OPTIMIZING RECOVERY
Science of Post-Exercise Nutrition

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- Robinson is the Director of High Performance at Arizona State University.
- Joined the U.S. Swimming National Team staff as an athletic trainer and strength/conditioning coordinator for gold medalists Michael Phelps and Allison Schmitt.
- Served as a trainer at international swim meets, such as the 2009, 2011 World Championships and the 2010, 2013 Pan Pacific Games.
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?

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

**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
- 16-24 fl. oz./lb body weight lost during exercise
WHAT TO EAT

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 glycogen content over 5 days of rest/hard exercise. Carbs and Protein + Fat lines are depicted.]
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

protein turnover

Body/Skeletal Muscle Protein

Protein synthesis \[\text{Turnover}\] Protein breakdown

Free amino acid pool
protein synthesis and protein breakdown at rest, during exercise, and post-exercise

![Graph showing protein turnover at different stages: Rest, Exercise, Post-Exercise, Post-Exercise +AA.]


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

![Graph showing net protein balance response over time.]

Phillips et al., J Am Coll Nutr, 2005
for example, after exercise
120 pound athlete may need…

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>82 grams</td>
<td>(amount in about 24 ounces of chocolate milk)</td>
</tr>
<tr>
<td>Protein</td>
<td>20 to 27 grams</td>
<td>(approximately equal to the amount in 24 ounces of chocolate 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>

and, a 190 pound athlete may need…

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
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</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>
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</tbody>
</table>
considerations for recovery

<table>
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<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

Trusted by Athletes
a growing body of evidence

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

lowfat chocolate milk: what’s in it?

**Nutrition Facts**

**Serving Size 8 Fl oz**

**Servings Per Container 1**

**Amount Per Serving**

- Calories 160
- Calories from Fat 25
- % Daily Value
  - Total Fat 2.5g
  - Saturated Fat 1.5g
  - Cholesterol 10mg
  - Sodium 150mg
  - Total Carbohydrate 21g
  - Dietary Fiber 1g
  - Sugars 21g
  - Protein 8g
- Vitamin A 10% • Vitamin C 4%
- Calcium 50% • Iron 4%
- Potassium 12% • Vitamin D 25%
- Riboflavin 25% • Niacin 12%
- Vitamin B12 13% • 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.*

- Total Fat (Less Than 1g)
- Cholesterol (Less Than 20mg)
- Sodium (Less Than 2,400mg)
- Dietary Fiber (Less Than 5g)
- Carbohydrate (Less Than 100g)

**9 ESSENTIAL NUTRIENTS**

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

1. Refuel and Rehydrate
2. Perform
3. Rebuild
4. Reshape
Replacing muscle glycogen

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.

- Male runners who drank 16 ounces of 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.
- Athletes who drank milk after exercise stayed hydrated longer than when they drank a sports drink.

power and speed during the next workout

According to new research, grabbing reduced fat chocolate milk after a hard swim could give swimmers a performance edge, compared to when they recovered with a carbohydrate sports drink or calorie-free beverage.

On average, 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.


![Image of chocolate milk bottle and swimmer]

REBUILD
A Muscle Building Advantage

Lowfat chocolate milk contains high-quality protein to help repair and rebuild muscles after strenuous exercise.

• 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.

• Athletes who recovered immediately with plain or chocolate milk had less exercise-induced muscle damage than those who drank water or sports drinks.

**Improved Body Composition**

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

- 32 healthy but untrained cyclists who recovered with 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.

- A 12-week training program found that milk drinkers **gained more muscle** and **lost more fat** than those who refueled with a soy or carb-only beverage.

McClave EL et al. ACSM, 2011.

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**BUILT WITH CHOCOLATE MILK athletes**

- Kelley O’Hara
- Kevin Love
- Tyler Clary
- Jessica Hardy
- Mirinda Carfrae
- Craig Alexander
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, head to
   BUILTWITHCHOCOLATEMILK.COM/COACHESCORNER

2. Follow BUILT WITH CHOCOLATE MILK
   • Facebook.com/BuiltWithChocolateMilk
   • Twitter.com/Chocolate_Milk and join the conversation by using the hashtag #BuildIt
   • Instagram @BuiltWithChocolateMilk
   • YouTube.com/BuiltWithChocolateMilk

3. Talk to your local dairy about where your favorite chocolate milk is sold.

4. Send a letter to parents to ask them to buy chocolate milk for their children’s recovery efforts

THANK YOU.