OPTIMIZING RECOVERY
Maximizing Post-Exercise Nutrition:
The Science Behind Refueling with Chocolate Milk

August 13, 2014

BUILD it.

got chocolate milk?
today’s agenda

Chocolate Milk Science

New Swimming Study
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 long-distance 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

**BEFORE**
Focus on fuel, hydration

**DURING**
Focus on fuel (during extensive exercise), hydration

**AFTER**
Focus on refuel, rehydration
a quick look at expert recovery advice


**WHAT TO EAT**

- Carbs
- Protein
- Fluids and electrolytes

**WHEN TO EAT**

- 30 minutes to 2 hours after strenuous exercise

**HOW MUCH TO EAT**

- 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

![Graph showing recovery time and glycojen content](image)

GLYCOGEN CONTENT (GM/KG MUSCLE)

RECOVERY TIME

- Carbs
- Protein + Fat

Rest/hard exercise

5 15 25 35 45 hours 5 days
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

Body/Skeletal Muscle Protein

Protein synthesis

Turnover

Protein breakdown

Free amino acid pool
skeletal muscle turnover

Steady State

Catabolic State

Anabolic State

Net Breakdown

Net Synthesis

S

B

S

B

S

B

Synthesis

Breakdown
protein synthesis and protein breakdown at rest, during exercise, and post-exercise

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

Phillips et al., J Am Coll Nutr, 2005
# fluids and electrolytes

<table>
<thead>
<tr>
<th>Fluids</th>
<th>16-24 fl. oz. for each pound of body weight lost during exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrolytes</td>
<td>Based on extent of sweat loss – sodium, potassium, magnesium, calcium</td>
</tr>
</tbody>
</table>
for example, after exercise 120 pound athlete may need...

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>82 grams (amount in about 24 ounces of chocolate milk)</td>
</tr>
<tr>
<td>Protein</td>
<td>20 to 27 grams (approximately equal to the amount in 24 ounces of chocolate milk)</td>
</tr>
<tr>
<td>Fluids</td>
<td>24 ounces (depending on exercise intensity, weight loss)</td>
</tr>
<tr>
<td>Electrolytes</td>
<td>Sodium, calcium, potassium and magnesium (depending on sweat losses)</td>
</tr>
</tbody>
</table>
and, a 190 pound athlete may need...

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Requirement</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>130 grams</td>
<td>(amount in about 40 ounces of chocolate milk)</td>
</tr>
<tr>
<td>Protein</td>
<td>32 to 43 grams</td>
<td>(amount in a quart of milk)</td>
</tr>
<tr>
<td>Fluids</td>
<td>24 ounces</td>
<td>(depending on exercise intensity, weight loss)</td>
</tr>
<tr>
<td>Electrolytes</td>
<td>Sodium, calcium, potassium and magnesium</td>
<td>(depending on sweat losses)</td>
</tr>
</tbody>
</table>
recovery food and drinks
considerations for recovery

<table>
<thead>
<tr>
<th>Food vs. beverage</th>
<th>Carb and protein combo</th>
<th>Convenience and affordability</th>
<th>Taste and tolerance</th>
<th>Intensity of workout, recovery timing</th>
</tr>
</thead>
</table>

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
a closer look at 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 great-tasting way to refuel and recover.
a growing body of evidence

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

Chocolate Milk as a Post-Exercise Recovery Aid

Jason K. Kap, Jennifer D. Johnston, Sandra Tecklenburg, Timothy B. Miklucioough, Alyce S. Fly, and Joel M. Stager

2006
lowfat chocolate milk: what’s in it?

### Nutrition Facts

**Serving Size 8 fl oz**  
**Servings Per Container 1**  

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
<th>Calories</th>
<th>Calories from Fat</th>
<th>% Daily Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat</td>
<td>2.5g</td>
<td>1.5g</td>
<td>4%</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>1.5g</td>
<td></td>
<td>8%</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>10mg</td>
<td></td>
<td>3%</td>
</tr>
<tr>
<td>Sodium</td>
<td>150mg</td>
<td></td>
<td>6%</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>26g</td>
<td>1g</td>
<td>8%</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td></td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>Sugars</td>
<td>25g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>8g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin A</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riboflavin</td>
<td>25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.*

- **CARBS**
- **PROTEIN**

### 9 ESSENTIAL NUTRIENTS

- Including many not found in sports drinks:
  - **CALCIUM** and **VITAMIN D**
  - **B VITAMINS**
  - **ELECTROLYTES**
    - Sodium, potassium, calcium, magnesium
the research

1. Perform
2. Refuel and Rehydrate
3. Rebuild
4. Reshape
Drinking chocolate milk after a hard workout could give athletes a performance edge, according to a growing body of 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.

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:

1. aerobic (200 yards)
2. anaerobic (75 yard sprint)
3. immediate (10 meters against resistance)
and, 3 randomized beverages, immediately and 2 hours after swim

1. chocolate milk
2. commercial carbohydrate sports drink
3. calorie-free beverage

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

matched for calories with chocolate milk
significant differences, most notably in longest swim

2.1 seconds faster per 200 yard 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

IRONMAN Triathlon @IronmanTri

After a tough swim recovering w choc milk could help swimmers cut seconds off race time: ow.ly/xonP1 Follow @GotChocoMilk 4more

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14 12
12:00 PM - 9 Jun 2014

Swimmers Life @swimmerslife

Chocolate milk for recovery? Yes please!! #swimming #triathlon #nutrition #gotmilk?

Swimmingscience.net

Retweeted by Got Chocolate Milk?™ and 1 other
Chloe Sutton @swimswim - Jun 2
Study from @UBloomington finds swimmers could gain edge when recovering w low fat chocolate milk ow.ly/xonP1 @GotChocoMilk syurs

Collapse

Retweets Favorites
23 31
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 VO2max (measure of aerobic fitness)

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

Lowfat chocolate milk contains the right three to one mix of carbs and protein scientifically shown to help refuel muscles. It helps restore muscles quickly to their peak potential and helps replenish what your body has lost – including fluids and critical nutrients lost in sweat.
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

Researchers believe

**Milk**
helped maintain hydration
better than other popular post-exercise beverages

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

milk helps replace electrolytes lost in sweat

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Amount (mg)</th>
<th>Percentage of Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium</td>
<td>360</td>
<td>12%</td>
</tr>
<tr>
<td>Magnesium</td>
<td>27</td>
<td>8%</td>
</tr>
<tr>
<td>Calcium</td>
<td>300</td>
<td>30%</td>
</tr>
<tr>
<td>Sodium</td>
<td>150</td>
<td>6%</td>
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8 ounce serving of lowfat milk; USDA National Nutrient Database for Standard Reference, Release 26
Lowfat chocolate milk contains high-quality protein to help repair and rebuild muscles after strenuous exercise.
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**

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

Drinking chocolate milk post-workout could help athletes tone up and reshape their bodies, according to research.
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

MEN

WOMEN

Soy beverage, carb-only beverage or fat free milk (same calories) after daily workouts

Milk drinkers gained more muscle and lost more fat at the end of the training program

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

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

1. 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 post-workout routine is Built With Chocolate Milk.

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

BUILD it.

got chocolate milk?