OPTIMIZING RECOVERY

Maximizing Post-Exercise Nutrition:

The Science Behind Refueling with Chocolate Milk

August 13, 2014





post-exercise nutrition

Can affect performance at the next event

Helps reduce the chances of injury

Boosts the health, well-being of athletes

IT'S JUST AS IMPORTANT AS PRE-EVENT NUTRITION!

who benefits from recovery?

Runners training for a longdistance race

Triathletes doing double workouts

Swimmers during an all day meet

ANY ATHLETE PARTICIPATING IN REGULAR STRENUOUS EXERCISE

what is recovery?

Muscle/ glycogen replenishment and rebuilding

Electrolyte replenishment and rehydration

Mental rest and recovery

Recovery can help athletes avoid injuries, and feel their best so they can stick to their training routines

the recovery context



Focus on fuel, hydration



Focus on fuel (during extensive exercise), hydration

AFTER

Focus on refuel, rehydration

a quick look at expert recovery advice







Position of the American Dietetic Association. Dietitians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance

It is the position of the American Die-tetic Association, Dietitians of Canada, and the American College of Sports Medicine that physical activity, ath-letic performance, and recovery from exercise are enhanced by optimal nutrition. These organizations recommend appropriate selection of foods and fluids, timing of intake, and supplement choices for optimal health and exercise performance. This updated position paper couples a rigorous, systematic, evidence-based analysis of nutrition and performance-specific literature with current scientific data related to energy needs, assessment of body composition, strategies for weight change, nutrient and fluid needs, special nutrient needs during train-ing and competition, the use of ing and competition, the use of supplements and ergogenic aids, nu-trition recommendations for vege-tarian athletes, and the roles and responsibilities of sports dictitians. Energy and macronutrient needs, especially carbohydrate and protein, must be met during times of high must be met during times of high physical activity to maintain body weight, replenish glycogen stores, and provide adequate protein to build and repair tissue. Fat intake should be sufficient to provide the essential fatty acids and fat-soluble vitamins, as well as contribute energy for weight maintenance. Alenergy for weight maintenance. Al-though exercise performance can be affected by body weight and compo-sition, these physical measures should not be a criterion for sports performance and daily weigh-ins are discouraged. Adequate food and fluid should be consumed before, during and after exercise to help.

0002.8223/09/10903.0017\$36.00/0

This American Dietetic Association (ADA) position paper uses ADA's vidence Analysis Process and information from ADA's Evidence Analysis abrary. Similar information is also available from Dietitians of Canada's Practice-based Evidence in Nutrition. The use of an evidence-based ap-proach provides important added benefits to earlier review methods. The proach provides important added benefits to earlier review methods. The major advantage of the approach is the more rigorous standardization of review criteria, which minimizes the likelihood of reviewer bias and in-creases the case with which disparate articles may be compared. For a detailed description of the methods used in the evidence analysis process, access ADA's Evrdence Analysis Process at http://dacal.com/eapprocess/ Conclusion Statements are assigned a grade by an expert work group based on the systematic analysis and evaluation of the supporting research evidence. Grade = 150.0d. Grade II=Farr, Crade III = Immited, Grade IV= Expert Opinion Only, and Grade V-Grade is Not Assignable (because there is no evidence to support or relate the conclusion).

Evidence-based information for this and other topics can be found a www.daevidencelibrary.com and www.dievidensatvork.com/pen and su scriptions for non-ADA members are available for purchase at https: www.adaevidencelibrary.com/store.cfm. Subscriptions for Dictitians of Canada and non-Dictitians of Canada members are available for Practic based Evidence in Nutrition at http://www.daetebeateavtor.com/pen_orde

maintain blood glucose concentra-tion during exercise, maximize exer-cise performance, and improve recovery time. Athletes should be well hydrated before exercise and drink enough fluid during and after exerenough fluid during and after exer-cise to balance fluid losses. Sports beverages containing carbohydrates and electrolytes may be consumed before, during, and after exercise to help maintain blood glucose concen-tration, provide fuel for muscles, and decrease risk of dehydration and hyponatremia. Vitamin and mineral supplements are not needed if adequate energy to maintain body weight is consumed from a variety of foods. However, athletes who re-strict energy intake, use severe weight-loss practices, eliminate one or more food groups from their diet, or consume unbalanced diets with low micronutrient density, may re-

genic aids are poorly enforced, they should be used with caution, and should be used with caution, and only after careful product evalua-tion for safety, efficacy, potency, and legality. A qualified sports dictitian and in particular in the United States, a Board Certified Specialist in Sports Dietetics, should provide and advice subsequent to a comprehensive nutrition J Am Diet Assoc. 2009;109:509-527.

It is the position of the American Die tetic Association, Dietitians of Can-ada, and the American College of Sports Medicine that physical activity, athletic performance, and recovery from exercise are enhanced by optima nutrition. These organizations recom-

© 2009 by the American Dietetic Association

Journal of the AMERICAN DIETETIC ASSOCIATION 509

Position of the American Dietetic Association, Dietitians of Canada, American College of Sports Medicine. Journal of the American Dietetic Association, 2009:109: 509-527.

International Society of Sports Nutrition. Journal of the International Society of Sports Nutrition. 2008;17-28. American College of Sports Medicine. Medicine & Science in Sports & Exercise. 2007;39:377-390.

WHAT TO EAT WHEN TO EAT

HOW MUCH TO EAT



Carbs Protein Fluids and electrolytes



30 minutes to 2 hours after strenuous exercise



0.75 g carbs/lb body weight

About one gram protein for every three or four grams carbs

16-24 fl. oz./lb body weight lost during exercise

WHAT TO EAT



Carbs

Protein

Fluids and electrolytes

CARBOHYDRATES

to refuel depleted muscle glycogen





PROTEIN

to reduce muscle breakdown and stimulate growth



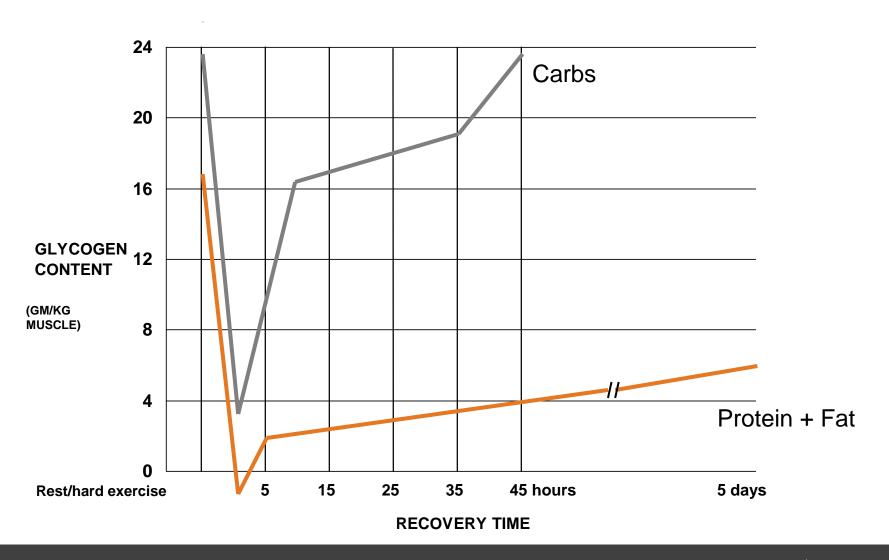
FLUID and ELECTROLYTES

to rehydrate the body by replenishing sweat losses





carbs refuel while protein builds and repairs



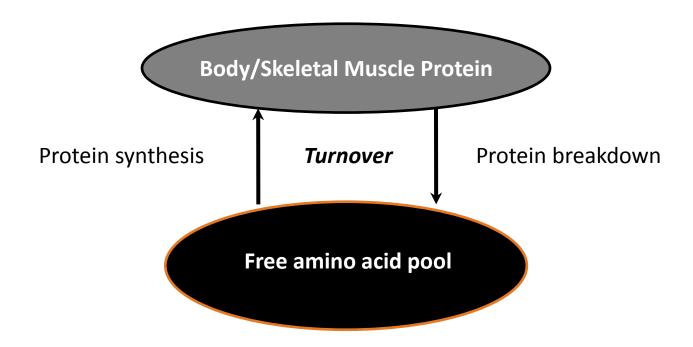
the power of protein

About one gram protein for every three or four grams carbs

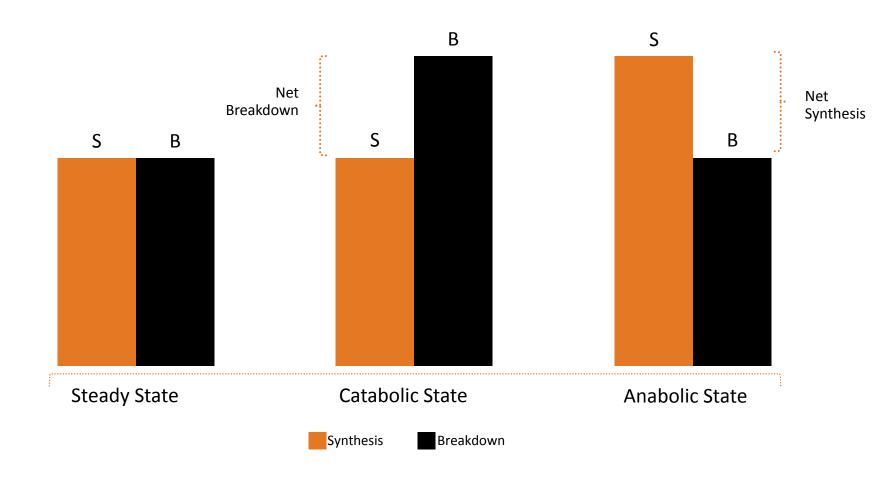
Consider:

- Type of protein, quality
- Leucine content
- The combination with carbs
- Too much is "wasted"

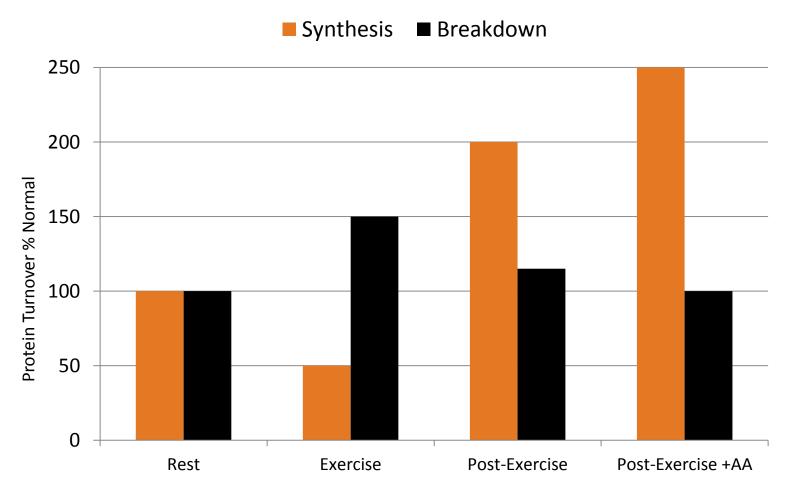
protein turnover



skeletal muscle turnover



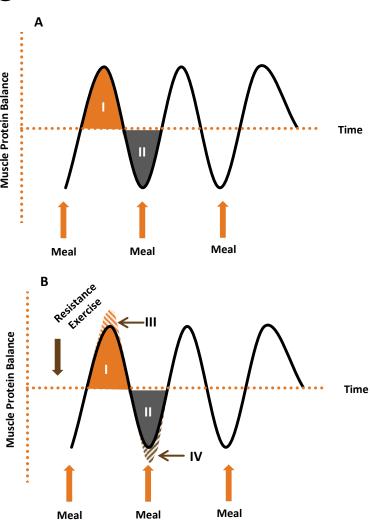
protein synthesis and protein breakdown at rest, during exercise, and postexercise



Biolo et al., Am J Physiol, 1995; Am J Physiol, 1997

net protein balance response to nutrition and exercise

- Exercise is essentially *catabolic*; energy is required for work
- Recovery is essentially anabolic; energy and rest is required to rehydrate, refuel, repair, and rebuild
- Nutrients primarily carbohydrate and protein - need to be consumed to achieve an anabolic state, a positive NET balance



fluids and electrolytes

Fluids

16-24 fl. oz. for each pound of body weight lost during exercise

Based on extent of sweat loss – sodium, potassium, magnesium, calcium

for example, after exercise 120 pound athlete may need...



82 grams (amount in about 24 ounces of chocolate milk)

Protein

20 to 27 grams

(approximately equal to the amount in 24 ounces of chocolate milk)

Fluids

24 ounces

(depending on exercise intensity, weight loss)

Electrolytes

Sodium, calcium, potassium and magnesium (depending on sweat losses)

and, a 190 pound athlete may need...

Carbohydrate

130 grams (amount in about 40 ounces of chocolate milk)

Protein

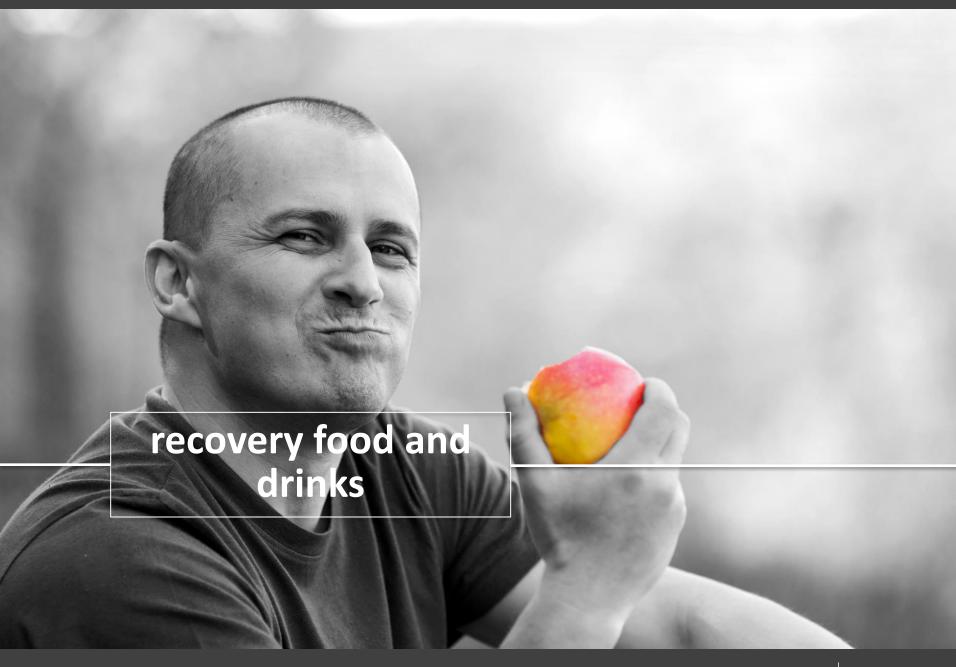
32 to 43 grams (amount in a quart of milk)

Fluids

24 ounces (depending on exercise intensity, weight loss)

Electrolytes

Sodium, calcium, potassium and magnesium (depending on sweat losses)



considerations for recovery

Food vs. beverage

Carb and protein combo

Convenience and affordability

Taste and tolerance

Intensity of workout, recovery timing

Find the right options and combinations for each athlete

post-workout snack ideas

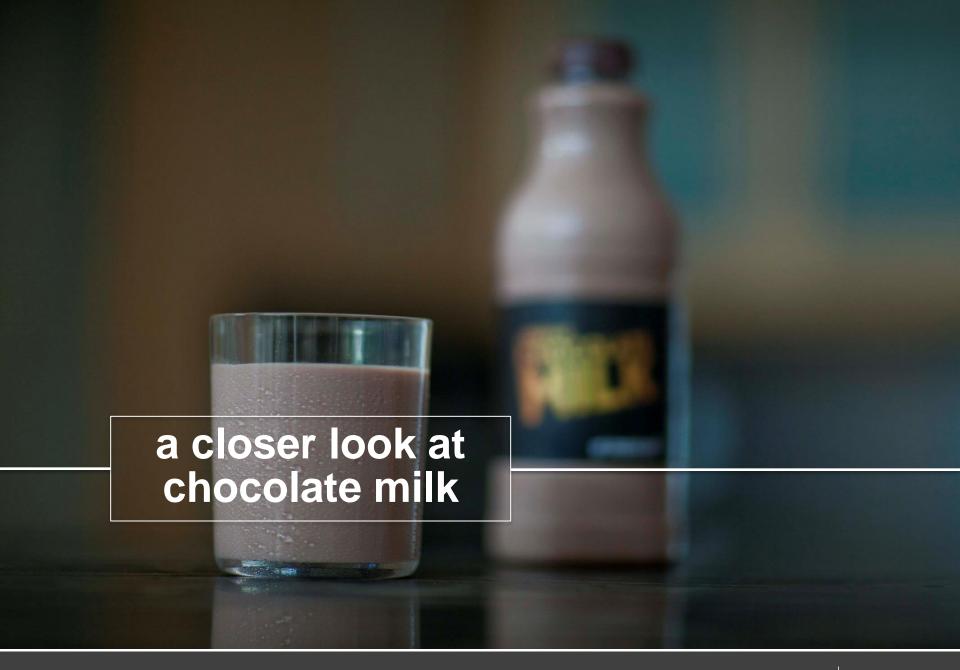
- Turkey and Cheese with Apple Slices and Pretzels
- Tuna on Whole Wheat
- Banana and Peanut Butter
- Chocolate Milk











why chocolate milk?

Backed by Science

Researchers first began studying chocolate milk because it had the same carb/protein ratio supported by science

Trusted by Athletes

For years, athletes
have grabbed
chocolate milk after
exercise, as a
convenient and greattasting way to refuel
and recover

a growing body of evidence

Instructional Journal of SportNorthonandSpancie Metabolism, 2006, 16, 78-91 6: 2006 University for

Chocolate Milk as a Post-Exercise Recovery Aid

Jason R. Karp, Jeanne D. Johnston, Sandra Tecklenburg, Timothy D. Mickleborough, Alyce D. Fly, and Joel M. Stager

Nine mails, endurance-trained cyclicis performed as interval worknown followed by 4 do frecovery; and a subsequent endurance trait to estantions at 70% byte on three separate days. Immediately following the first energies both and 2 h out recovery, subject frank into worknine consumpt of the choicest walls, full replacement draits (CRS, in a single-blank frankoultand to design. Cardodyptains explacement draits (CRS, in a single-blank frankoultand to design. Cardodyptains content was equivalent for described walls and CRT state of the exclusion (CTS). We replace the single of performed sentions (CDS). TITLE and W, were dignificantly granted for doctories with and TRF visids compared to CRS trail. The results of this shady suggest that choosine milk is an effective recovery sidd between two enhancements.

Ecy Words: glycogen resynthesis, endurance performance, nutrition, sports drink

his well known that endurance exercise performance is infinenced by the amount of stored plyoceps in indetent muscle, and that intense endurance exercise decreases: muscle plyoceps stores (0, 10, 13, 18), leading to a diminution in performance. The ensynthesis of glyoceps between training sessions occur most rapidly if carbo-laydrates (OHO) are consumed within 30 min to 1 h after exercise (0, 13, 17). Indeed, delaying earbohydrate in speciation for 1 h after a vorticus or netwee the rate of plyoceps resynthesis; it is suggested that 50 m 55 g of CR10 to inspected that 50 to 45 min after exercise (1), with inspection of 10 h 35 g CR10 high order between the rate of plyoceps are not represented to 12 to 15 g CR10 high order of the carbohydrate and improve containing with the same time house (1, 18, 20, 3). Ingesting profits along with carbohydrate order to the contribution of the contribution of

The sufficer are with the Dept of Kineticlogy and Applied Health Science, Human Performance Labora tory, Indiana University, Riccomington, DN 47402.

71

More than 20 studies on the specific benefits of milk and chocolate milk for post-exercise recovery



2006

lowfat chocolate milk: what's in it?

Nutrition Facts Serving Size 8 fl oz Servings Per Container 1 **Amount Per Serving** Calories from Fat 25 Calories 160 % Daily Value* Total Fat 2.5g 4% Saturated Fat 1.5g 8% Cholesterol 10mg 3% Sodium 150mg 6% Total Carbohydrate 26g 8% Dietary Fiber 1g 4% Sugars 25g Protein 8g Vitamin A 10% Vitamin C 4% Calcium 30% Iron 4% Potassium 12% Vitamin D 25% Riboflavin 25% Niacin 12% Vitamin B12 15% • Phosphorus 25% Magnesium 8% *Percent Daily Values are based on a 2.000 calorie diet. Your daily values may be higher or lower depending on your calorie needs: Calories 2,500 Total Fat Less Than 65g 80g Saturated Fat Less Than 20q 25g 300 mg Cholesterol Less Than 300mg Sodium Less Than 2,400mg 2,400mg Total Carbohydrate 300g 375g Dietary Fiber Calories per gram: Fat 9 · Carbohydrate 4 · Protein 4



CALCIUM and VITAMIN D

B VITAMINS

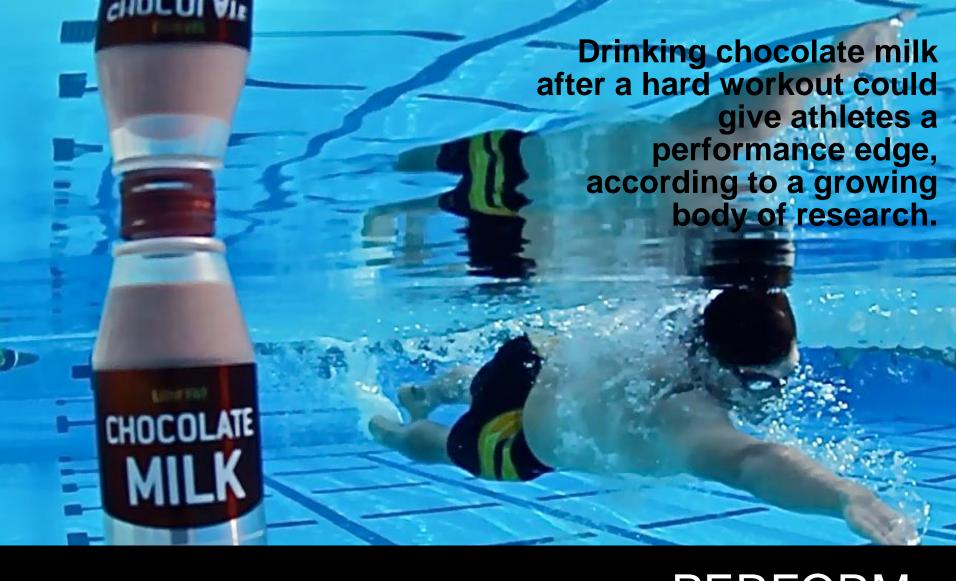
ELECTROLYTES

sodium, potassium, calcium, magnesium

the research

- Perform
- Refuel and Rehydrate
- Rebuild
- Reshape





PERFORM

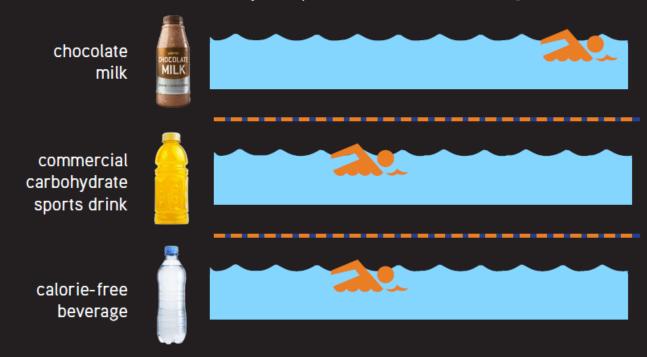
First-of-its kind swimming research





SWIMMERS GAIN AN EDGE WITH CHOCOLATE MILK

Swimmers who recovered with **chocolate milk** after an intense practice, on average shaved off **2.1 seconds** per 200 yard swim, and **0.5 seconds** per 75 yard sprint in time trials later that same day, compared to when they recovered with a traditional carbohydrate sports drink or calorie-free beverage.



SOURCE: Stager JM, Brammer CL, Sossong T, Kojima K, Spanbaur D, Grand K, Wright BV.
Supplemental recovery nutrition affects swim performance following glycogen depleting exercise.

researchers tested 3 performance scenarios



Six division one collegiate swimmers performed a muscle fuel (glycogen)-depleting swim followed by five hours of recovery for three consecutive weeks



Following the recovery period, 3 swim performance test sets were completed



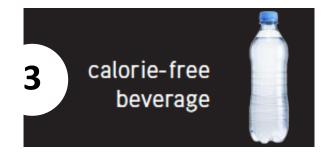




and, 3 randomized beverages, immediately and 2 hours after swim



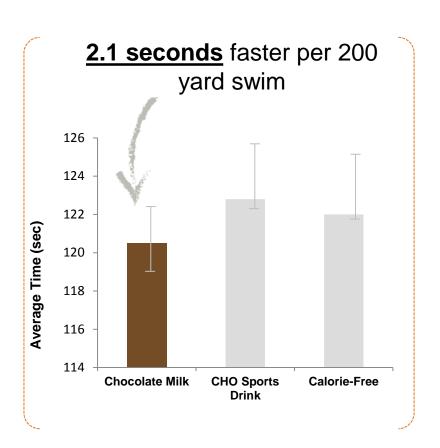




Significant differences in the next aerobic and anaerobic swims were found – indicating better recovery after drinking chocolate milk



significant differences, most notably in longest swim



"From cyclists to runners to soccer players, there's a strong body of research supporting the benefits of recovering with chocolate milk. Now, our research suggests these same benefits extend to swimmers – a sport that relies on quick recovery for multiple races within a single day."

-- Dr. Joel Stager, lead researcher



Dr. Joel Stager, Indiana University





Measuremental

🗘 🛂 Follow

power and speed during the next workout



4 hours after the first bout of exercise, athletes who recovered with chocolate milk:

- Exercised LONGER and with MORE POWER during a second workout
- Cycled 51% LONGER
- Had significantly MORE POWER and RODE FASTER, shaving about six minutes from their ride time
- Ran 23% LONGER in a follow-up run
- Had TWICE THE IMPROVEMENT in V02max (measure of aerobic fitness)

Karp JR, et al. *Journal of Sport Nutrition and Exercise Metabolism*. 2006;16:78-91. Thomas K, et al. *Applied Physiology, Nutrition and Metabolism*. 2009;34:78-82. Ferguson-Stegall L, et al. *Journal of Strength and Conditioning Research*. 2011;25:1210-1224. Lunn WR, et al. *Medicine & Science in Sports & Exercise*. 2012;44:682-691 Ferguson-Stegall L, et al. *Journal of nutrition and Metabolism*. 2011.

a closer look at runners

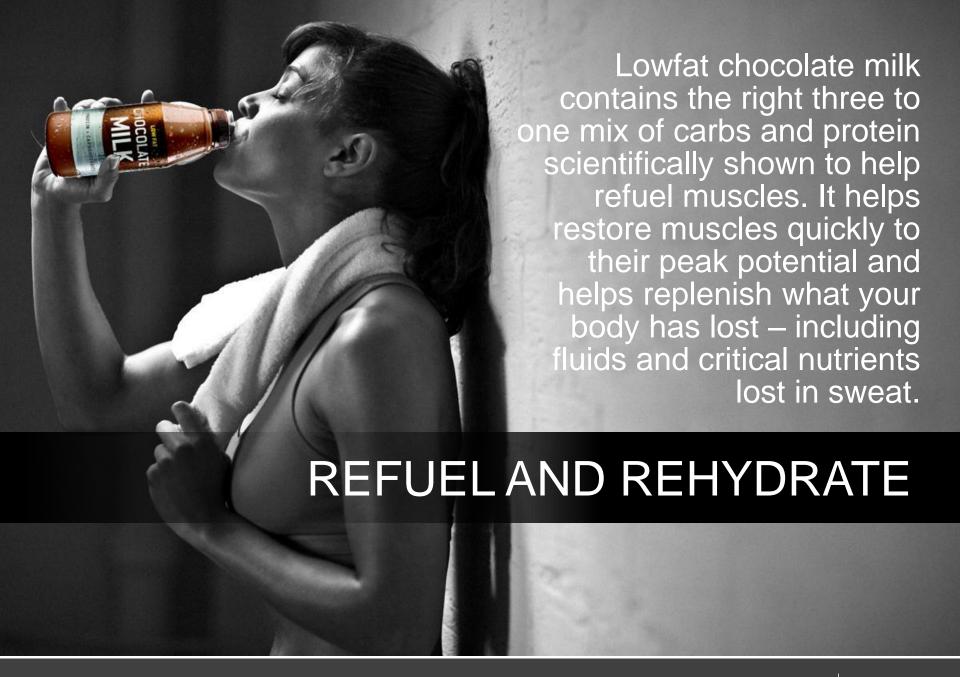
Recreational runners ran 23% longer in a follow-up run after drinking fat free chocolate milk compared to a typical sports drink.

Male runners did 45-minute run at moderate pace (65% VO2 max)

Drank fat-free chocolate milk or same number of calories in a carb-only beverage

- Post-exercise milk resulted in less muscle breakdown and more muscle synthesis
- Performed better in follow-up time trial





replacing muscle glycogen



The Right Mix of Carbohydrates and Protein

3:1

About one gram protein for every three or four grams carbs

post-exercise muscle glycogen

Male runners did 45-minute run at moderate pace (65% VO2 max)

Drank 350 calories of either fat-free chocolate milk or carb-only beverage

16 ounces of fat free chocolate milk after exercise led to greater concentration of glycogen in muscles at 30 and 60 minutes post-exercise, compared to a carb only sports drink with the same calories

Karfonta KE, et al. Medicine & Science in Sports & Exercise. 2010;42:S64.

rehydration

Milk

helped maintain hydration better than other popular post-exercise beverages

Researchers believe

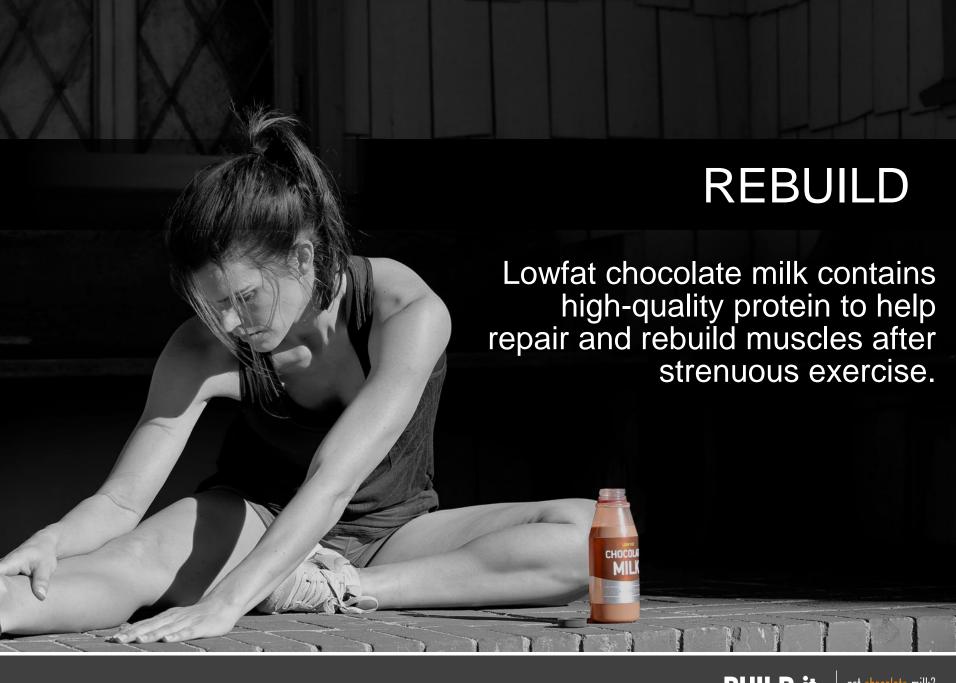
milk's natural electrolyte content and energy density may help restore and maintain hydration after exercise

Shirreffs SM, et al. *British Journal of Nutrition*. 2007;98:173-180. Watson P, et al. *European Journal of Applied Physiology*. 2008;104:633-642.

milk helps replace electrolytes lost in sweat

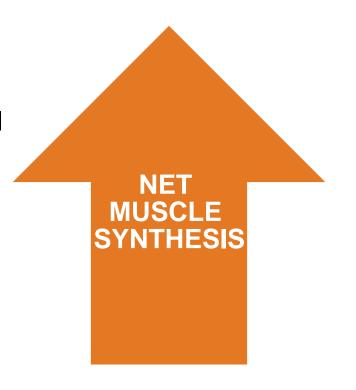
Milk provide 360mg: **Potassium** 12% of the daily value Milk provides 27mg: Magnesium 8% of the daily value Milk provides 300mg: Calcium 30% of the daily value Milk provides 150mg: Sodium **6**% of the daily value

8 ounce serving of lowfat milk; USDA USDA National Nutrient Database for Standard Reference, Release 26



a muscle building advantage

- In a study of moderately trained male runners those who drank fat free chocolate milk after exercise had enhanced skeletal **muscle protein synthesis** – a sign that muscles were able to repair and rebuild compared to a fluid replacement drink with just carbohydrates.
- Athletic men and women who drank milk one hour after a "leg resistance exercise routine" experienced a significant increase in two measured amino acids



Lunn W, et al. Medicine and Science in Sports and Exercise, 2010;42:S48. Elliot TA, et al. Medical Science in Sports and Exercise. 2006;38:667-674.

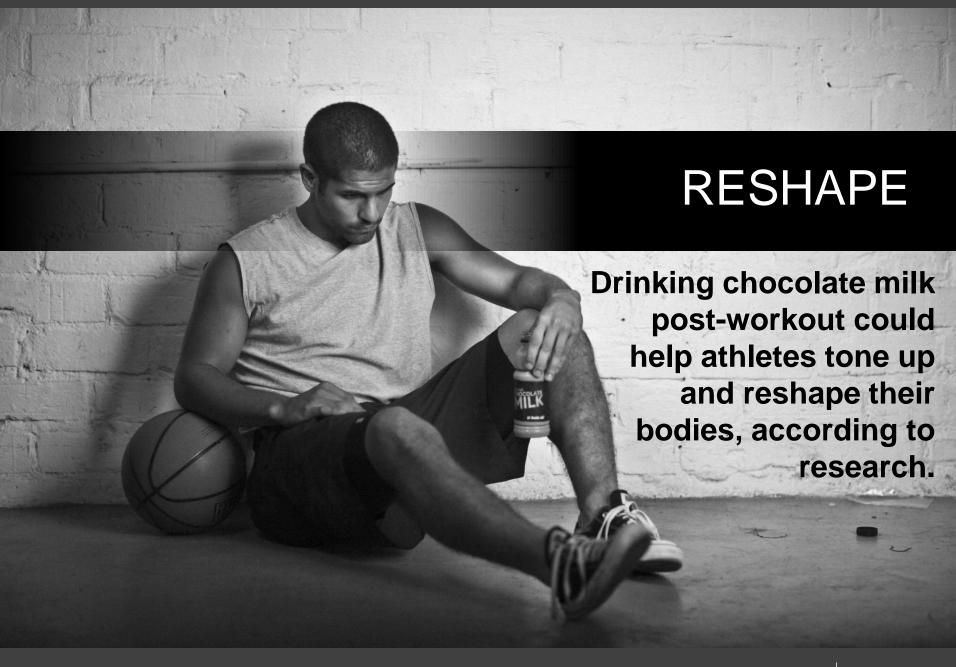
reducing exercise-induced muscle damage

Athletes who recovered immediately with plain or chocolate milk had less exercise-induced muscle damage than those who drank water or sports drinks, according to several studies.

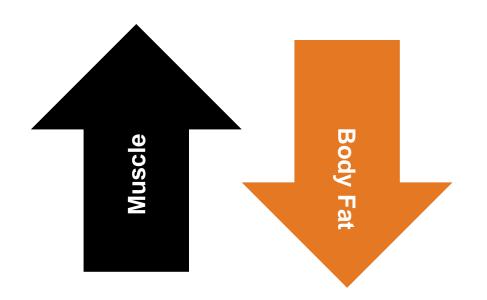
EXERCISE-INDUCED MUSCLE DAMAGE

can lead to future impairments in muscle performance, which could affect future exercise bouts

Cockburn E, et al. *Applied Physiology, Nutrition and Metabolism.* 2008;33:775-783. Cockburn E et al. *Applied Physiology, Nutrition and Metabolism.* 2010;35:270-277.



improved body composition



Researchers suggest
MILK'S ADVANTAGE
may be due to
unique properties
of milk proteins
that may cause differences
in speed of digestion
and absorption.

Including milk as a recovery beverage in an ongoing, regular recovery routine could have long-term benefits.

two training studies found increased muscle, lower body fat

12 week training program



"milk is an effective drink to support favorable body composition changes in women with resistance training."

Hartman JW, et al. *American Journal of Clinical Nutrition*, 2007;86:373-381. Josse et al. *Medicine & Science in Sports & Exercise*. 2010;42:1122-1130.

three pound lean muscle advantage

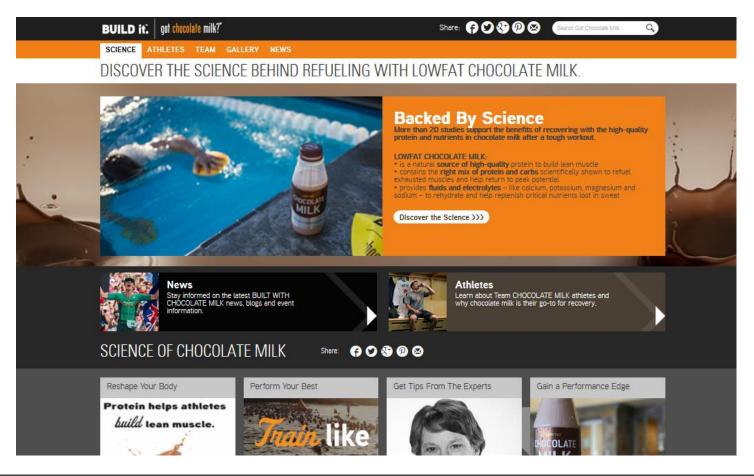
32 healthy but untrained cyclists who recovered with lowfat chocolate milk gained more muscle and lost more fat during training, with a 3 pound lean muscle advantage, compared to athletes who recovered with a carbohydrate drink.



McCleave EL et al. ACSM, 2011.

read more about the research and references...

gotchocolatemilk.com



BUILT WITH CHOCOLATE MILK athletes

USA Hockey



Team USA Women's Ski Jumping Team



Craig Alexander



Apolo Ohno



Mirinda Carfrae



Luke McKenzie



how you can get in the game

 To learn more about the science behind the recovery benefits of lowfat chocolate milk and access exclusive training tips and videos, log on to gotchocolatemilk.com.

2. Follow BUILT WITH CHOCOLATE MILK

- Facebook.com/gotchocolatemilk
- Twitter.com/GotChocoMilk
- Instagram @gotchocolatemilk
- YouTube/gotchocolatemilk
- 3. Talk to your local dairy about where your favorite chocolate milk is sold

ARE YOU BUILT WITH CHOCOLATE MILK? Join Today!

If you're a passionate athlete that refuels with lowfat chocolate milk after a tough training session, race or competition, we want YOU to apply to become a sponsored athlete of Team CHOCOLATE MILK. You could win:

- \$500 sponsorship
- Free race entries to Rock 'n' Roll, IRONMAN, Iron Girl and Esprit de She race series
- Train training and race gear
- Training perks and team support throughout 2014

Applications are accepted from January 2, 2014 to September 26, 2014. The application includes:

 A short online application and a 60-second video that describes how your postworkout routine is Built With Chocolate Milk.

Get more info and apply to join today GotChocolateMilk.com.

THANK YOU



BUILD it.

got chocolate milk?