

NUTRITION STRATEGIES FOR ENDURANCE ATHLETES



Sheila Kealey, MPH

Nutrition & Health Researcher

- > 20 years with U California, San Diego
- **Research focus:** lifestyle behaviors (diet, physical activity, smoking) & disease
- Research publications and book chapters

Health Communications

- 100's of articles related to diet and health
- Cookbook and Food Guide
- Web: SheilaKealey.com

Athlete & Coach



What I Plan to Cover

- **BASICS of Sports Nutrition**
- **Best foods/beverages to eat**
 - Before workout
 - During workout
 - After workout



CONFUSION



Sports Nutrition Basics

Workout Fueling Timing & Benefits

BEFORE

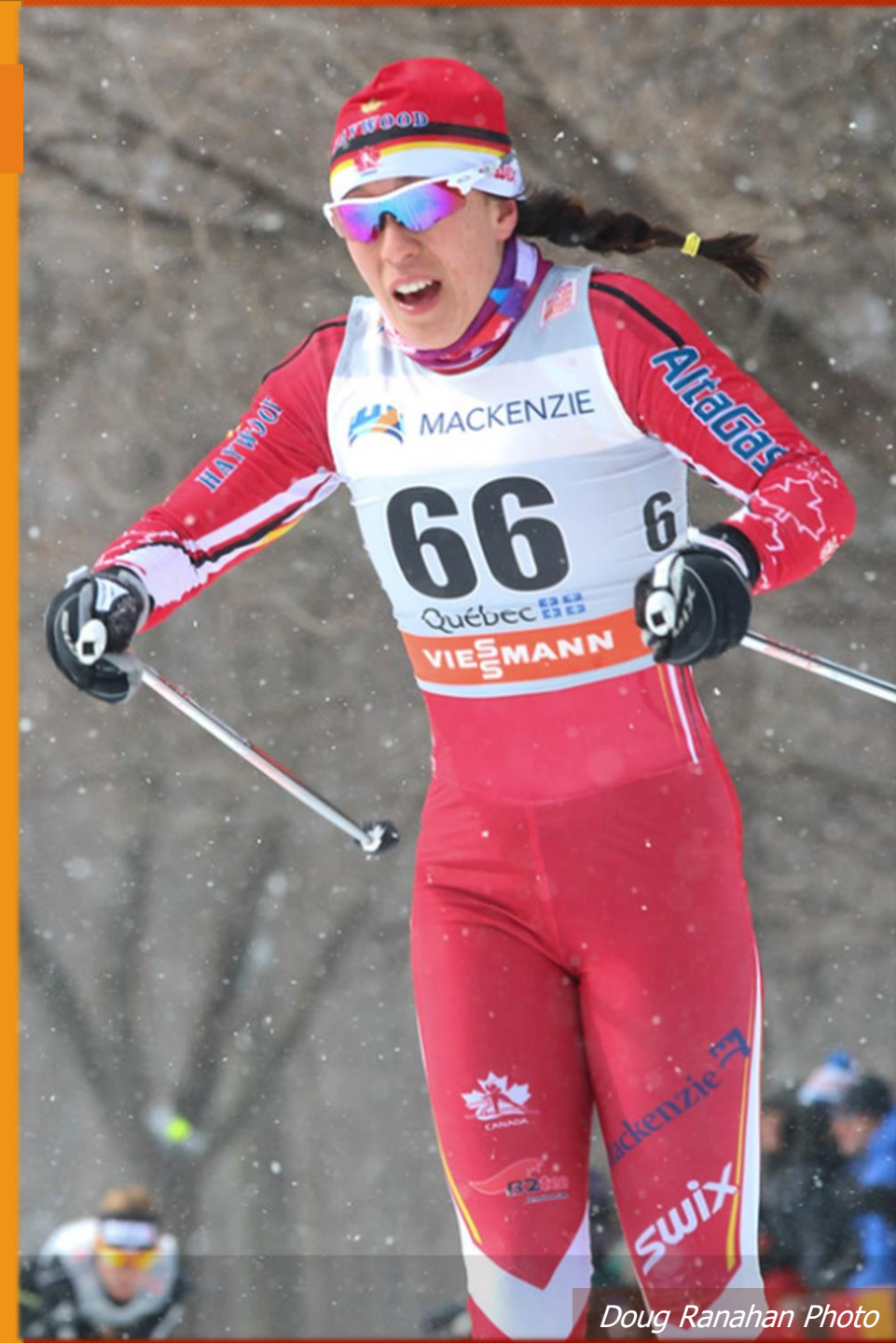
- Get more out of training session

DURING

- Helps resist fatigue & dehydration

AFTER

- Promote recovery



Doug Ranahan Photo

ENERGY for Exercise

- ▶ The body's preferred fuel during exercise is muscle glycogen (stored **carbohydrate**).
- ▶ Exercise depletes muscles of glycogen.
- ▶ Muscles have a limited supply of glycogen: low glycogen impairs performance.
- ▶ The more active you are, the more carbohydrate you need to eat.



Doug Ranahan Photo

To perform quality training sessions, athletes have to replenish these glycogen stores with carbohydrate-containing foods & drink.

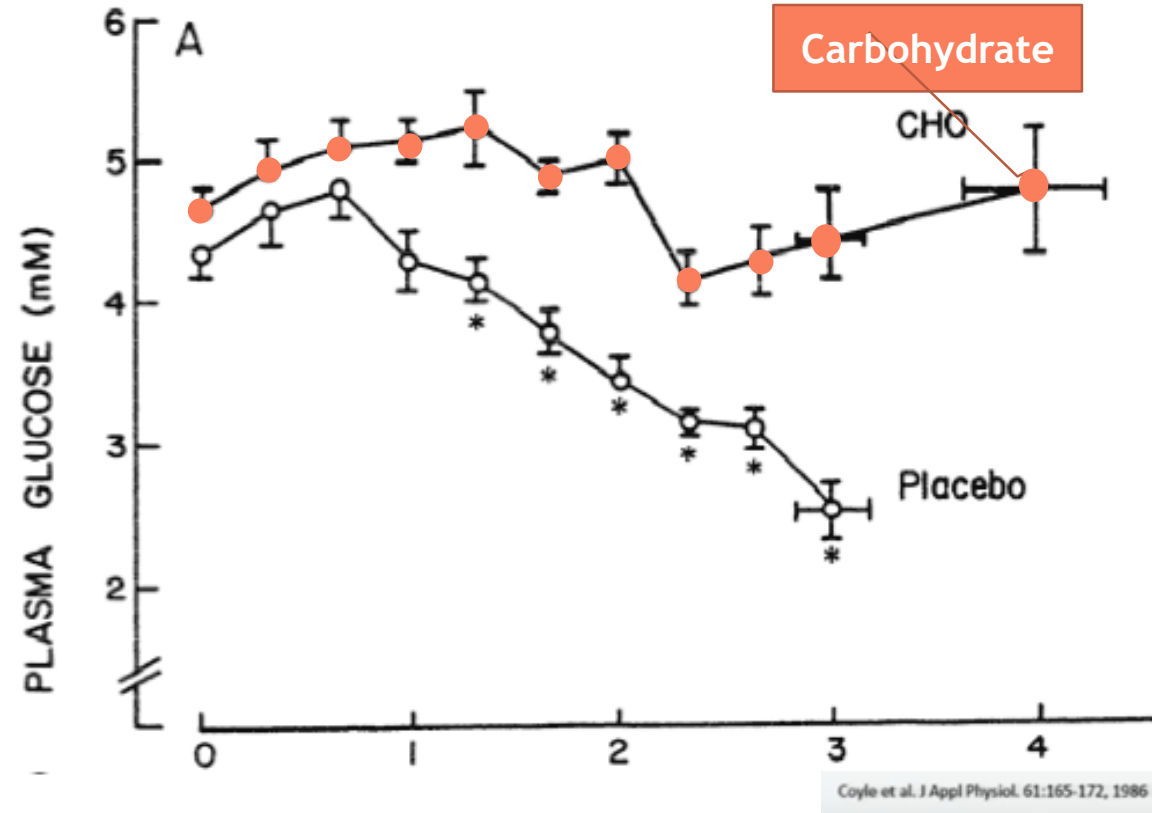
What happens when athletes don't fuel workouts properly?

- Lack of energy
- Decreased concentration & motivation (glucose is the brain's main fuel)
- Difficulty performing workout to potential
- Difficulty recovering from workout
- Stresses immune system = easier to get sick

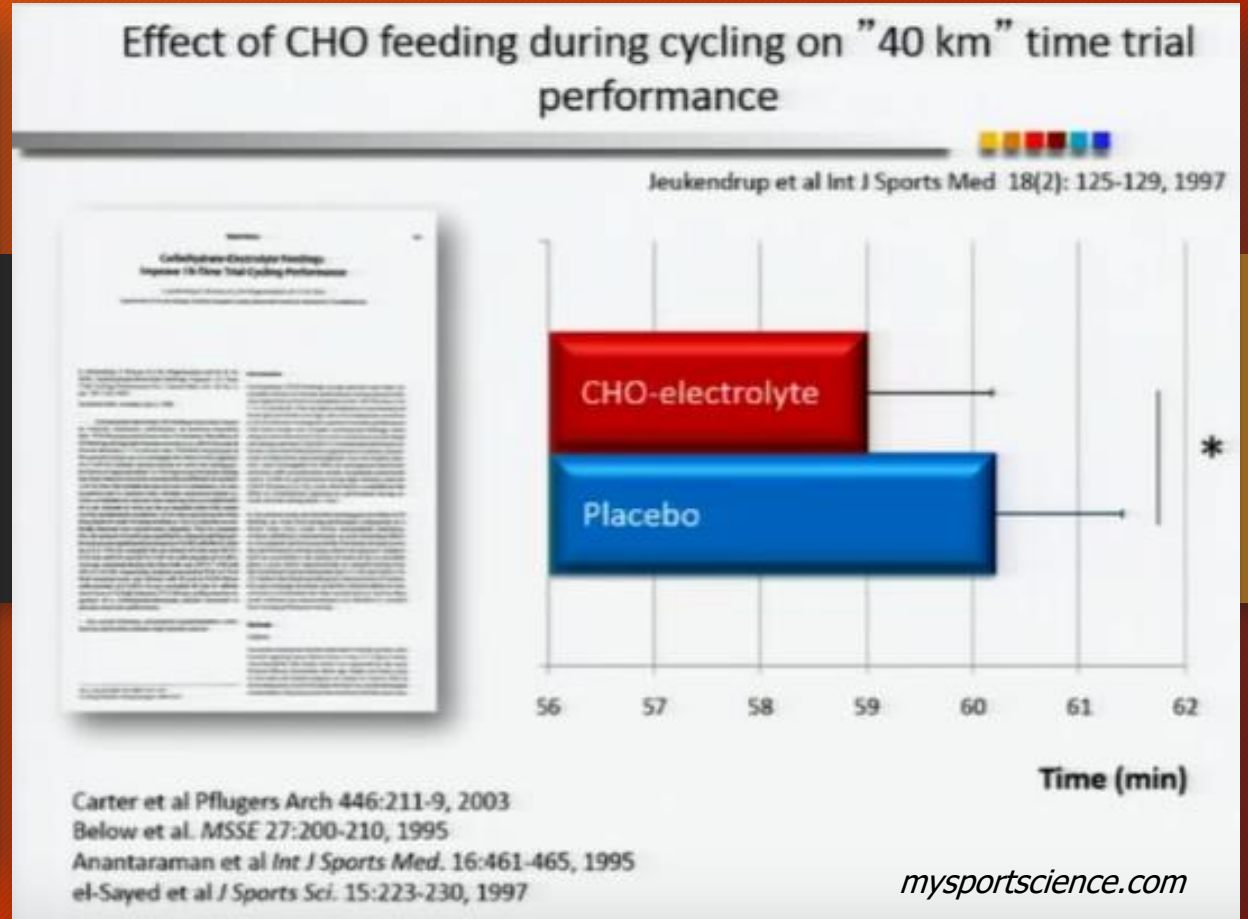


Carb Intake During Exercise

1. Increases time to exhaustion



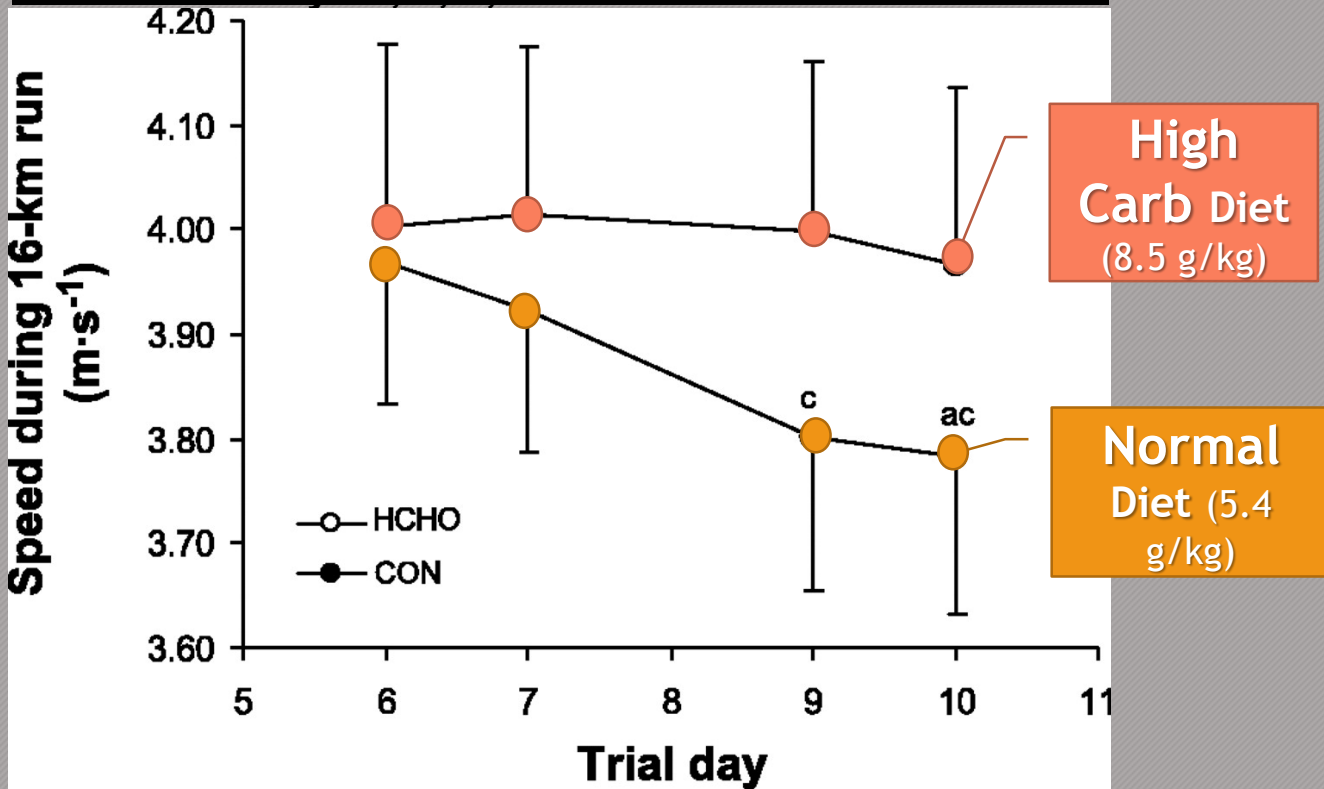
2. Performance Benefits for 1 hr Duration



Well established benefits

3. Reduces Overtraining Symptoms

- Simulated “overtraining” training camp situation with 7 d repeated hard training.
- Normal diet vs high carb diet.
- High carb diet reduced overtraining symptoms and reduced negative mood state compared to normal diet.



J. Achten et al. J Appl Physiol 2004;96:1331-1340



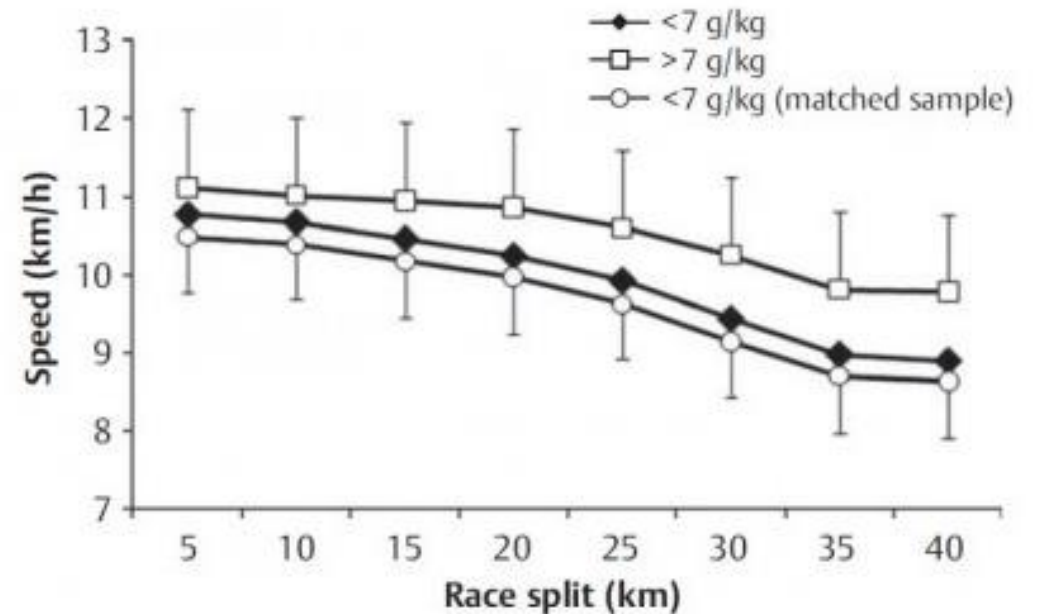
Other Benefits to Carbs During Exercise

- limits exercise-induced immune suppression
- reduces the rate of muscle breakdown
- improved motor skills (speed/agility) and cognitive demand of various team/ skill sports

Carbs Day Before

- Predict faster finishing time (Ironman, Marathon)

Example: Study of LONDON Marathon finishers 2009.
Runners who consumed > 7 g carb/per kg day before ran faster in & maintained their running speed.

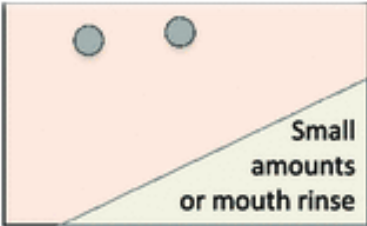
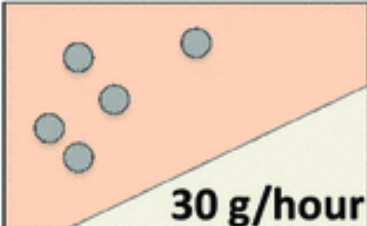
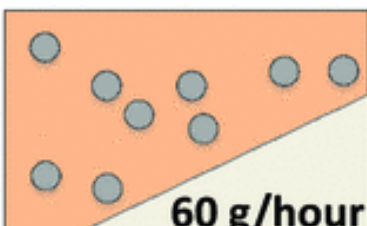
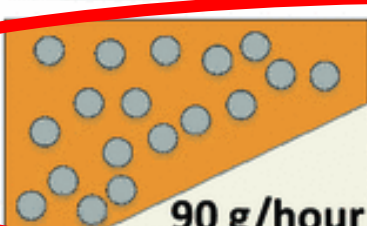


CARB Intake for Optimal Performance

Not necessary for all long/intense workouts, but good to practice.

Dose-Response > 2 h
(more carbs = better performance)

mix of different types of carbs best absorbed.

Duration	Amount of Carb Needed	Type of Carb Needed	Nutritional Training?
30-75 mins	 Small amounts or mouth rinse	Single or multiple transportable carbohydrates	Nutritional training recommended
1-2 hours	 30 g/hour	Single or multiple transportable carbohydrates	Nutritional training recommended
2-3 hours	 60 g/hour	Single or multiple transportable carbohydrates	Nutritional training highly recommended
>2.5 hours	 90 g/hour	ONLY multiple transportable carbohydrates	Nutritional training essential

Marathon Fueling Plans



During the race:

Eload drink + 0.5 eload energy gel (110 cal per gel) every 3 km, starting at 6 km.

I will carry my 6 gels (plus 1 extra) and consistently have one on the go throughout the race. Depending on weather, I may vary the drink consumption. If it is cold and I feel sloshy, I will drink less.

=4-7 gels
and 5.5-11
cups
sports
drink



PRE RACE

- 3 h pre race:

breakfast including 1 bottle of sports drink

- 1 h pre race:

another bottle of sports drink plus a sports bar

Before start: 1 gel

During the race:

- 5K: 250 ml sports drink

- 10K: 250 ml sports drink

- 15K: 250 ml sports drink

- 20K: 250 ml sports drink + 1 gel

- 25K: 250 ml sports drink + 1 gel

- 30K: 250 ml water + 1 gel

- 35K: 250 ml water + 1 gel

- 40K: 250 ml water + 1 gel

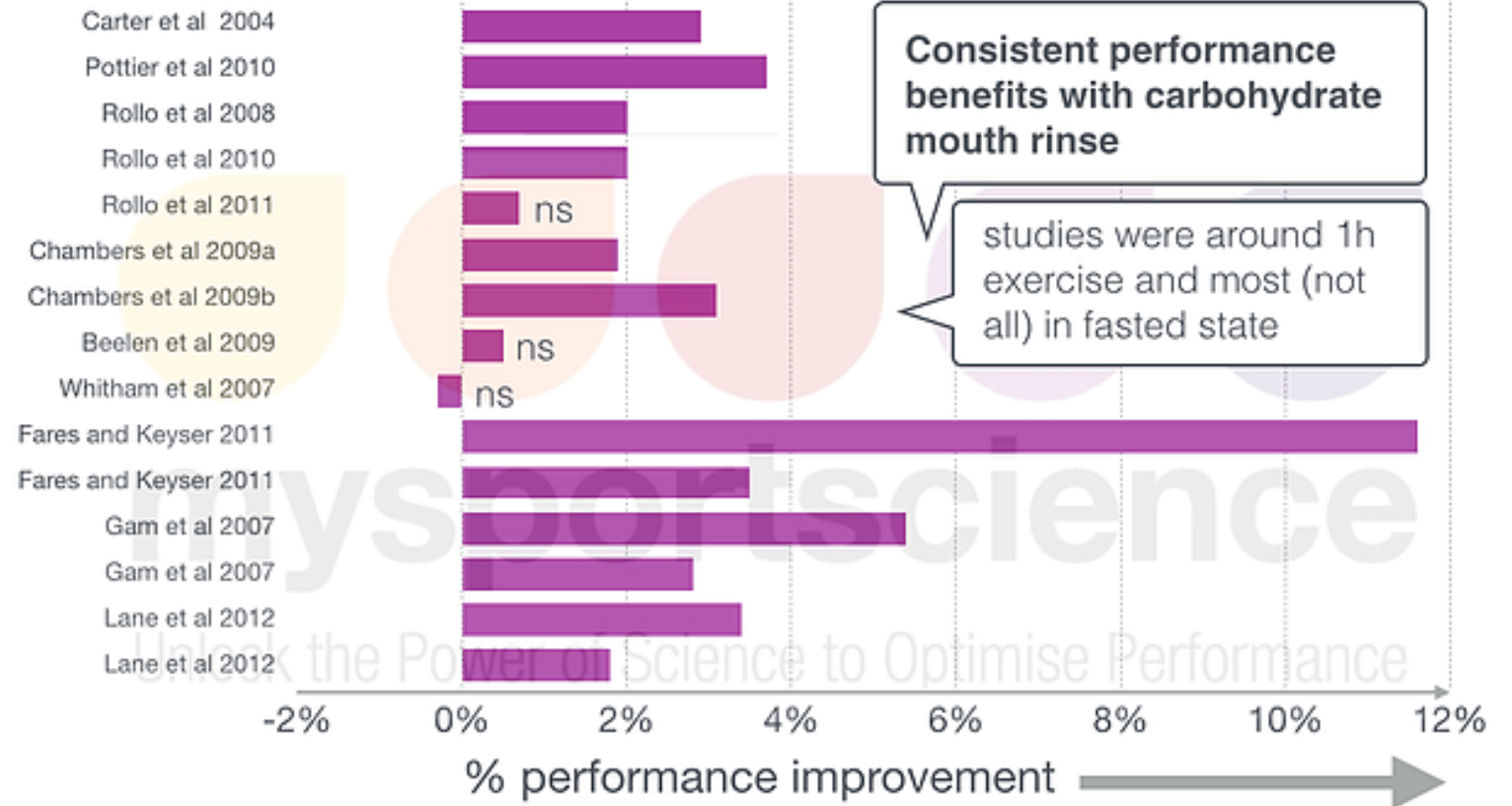
*2:04:26 in
Berlin (2007)*

= 5 gels; 5
cups sports
drink
60-80 g
CHO in 1.1
L water
each hour

Carbohydrate Mouth Rinse



Overview of studies Effects of carbohydrate mouth rinse on endurance performance






from Asker Jeukendrup mysportscience.com



WHEN & WHAT to eat BEFORE intense training/racing



	% CARBS		Type of food/meal	
4 Hours	60-70	Regular meal: limit fried foods, spicy foods, decrease fat	Pasta/rice with veggies and lean protein	
3 Hours	70-75	Smaller meal	Sandwich with lean protein (tuna, chicken) & veggies; bread & nut/seed butter, energy bar	
2 Hours	75-80		Fruit, lowfat cereal bar, cereal, bread	
1 Hour	85-100	Light snack, blender/liquid meal & some fluid	Smoothie, water, sports drink, diluted juice	

Foods to avoid before hard efforts



Best to limit anyways

High fat, high sodium, few nutrients,
hard to digest protein



Great outside of training, limit before

Harder to digest – high fiber, high protein and fat

Most of these foods are low in carbohydrates

Best CARBS for EXERCISE

- Empty quickly from stomach
- Digest rapidly
- Absorbed quickly
- Used immediately by muscle

Limit carbs that are harder to digest



EXCELLENT Nutrition, but best outside of hard exercise

Rehydration Tips

- Start workout hydrated, but not overhydrated
- Consume fluids over time instead of a lot at once
- Water & snacks, or sports drinks if that is easier (but not always necessary)
- Check hydration status with urine color



Drink Up!



- During strenuous activity, you lose fluid and electrolytes through sweat
- You need to replace fluid and electrolytes by drinking
- Dehydration=fatigue! It zaps muscle strength, energy, concentration & coordination
- Thirst isn't always a good indicator, so make it a habit to drink every 20 minutes or so.

Sports drinks provide energy (carbs) and replace electrolytes (sodium and potassium) that are lost in sweat.

Water is good (and sometimes preferred) for nonvigorous activities, or activities < 1- 1.5 hrs.

Why Sports Drink?

- Most sports drinks contain a carbohydrate that will quickly empty from your stomach and be easily absorbed through your small intestine.
- The amount of carbs (6 to 8 %) ensures that the drink can easily empty from your stomach.
- The sodium in sports drinks also helps absorption of fluid across the small intestine.



Sports drinks are best for intense, prolonged training and racing. For easier workouts, water + high carb snack works.

Water + Food?

- **Water + food/snacks is fine** for most workouts.
- **Food should be high in carbohydrates** – simple carbohydrates (sugars) are good fuel during workouts.
- **For intense workouts and time trials** you may want to use a sports drink (easier/quicker to digest than food, proper concentration for optimal absorption). It's also good practice for races. Though short duration, when you factor in warmup, cooldown, etc. fueling needs can be high.





Recovery Nutrition

Recovery Methods

Proven effective and large benefits

Simple, inexpensive, or free!



RECOVERY NUTRITION

After a workout, consuming the right foods or fluids at the right times can

- maximize training gains
- speed up the recovery process
- enhance subsequent performance

Athletes have more chance to improve if they are fresh and recovered at workouts



Why Is RECOVERY Nutrition Important?

In a typical hard 2-hour workout athletes . . .

- use up most stored carbohydrate energy (muscle and liver glycogen)
- sweat away over 2 L of water (& about 1600 mg of sodium)
- break down a variety of different body cells including muscle and red blood cells



Recovery & Training: find the balance

Positive vs Negative Fatigue



3 R'S TO RECOVERY NUTRITION



sheilakealey.com



1 REFUEL

Carbohydrate-rich foods will help replace your glycogen stores for your next training session. This is particularly important if you are doing back to back workouts.



2 REHYDRATE

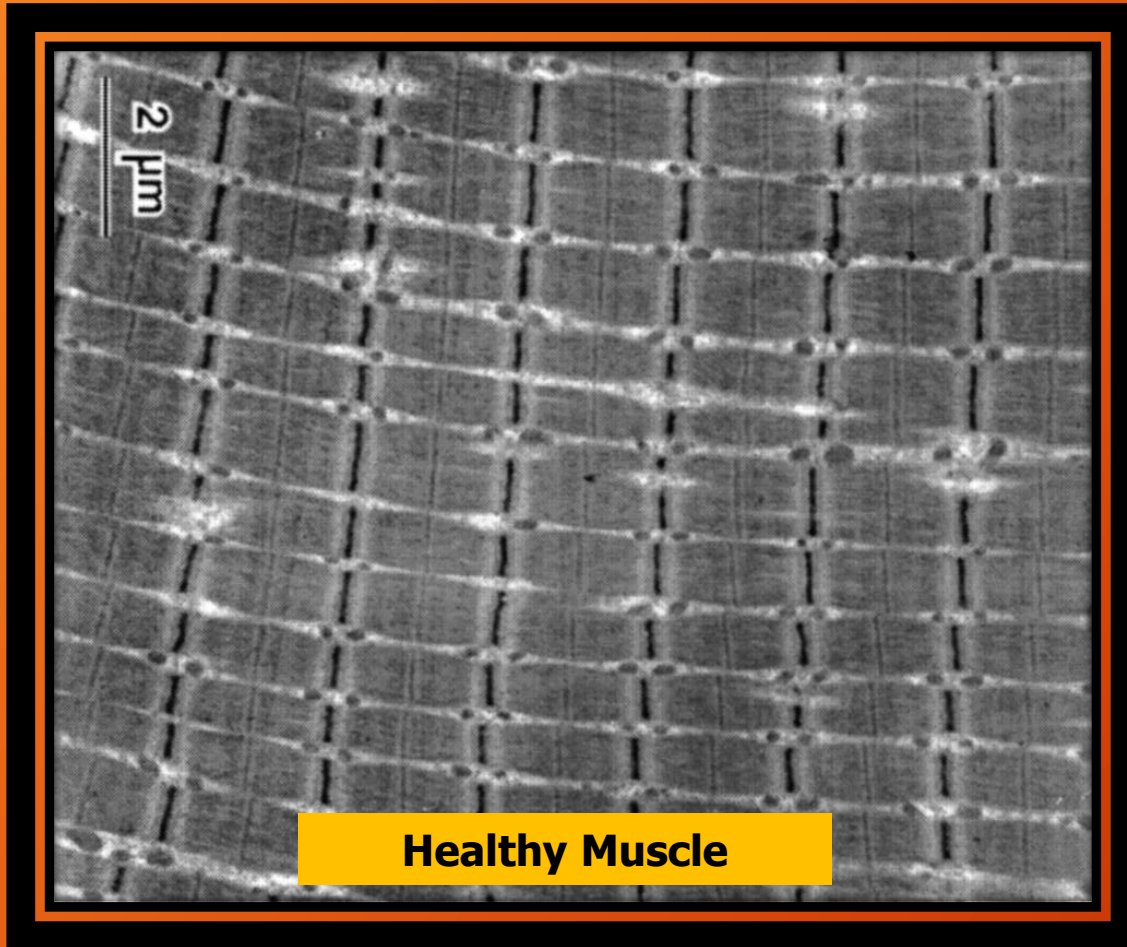
Replace sweat losses to start next training session fully hydrated. Water and snacks are fine. Juice (mostly carbs) or chocolate milk (carbs + protein), allow you to get carbs while you rehydrate.



3 REBUILD

Repairing muscle tissue is an important part of recovery. Although not as crucial to your next training session as carbs or fluids, protein will help long-term adaptations. Aim for 20g of protein within 30 minutes of exercise (about 500 ml of milk).

Exercise Damages Muscles



Good nutrition can help accelerate repair

Timing Is Important



- Make rehydrating and refueling a priority following your workout.
- Your muscles are most receptive to replenishing glycogen right after you stop exercising.
- That means **PLANNING**. . .
 - Pack a good recovery snack in your water bottle pouch or race/training bag.

**Aim to refuel within
30 minutes
of your workout.**





HOW MUCH PROTEIN DO YOU NEED?

More info on athletes & protein: www.sheilakealey.com/2014/05/05/how-much-protein/

sheilakealey.com

Estimated PROTEIN Requirements for

Sedentary Individuals



Athletes

Endurance

Elite

Moderate Intensity

Recreational

Protein Intake (g/kg/day)

Men **Women**

0.8-1.0 **0.8-1.0**

0.8-1.0 0.8-1.0

1.6 1.36

1.2 1.02

0.8-1.0 0.7-.9

Football, power sports



1.4-1.7 **1.2-1.4**

Resistance athletes (early training)

1.5-1.7 **1.3-1.4**

Resistance athletes (steady state)

1.0-1.2 **0.9-1.0**

How Much Protein?



15g

in 1 cup
cooked beans



18g

in 1 cup
cooked lentils



21g

in 1 cup
Greek yogurt



28g

in 1 cup
cottage or
ricotta cheese



22g

in 3 oz
shelled
edamame



8g

in ½ cup
cooked quinoa



8g

in 1 cup
of milk



7g

in 1 oz
cheddar
cheese



11g

in ½ cup
firm tofu



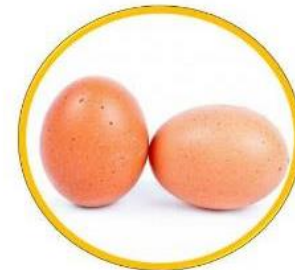
7g

in ¼ cup
mixed nuts



30g

in 3 oz
beef



13g

in 2
eggs



8g

in 2 tbsp
peanut
butter



6g

in 1 cup
shelled
peas



22g

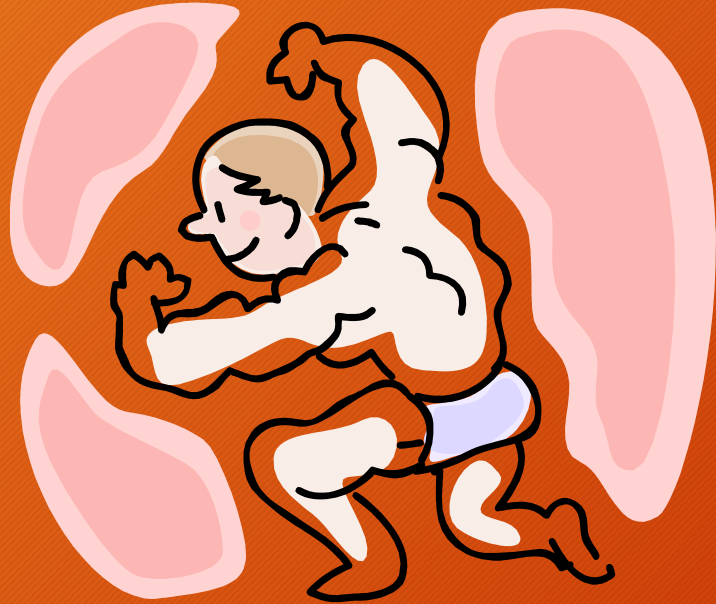
in 3 oz
salmon



26g

in 3 oz
chicken

More protein is not better!



>20-30 g protein doesn't deliver any further muscle repair/building

“A reasonably high protein intake may not be harmful, there is currently no evidence that protein intake about 1.5 – 2g/kg/day is beneficial.”

Kevin Tipton

Professor of Sport, Health and Exercise Sciences at Stirling University.

Protein nutrition and metabolism.

Protein timing for optimal muscle growth/recovery

- Protein distribution throughout the day is important for muscle-building processes
- Most people have an unbalanced protein intake (i.e., 10-15 g breakfast; 15g lunch, 65g dinner)
- Aim for 3-4 meals/day with about 20 g protein (at breakfast include greek yogurt, eggs, cottage cheese)
- You don't build muscle just by eating: muscle building doubled if combined with strength training

What does an optimal daily protein intake look like?

IT'S NOT HARD to get enough protein with FOOD. Here's how a 70 kg (154 lb) endurance athlete can achieve an intake of 1.5 g protein/kg

106 g
PROTEIN*

24 g Breakfast: 6 oz. Greek yogurt (16 g)
2 tbsp. peanut butter (8 g)



35 g Lunch: 1 cup lentils (16 g)
1 oz cheese (7 g)
8 oz milk (8 g)
1 fruit serving (2 g)
1 vegetable serving (2 g)



20 g Snack: Smoothie with yogurt, milk, fruit (12 g)
Handful of nuts (8 g)

27 g Supper: 3 oz salmon (21 g)
1 cup vegetables (4 g)
½ cup cooked brown rice (2 g)



PROTEIN POWDERS

- Protein powders are **HIGHLY PROCESSED**. You can easily get your protein from **REAL FOOD**.
- **PRODUCT SAFETY?** Protein powders aren't well regulated (reviews show some contain contaminants, or don't contain what the label says).
- **EXTRA INGREDIENTS** you don't need (such as sweeteners, vitamins, minerals, herbs, etc).



PROTEIN POWDERS: Bottom Line

- Get your protein from real food - many options including beans, legumes, meats, and dairy
- Most people are already getting the protein they need from their diet
- Eating more protein doesn't lead to bigger strength gains
- Protein powders = *convenient substitute* for protein from real foods, not a mainstay of your diet



1

Chocolate Peanut Butter PROTEIN SHAKE



Greek yogurt



1/2 cup

Peanut Butter
Honey
Cocoa Powder



1 tbsp. each

Milk



1/2 cup

22g protein



2 "Protein" shake recipes

2

Strawberry Banana POST-WORKOUT Recovery SMOOTHIE

Rehydrate, Refuel, & Rebuild . . . deliciously



sheilakealey.com

Recovery INGREDIENTS

Milk



23 g protein
calcium

Greek Yogurt



healthy carbs,
potassium
vitamin C
folate
anthocyanins

Bananas



Strawberries



sheilakealey.com

Sugar - good or bad?



It depends on the context

Limit sweet beverages outside of exercise

- Sports Drinks, Soda, Fruit juices
- Choose fruit instead of fruit juice

WHY?

- Compete with other nutrients
- Raise blood sugar when you don't need it
- Concentrated source of quickly absorbed sugar
- High in calories with few nutrients



Questionable Sports Nutrition & Health Trends & How to Spot Them



ALL
Carbs
are Not
EQUAL



Athletes who follow a low-carb diet

- Body's ability to use carbohydrate as a fuel is diminished.
- Detrimental effects on high intensity exercise where carbohydrate is the primary fuel.
- Studies clearly demonstrate impaired performance during periods of intensified training with or high intensity exercise.
- Athletes who avoid carbs are more at risk for gastrointestinal problems and run out of energy in longer endurance events.

Is there value to Low-Carb Training/Eating?

TRAIN LOW (various definitions/workouts with depleted glycogen/no carbs)

- Strategy that *may* increase the body's ability to burn fat/use fat as fuel
- Should be carefully integrated into training program because of risks – longer recovery needed, compromised workouts (less power, speed, fatigue), risks to immune function
- Not for young athletes or any athletes who don't practice good sports nutrition
- Interesting research area but few studies, none rigorous, no established guidelines

EATING LOWER CARB

Varying carb intake with activity level can make sense (i.e., less activity=fewer carbs)

Post Race Nutrition

Develop a Routine and plan for it. FOOD & DRINK are part of your race plan.

1. Race

2. Drink and/or eat

(grab your drink bottle – be prepared!)

3. Cool Down



Athlete's Training Diet

Good sports nutrition is founded on an overall healthy diet

- **Carbohydrates** from a variety of whole grains, vegetables, fruit, and beans
- **Protein** from fish, poultry, lean meats, beans & legumes, tofu, low-fat dairy foods, and eggs
- **Fats** from healthy sources, such as nuts, seeds, fish, avocados, olive oil

