chocolate milk and a commercial recovery beverage on postexercise recovery indices and endurance cycling performance.**

Pritchett K, Bishop P, Pritchett R, Green M, Katica C.: Applied Physiology, Nutrition, and Metabolism = Physiologie Appliquée, Nutrition et Métabolisme, 2009,

34(6):1017-22.

Department of Health, Human Performance, and Nutrition, Central Washington University, Ellensburg, WA 98926, USA.

To maximize training quality, athletes have sought nutritional supplements that optimize recovery. This study compared chocolate milk (CHOC) with a carbohydrate replacement beverage (CRB) as a recovery aid after intense exercise, regarding performance and muscle damage markers in trained cyclists. Ten regional-level cyclists and triathletes (maximal oxygen uptake  $55.2 \pm 7.2 \text{ mL.kg}^{-1}.\text{min}^{-1}$ ) completed a high-intensity intermittent exercise protocol, then 15-18 h later performed a performance trial at 85% of maximal oxygen uptake to exhaustion. Participants consumed  $1.0 \text{ g carbohydrate.kg}^{-1}.\text{h}^{-1}$  of a randomly assigned isocaloric beverage (CHOC or CRB) after the first high-intensity intermittent exercise session. The same protocol was repeated 1 week later with the other beverage. A 1-way repeated measures analysis of variance revealed no significant difference ( $p = 0.91$ ) between trials for time to exhaustion at 85% of maximal oxygen uptake (CHOC  $13 \pm 10.2 \text{ min}$ , CRB  $13.5 \pm 8.9 \text{ min}$ ). The change in creatine kinase (CK) was significantly ( $p$

**Estimation of prepractice hydration status of National Collegiate Athletic Association Division I athletes.**

Volpe SL, Poule KA, Bland EG.: Journal of Athletic Training, 2009: 44(6):624-9. University of Pennsylvania, Division of Biobehavioral and Health Sciences, School of Nursing, Claire M. Fagin Hall, 418 Curie Boulevard, Philadelphia, PA 19104-4217, USA.

Context: To our knowledge, no one has compared the prepractice hydration status of male and female National Collegiate Athletic Association (NCAA) Division I athletes or has studied the effects of the menstrual cycle phase on women's prepractice hydration status. Objective

: To report prepractice hydration status of collegiate athletes and determine the factors that might influence that status.

Design

: Cross-sectional, descriptive study.

Setting

: University sports team practices.

Patients or other participants

: Participants included 138 male and 125 female athletes (age = 19.9 + or - 1.3 years, height = 165.8 + or - 42.9 cm, mass = 77.4 + or - 17.5 kg) from an NCAA Division I New England university.

Intervention(s):

One spontaneously voided (spot) urine sample was collected from each participant before his or her team practice and was measured 2 times.

Main outcome result(s)

: A refractometer was used to analyze the amount of light that passed through a small drop of urine and assess urine specific gravity. Fluid intake and menstrual history for women were also collected. Three hydration-status groups were defined based on the American College of Sports Medicine and National Athletic Trainers' Association criteria: (1) euhydrated, which was urine specific gravity less than 1.020; (2) hypohydrated, from 1.020 to 1.029; and (3) significantly hypohydrated, equal to or more than 1.030.

Results

: Thirteen percent of student-athletes appeared significantly hypohydrated, with a mean urine specific gravity of 1.031 + or - 0.002 ( $\chi^2(2) = 12.12$ ,  $P$

Conclusions

: Before activity, athletes were hypohydrated at different levels. A greater percentage of men than women were hypohydrated. Menstrual cycle phase did not appear to affect hydration in women.

## **Effect of ingesting a honey-sweetened beverage on soccer performance and exercise-induced cytokine response.**

Abbey EL, Rankin JW.: International Journal of Sport Nutrition and Exercise Metabolism, 2009 19(6):659-72.  
Dept. of Human Nutrition, Foods and Exercise, Virginia



Polytechnic Institute and State University, Blacksburg, VA 24061-0430, USA.

**Purpose:** This study compared the effect of a honey-sweetened beverage with those of a commercial sports drink and a placebo on performance and inflammatory response to a 90-min soccer simulation. **Methods:** Ten experienced male soccer players randomly performed 3 trials (honey [H], sports drink [S], and placebo [P]), consuming the beverage before and during halftime for a total of 1.0 g/kg carbohydrate for H and S. Performance measures included 5 sets (T1-T5) of a high-intensity run and agility and ball-shooting tests followed by a final progressive shuttle-run (PSR) test to exhaustion. Blood samples were drawn pretest, posttest (B2), and 1 hr posttest (B3) for markers of inflammation, oxygen radical absorbance capacity (ORAC), and hormone response. **Results:** T2-T5

were significantly slower than T1 (p

**Conclusion**

: Acute ingestion of honey and a carbohydrate sports drink before and during a soccer-simulation test did not improve performance, although honey attenuated a rise in IL-1ra. Ingestion of carbohydrate and/ or antioxidant-containing beverages at frequencies typical of a regulation match may not be beneficial for trained soccer players.

### **Influence of ingesting a carbohydrate-electrolyte solution before and during a 1-hr running performance test.**

Rollo I, Williams C.: International Journal of Sport Nutrition and Exercise Metabolism, 2009, 19(6):645-58. School of Sport and Exercise Sciences, Loughborough University, Loughborough, UK.

The aim of this study was to investigate the influence of ingesting a carbohydrate-electrolyte solution (CHO-E) on performance during a 1-hr treadmill run. Eight male endurance-trained

runners (age 31 +/- 8 yr, M +/- SD) completed three 1-hr performance runs separated by 1 wk. The study used a double-blind placebo (PLA) controlled design. On 2 occasions (P1, P2) runners consumed a placebo solution, 8 ml/kg body mass (BM), 30 min before and 2 ml/kg BM at 15-min intervals throughout the 1-hr run. On a separate occasion they consumed the same quantity of a 6.4% CHO-E solution (C). Total distances covered for P1, P2, and C trials were 13,685 +/- 1,116 m, 13,715 +/- 1,143 m, and 14,046 +/- 1,104 m, respectively. Although there was no difference between the 2 PLA trials ( $p > .05$ ), the distance covered during the C trial was significantly greater than in either PLA trial ( $p$

### **Physiological and performance effects of glycerol hyperhydration and rehydration.**

van Rosendal SP, Osborne MA, Fassett RG, Coombes JS

. Nutrition reviews. (12):690-705, 2009.

The University of Queensland, School of Human Movement Studies, Brisbane, Queensland,

Australia. Studies have shown that beverages containing glycerol can enhance and maintain hydration status and may improve endurance exercise performance by attenuating adverse physiological changes associated with dehydration. Improvements to performance include increased endurance time to exhaustion by up to 24%, or a 5% increase in power or work. However, some studies have found no performance benefits during either prolonged exercise or specific skill and agility tests. In studies that have shown benefits, the improvements have been associated with thermoregulatory and cardiovascular changes. These include increased plasma volume and sweat rates, as well as reduced core temperature and ratings of perceived exertion. In a very small number of subjects, glycerol consumption has been associated with side-effects including nausea, gastrointestinal discomfort, dizziness, and headaches. In summary, while glycerol and fluid ingestion results in hyperhydration, the documented benefits to exercise performance remain inconsistent.

Hazards of ultra-marathon running in the Scottish Highlands: exercise-associated hyponatraemia. Cuthill, J. A., Ellis, C., Inglis, A.: Intensive Care Unit, Glasgow Royal Infirmary, Glasgow, UK. Emergency medicine journal : EMJ, 26(12):906-7, 2009. The case histories are presented of four athletes taking part in a 95-mile ultra-endurance foot race in Scotland who were hospitalised after developing exercise-associated hyponatraemia and rhabdomyolysis. Exercise-associated hyponatraemia is relatively uncommon in temperate climates. Risk factors disposing to this disorder are discussed. Exercise-associated hyponatraemia is thought to be due to overconsumption of hypotonic fluid with other associated pathophysiology including an inability to suppress fully antidiuretic hormone during exercise or to mobilise adequate sodium from osmotically inactive internal stores. Non-specific symptoms make this disorder difficult to diagnose on site without the assistance of serum sodium measurement, but any delay in treatment of patients with encephalopathy can prove fatal. Mainstays of treatment include fluid restriction, hypertonic saline, loop diuretics and mannitol.