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# Nutrition for Optimal Sports Performance

**A Comprehensive Guide**

Updated 8/1/10

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# Nutrition for Optimal Sports Performance Overview

Segments:

➤ **Sports Nutrition Introduction**

- The Athlete's Grocery List — Tips for Healthy Eating
- The 3 Principles of Sports Nutrition
- Your Sports Nutrition Game Plan: Hydration to Recovery
- The Latest Products and Tools from PowerBar®



# Sports Nutrition Introduction

**Sports nutrition** is the practical science of hydrating and fueling before, during, and after exercise.

**Executed properly**, sports nutrition can help promote optimal training and performance.

**Done incorrectly** or ignored, it can derail training and hamper performance.



# Sports Nutrition Introduction

## Benefits of sports nutrition

- Enables you to train longer and harder
- Delays the onset of fatigue
- Enhances performance
- Promotes optimal recovery and adaptation to your workouts



# Sports Nutrition Introduction

## Benefits of sports nutrition

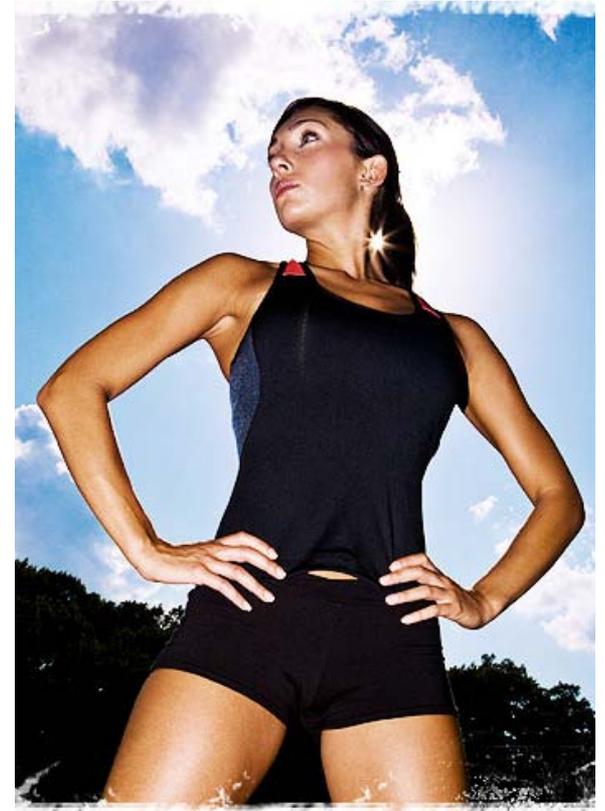
- Improves body composition and strength
- Enhances concentration
- Helps maintain healthy immune function
- Reduces the potential for injury
- Reduces the risk of heat cramps and stomach aches



# Nutrition for Optimal Sports Performance Overview

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# Tips for Healthy Eating

- Sports nutrition focuses on what you need to be fueled and hydrated during exercise, and to promote rapid recovery after exercise.
- But what are you eating the rest of the time, when you're not exercising?
- Cutting-edge sports nutrition is founded on healthy eating.



# Tips for Healthy Eating

## Aim for a well-balanced diet:

- **Carbohydrates** from a variety of whole grains, vegetables, fruit, and beans
- **Protein** from fish, poultry, lean meats, beans, low-fat or nonfat dairy foods, and eggs or egg whites
- **Fats** from healthy sources, such as vegetable oils, nuts, seeds, and avocados



# Tips for Healthy Eating

## Carbohydrates

- **Healthy sources:**  
Whole grain cereals, breads, and pasta; fruits; vegetables; and beans.
- **Nutritional benefits:**  
Major source of energy, vitamins, minerals, and fiber.
- **Health benefits:**  
Regularity; healthier blood cholesterol levels; and lower risk of heart disease, diabetes, and cancer.
- **Performance benefit:**  
Carbs are your major muscle fuel source for high-intensity exercise.



# Tips for Healthy Eating

## Protein

- **Healthy sources:**

Fish, poultry, lean meats, low-fat and nonfat dairy foods, seeds, nuts, beans, and eggs.

- **Nutritional benefits:**

Provides amino acids, the building blocks for making proteins.

- **Health benefits:**

Proteins make up muscle and play roles in digestion, metabolism, and immune function.

- **Performance benefits:**

Protein helps in the building and repair of muscle tissue, and works with carbs to boost the rate of recovery after exercise.



# Tips for Healthy Eating

## Fats

- **Healthy sources**

Vegetable oils such as canola oil and olive oil, nuts, seeds, and fish.

- **Nutritional benefits**

Major source of energy; vitamins A, D, E, K; omega-3 fatty acids; and other essential fats.

- **Health benefits**

Healthier blood cholesterol levels and lower risk of heart disease.

- **Performance benefits**

Fats are the major muscle fuel sources for low-intensity exercise.

- **Limit certain fats**

- *Limit your intake of saturated fats and cholesterol* by choosing lean meats and low-fat or nonfat dairy foods and egg whites.
- *Keep trans fats intake as low as possible* by reading labels and limiting your intake of fried fast foods and commercially prepared baked goods.



# Tips for Healthy Eating

## Made Simple



### At meals:

- **Fill  $\frac{3}{4}$  of your plate with a variety of carbohydrate-based foods** such as fruit, cereals, pasta, bread, potatoes, and other vegetables.
- **Fill the other  $\frac{1}{4}$  of your plate with lean protein foods**, such as fish, poultry, lean meats, low-fat or nonfat dairy products, beans, and small amounts of nuts and seeds, which are good sources of healthy fats.

# Healthy Eating for Athletes:

## Vitamins and Minerals

- **Vitamins and minerals are essential to the diet.**

You can't make them so you have to get them from foods or dietary supplements.

- **Essential micronutrients have many important functions, including:**

Supporting growth, repairing tissues, carrying oxygen to muscles and other tissues, and supporting the metabolism of energy, carbs, protein, and fat.

- **All the essential vitamins and minerals are important to athletic performance and good health. Some key examples are:**

**B vitamins** (thiamin, riboflavin, and pyridoxine) – for energy and nutrient metabolism

**Vitamin C** – for healthy immune function

**Calcium and vitamin D** – for strong and healthy bones

**Iron** – for optimum oxygen delivery to tissues and the prevention of anemia

- **For extra insurance, consider taking a basic daily multivitamin/mineral supplement .**

# Tips for Healthy Eating

## In Summary

### The focus of healthy eating:

To help ensure that you remain healthy over the long term

### The focus of sports nutrition:

To help keep you hydrated, to fuel your exercise, and to promote rapid recovery after exercise

**Athletes need both!**

# Nutrition for Optimal Sports Performance Overview

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# The 3 Principles of Sports Nutrition

The 3 most important principles of sports nutrition are as follows:

- Stay **hydrated**.
- Provide **fuel** for your muscles.
- Promote optimal **recovery** after exercise.

Apply these principles correctly and you can consistently maximize the gains from your training and compete at your best.

# The 3 Principles of Sports Nutrition

## Hydration

**During exercise, you lose fluid and electrolytes as you sweat:**

- The key electrolyte is sodium.
- If you don't replace both fluid and sodium during exercise, you can become dehydrated.

**The single largest contributor to fatigue during exercise is dehydration caused by fluid and sodium losses:**

- Inadequate fluid and sodium make your heart work harder and make exercise much more difficult.
- Dehydration also impairs concentration and the ability to make tactical decisions.

**Complicating matters is that thirst alone is not a good indicator of your hydration needs during exercise.**

# Principles of Sports Nutrition:

## Hydration

**Losing over 2% of your body weight due to fluid loss during exercise means you are dehydrated and your performance has already been hampered:**

- A 2% loss is just 3 lbs for a 150-lb athlete.
- It is common to lose this much fluid, or more, during a workout or competition.

**Consuming too much fluid during exercise leads to overhydration or *hyponatremia*, which also impairs performance and can have serious health consequences.**

**Stay within your *hydration zone* during exercise:**

- That means avoid gaining weight during exercise due to overconsuming fluid.
- And don't lose any more than 2% of your body weight due to fluid loss.

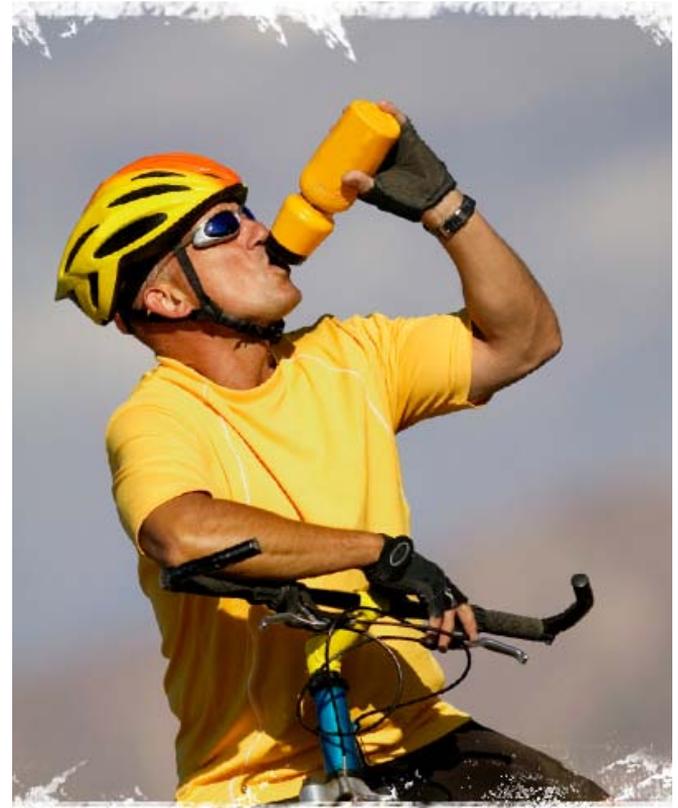
**Fortunately, dehydration and overhydration can be avoided or minimized by sticking to a disciplined hydration plan.**

# The 3 Principles of Sports Nutrition

## Hydration

**To avoid the performance-impairing effects of dehydration:**

- Start training sessions and competitions fully hydrated.
- Rehydrate as needed during exercise.
- Fully replace fluid and sodium losses after exercise.



# The 3 Principles of Sports Nutrition

## Fueling

- Carbohydrates are the primary muscle fuel for most types of exercise.
- 60–90 minutes of endurance training or a few hours in the weight room can seriously deplete carbohydrate muscle fuel stores.
- Starting exercise with full carbohydrate stores can delay the onset of fatigue and help you train or compete more effectively.
- Workouts and performance during competitions suffer if your diet is too low in carbs.

# The 3 Principles of Sports Nutrition

## Fueling

**There are 2 forms of carbohydrate in your body:**

- *Glucose*, which circulates in the bloodstream
- Glycogen, which is bundles of glucose stored in the liver and muscles

**When you're fully loaded with carbs, you have:**

- About 40 calories of glucose in the bloodstream
- About 1,900 calories stored as glycogen in the muscles, plus liver glycogen

# The 3 Principles of Sports Nutrition

## Fueling

### “Hitting the Wall”

- When you run out of muscle glycogen stores, you rely on your small reserves of liver glycogen to maintain blood glucose levels.
- After liver glycogen stores are used up, blood sugar levels drop and you are forced to either slow way down or stop.
- In some sports, this is called “hitting the wall” or “bonking.”

# The 3 Principles of Sports Nutrition

## Fueling



Avoid “Hitting the Wall”

# The 3 Principles of Sports Nutrition

## Fueling

To avoid running out of muscle fuel during workouts or competitions:

- Start training sessions and competitions fully fueled.
- Refuel as needed during exercise.
- Replenish glycogen stores after exercise.



Diets with minimal carbs are **NOT** appropriate for athletes!

# The 3 Principles of Sports Nutrition

## Recovery

- Workouts and competitions deplete your glycogen stores.
  - Muscle tissue is damaged as you train and compete, and requires repair.
  - Your muscles are also being stimulated to adapt to your training workload.
- Recovery includes:
    - Reloading carbohydrate fuel stores
    - Repairing and building new muscle tissue
    - Rehydrating

# The 3 Principles of Sports Nutrition

## Recovery

- Recovery is where you realize the gains from all of your training.
- Recovery enables you to be ready for your next workout or competition.
- The recovery process doesn't start after exercise until you provide your body with the nutritional components it needs:
  - Carbohydrates
  - Protein
  - Fluids
  - Replacing key electrolytes lost in sweat

# The 3 Principles of Sports Nutrition

## Recovery

In order to promote rapid recovery, as soon as possible after training or competing (within 30–60 minutes), consume:

- Carbohydrates for glycogen restoration
- Protein for repairing and building new muscle tissue
- Fluids and sodium for rehydration



# The 3 Principles of Sports Nutrition

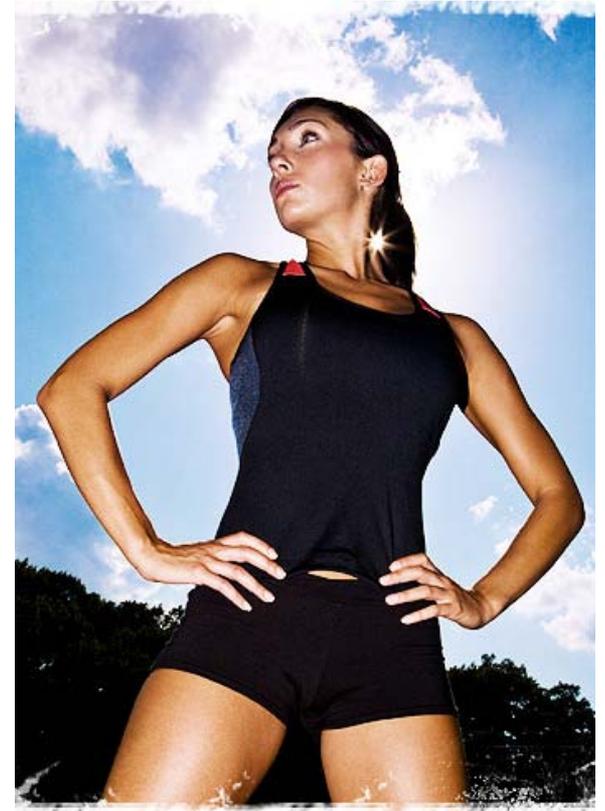
**To apply these principles correctly, practice them during training.**

- When your training and sports nutrition regimen are in sync, you maximize your performance gains.
- It is only through a system of trial and error during training that you can develop your own personalized sports nutrition plan.
- Practice your sports nutrition regimen during training. Don't try anything new on race or game day.

# Nutrition for Optimal Sports Performance Overview

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# Your Sports Nutrition Game Plan



## Putting the principles of sports nutrition into practice:

- **Start exercise fully hydrated and fueled.**
  - Carbohydrate load when necessary.
  - Match your sweat rate and know what to hydrate with during exercise.
  - Refuel as needed during exercise.
  - Promote full recovery:
    - After exercise
    - Daily strategies



# Your Sports Nutrition Game Plan

## Start Exercise Fully Hydrated and Fueled



### **By starting workouts and competitions fully hydrated:**

- You'll be able to train harder and achieve better workouts.
- You'll be able to compete at a higher level for longer.

### **Make up for any fluid deficits from prior workouts or competitions:**

- Consume 14–20 fl oz (400–600 ml) of water or a sports drink 2–3 hours before training or competing.

### **Keep hydrating as needed during warm-ups.**

### **Monitor your hydration status *before exercise* by checking the color of your urine:**

- Light-yellow color is consistent with adequate hydration.
- If urine is the color of apple juice, more fluids are needed.

# Your Sports Nutrition Game Plan

## Start Exercise Fully Hydrated and Fueled



### **Glycogen stores get utilized every time you train or compete:**

- If fuel reserves aren't consistently replenished, deficits build and you feel fatigued during exercise.

### **Top off muscle glycogen fuel stores before exercise:**

- Consume a carb-based meal 2–4 hours before exercise.
- Choose familiar carb-based foods and beverages, including pasta, rice, bread, cereal, vegetables, fruit, and sweetened dairy products such as flavored yogurts and flavored milks .

### **The goal is to start fully fueled but feeling comfortable:**

- Avoid slow-to-digest fatty and high-fiber foods prior to exercise.
- Experiment during training to find the right food items and routine that work best for you.

# Your Sports Nutrition Game Plan

## Start Exercise Fully Hydrated and Fueled



### Examples of high-carbohydrate pre-exercise meals

*(2–4 hours before exercise)*

#### Breakfast

- Cold or hot cereal, fruit, and low-fat or nonfat milk
- French toast or pancakes with maple syrup
- English muffin with jam and peanut butter, banana, and fruit juice

#### Lunch or Dinner

- Pasta with tomato sauce, French bread, steamed vegetables, low-fat/nonfat milk, pudding, and canned fruit
- Grilled chicken sandwich, baked potato with low-fat sour cream or salsa, and low-fat frozen yogurt
- Thick-crust cheese pizza, low-fat gelato, and canned peaches
- Baked or grilled chicken, turkey, fish, or lean beef; steamed rice; roll; green beans; low-fat frozen yogurt; and fruit juice

# Your Sports Nutrition Game Plan

## Start Exercise Fully Hydrated and Fueled



**Consume an easy-to-digest, carb-based snack (about 40–60 grams of carbs) 30–60 minutes before exercise, along with fluids.**

**If you've got pregame jitters, don't skip eating entirely:**

- Try liquid carbohydrate sources in place of solid foods.

**Ideas for quick-to-digest, carb-based options:**

- Fruit smoothie or meal-replacement beverage
- PowerBar<sup>®</sup> Performance Energy bar, PowerBar<sup>®</sup> Energy Gel, or PowerBar<sup>®</sup> Energy Blasts gel filled chews with water
- Small roll or sandwich made with a banana and honey
- Low-fat or nonfat yogurt or frozen yogurt, gelato, or sorbet

# Your Sports Nutrition Game Plan



## Putting the principles of sports nutrition into practice:

- ✓ Start exercise fully hydrated and fueled.
- **Carbohydrate load when necessary.**
  - Match your sweat rate and know what to hydrate with during exercise.
  - Refuel as needed during exercise.
  - Promote full recovery:
    - After exercise
    - Daily strategies



# Your Sports Nutrition Game Plan

## Carbohydrate Load When Necessary

- Carbohydrate loading is a research-proven fueling strategy designed to extend endurance in athletes.
- Consider carbohydrate loading before periods of intense training or a long endurance event.
- If you're exercising at a steady pace and intensity, carbohydrate loading can increase endurance by about 20%.



# Your Sports Nutrition Game Plan

## Carbohydrate Load When Necessary

### How to carbohydrate load:

Two Different Approaches	Carb-Loading Regimen	Example: 150-lb (68-kg) athlete
<b>3–4 days prior</b> (Taper exercise for 3–4 days before your event)	3.6–5.5 g of carbs per lb body weight daily (8–12 g per kg)	540–825 g of carbs per day for 3–4 days before
<b>1–2 days prior</b> (Rest for 1–2 days before your event)	4.5–5.5 g of carbs per lb body weight daily (10–12 g per kg)	675–825 g of carbs per day for 1–2 days before

# Your Sports Nutrition Game Plan

## Carbohydrate Load When Necessary

### 700 g of carbs — sample menu

#### Breakfast

- 1 cup cold breakfast cereal with 1 cup low-fat or nonfat milk
- 1 cup canned peaches
- 2 slices white toast with jam
- 1 cup of orange juice

#### Morning snack

- 1 PowerBar® Performance Energy bar
- 1 banana
- 20 fl oz (600 ml) Ironman Restore™ sports drink

#### Lunch

- 1 bagel with banana and honey
- 1 sandwich with lean meat, tomato, and lettuce
- 1/2 cup canned mandarin oranges or fruit cocktail
- 1 cup low-fat or nonfat yogurt with fruit
- Water

#### Afternoon snack

- 2 cups fresh fruit smoothie made with yogurt and frozen or canned fruit
- 1 PowerBar® Fruit Smoothie Energy bar

#### Dinner

- 1-1/2 cups pasta
- 1 cup tomato sauce with or without lean meat
- 1 cup cooked green beans
- 1 orange
- 1 cup sorbet with fruit
- 1 cup fruit juice

#### Evening snack

- 1 cup cold breakfast cereal with 1 cup low-fat or nonfat milk
- 20 fl oz (600 ml) Ironman Restore™ sports drink

# Your Sports Nutrition Game Plan



## Putting the principles of sports nutrition into practice:

- ✓ Start exercise fully hydrated and fueled.
- ✓ Carbohydrate load when necessary.
- **Match your sweat rate and know what to hydrate with during exercise.**
  - Refuel as needed during exercise.
  - Promote full recovery:
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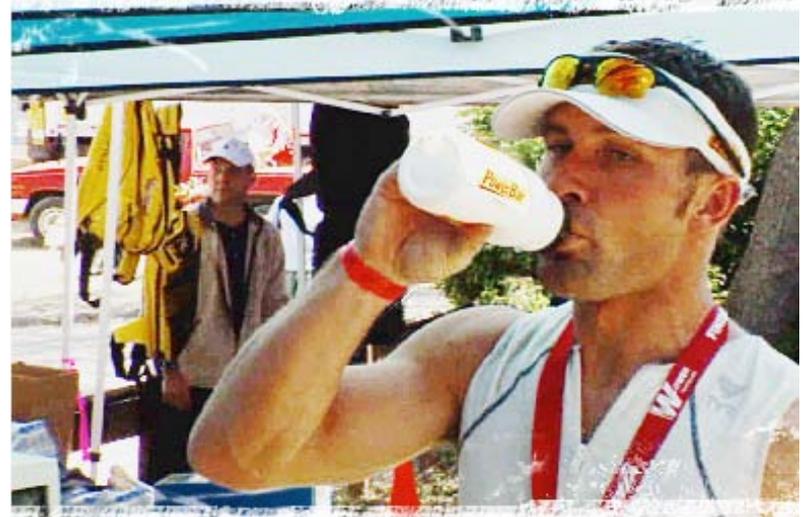
# Your Sports Nutrition Game Plan

## Match Your Sweat Rate and Know What to Hydrate with During Exercise



To stay hydrated during exercise, consume fluids at a rate that closely matches your sweat rate:

- Matching your sweat rate generally requires about 13–26 fl oz (400–800 ml) of fluid every hour of exercise, preferably in smaller amounts taken frequently. But fluid needs can vary considerably.
- Calculate your sweat rate to determine your actual hydration needs.
- To calculate your sweat rate, and for a personalized plan to meet your unique hydration needs, click on the **PowerBar® Sweat Rate Calculator** at [www.PowerBar.com](http://www.PowerBar.com).



# Your Sports Nutrition Game Plan



## Match Your Sweat Rate and Know What to Hydrate with During Exercise

**Carry your own sports bottle or fuel belt and use breaks wisely:**

- Most athletes can easily consume about 5 fl oz (150 ml) during a quick break; each gulp is about 1 fl oz (30 ml).

**Monitor the effectiveness of your hydration plan. Many athletes fall far short of meeting their hydration needs during exercise:**

- Weigh yourself before and after practices or competitions.
- The goal is to stay in your hydration zone and avoid dehydration. That means losing no more than 2% of your body weight during exercise.
- If your weight loss is greater than 2%, make a conscious effort to take in more fluids during exercise.

# Your Sports Nutrition Game Plan



## Match Your Sweat Rate and Know What to Hydrate with During Exercise

**A sports drink is generally the best option when you're training or competing. The advantages of a sports drink over plain water are many:**

- It promotes better performance because it provides carbohydrates to fuel your muscles and your brain.
- Athletes freely consume more fluids when their hydration beverage is flavored, as is the case with a sports drink.
- Sodium and carbs cause the fluid in the sports drink to be absorbed more quickly.
- The sodium also helps maintain your drive to continue drinking fluids when exercising, which is crucial to meeting your fluid needs.
- Sodium also helps you retain the fluid that you've consumed.

# Your Sports Nutrition Game Plan



## Match Your Sweat Rate and Know What to Hydrate With During Exercise

**Water** is fine when exercising for less than 1 hour in moderate temperature conditions.

A **sports drink** is recommended for exercise of 1 hour or longer, and anytime conditions are hot or humid.

# Your Sports Nutrition Game Plan



## Putting the principles of sports nutrition into practice:

- ✓ Start exercise fully hydrated and fueled.
- ✓ Carbohydrate load when necessary.
- ✓ Match your sweat rate and know what to hydrate with during exercise.
- **Refuel as needed during exercise.**
  - Promote full recovery:
    - After exercise
    - Daily strategies



# Your Sports Nutrition Game Plan



## Refuel as Needed During Exercise

- Carbohydrate is the primary muscle fuel utilized during exercise, and stores are limited.
- Carbohydrate refueling needs depend on the length and intensity of exercise.
- For long-duration, all-out effort, refuel with sports nutrition products that provide a 2:1 blend of glucose and fructose to speed energy delivery to muscles and extend endurance.

# Your Sports Nutrition Game Plan

## Refuel as Needed During Exercise



### Carb refueling recommendations:

Exercise lasting less than 1 hour	Carbohydrate intake during exercise is not required to fuel your performance.  However, a sports drink with carbs and sodium can help hydrate you more effectively.
Exercise lasting 1–2 hours	Consume 30–60 g of carbs during each hour of exercise, to boost performance and extend endurance
Intense training lasting longer than 2–3 hours	Consume 45–90 g of a 2:1 blend of glucose and fructose per hour of exercise, to increase energy delivery to muscles and extend endurance.

# Your Sports Nutrition Game Plan



## Putting the principles of sports nutrition into practice:

- ✓ Start exercise fully hydrated and fueled.
- ✓ Carbohydrate load when necessary.
- ✓ Match your sweat rate and know what to hydrate with during exercise.
- ✓ Refuel as needed during exercise.
- **Promote full recovery:**
  - After exercise
  - Daily strategies



# Your Sports Nutrition Game Plan



## Promote Full Recovery: After Exercise

Your body is ready to start the recovery process as soon as you finish your workout or competition, but you need to provide the necessary nutrients:

- Carbohydrates to restore depleted glycogen stores
- Protein to repair and build muscle tissue
- Fluids and sodium to rehydrate



# Your Sports Nutrition Game Plan



## Promote Full Recovery: After Exercise

### Carbohydrates

To speed glycogen restoration after strenuous exercise:

- Consume 0.5 grams of carbs per lb (1.1 grams per kg) body weight within 30 minutes of finishing exercise.
- For a 150-lb (68-kg) athlete, that equates to 75 grams of carbohydrates right after exercise.
- Repeat this within 2 hours after exercise, or consume a carb-based meal.
- For heavy training, repeat this hourly for the first 3 hours after exercise, or consume carb-based meals and snacks.
- Simple carbs right after exercise are more effective at speeding glycogen restoration.
- This is especially important if you are exercising again within 24 hours.

# Your Sports Nutrition Game Plan



## Promote Full Recovery: After Exercise

Fully rebuilding glycogen stores takes about 24 hours on a carb-based diet — but many athletes don't get enough total carbs each day.

	Exercise	Total Daily Carbohydrate Needs	150-lb (68-kg) Athlete
<b>Light Training</b>	<1 hour, low-intensity	2.3–3.2 g of carbs per lb body weight (5–7 g per kg)	345–480 g of carbs per day
<b>Heavy Training</b>	1–4 hours, moderate- to high-intensity	3.2–4.5 g of carbs per lb body weight (7–10 g per kg)	480–680 g of carbs per day
<b>Extreme Training</b>	>4 hours, moderate- to high-intensity	4.5–5.5 g per lb body weight (10–12 g per kg)	680–816 g of carbs per day

# Your Sports Nutrition Game Plan



## Promote Full Recovery: After Exercise

Sample intake for about 500 g of carbs per day	Grams of carbs
1 cup cereal, 1 cup milk	45
1 cup blueberries	21
PowerBar® Performance Energy bar	45
Sandwich, 2 oz turkey	32
½ cup baby carrots	6
16 oz chocolate 1% milk	52
1 cup flavored yogurt	47
BBQ chicken tenderloins, 7.5-oz package	34
1 cup white rice	41
1 cup cooked sweet potatoes	58
1 PowerBar Harvest® Energy bar	45
16 oz cranberry juice	68
<b>Total grams of carbs</b>	<b>494</b>

# Your Sports Nutrition Game Plan



## Promote Full Recovery: After Exercise

### Protein

Muscle tissue repair and building is critical to recovery:

- Muscle tissue is made up of proteins, and proteins are made up of building blocks known as amino acids.
- When you consume foods, any protein present is digested and broken down into its component amino acids.
- These amino acids are then absorbed and repackaged into the proteins your body needs for the repair and building of muscle tissue.

# Your Sports Nutrition Game Plan



## Promote Full Recovery: After Exercise

Athletes need more protein than inactive individuals, but most athletes get plenty of protein — and consuming more than what you need offers no extra muscle-building or performance benefits.

	Total Daily Protein Needs	150-lb (68-kg) Athlete
Resistance Exercise	0.55–0.77 g per lb body weight (1.2–1.7 g per kg)	82–116 g of protein per day
Endurance Exercise	0.55–0.73 g per lb body weight (1.2–1.6 g per kg)	82–109 g of protein per day
Teenage Athletes	0.68–0.91 g per lb body weight (1.5–2.0 g per kg)	102–136 g of protein per day

# Your Sports Nutrition Game Plan



## Promote Full Recovery: After Exercise

Sample daily intake for about 100 g of protein per day	Grams of protein
1 cup cereal, 1 cup milk	11
PowerBar® Performance Energy bar	9
Sandwich, 2 oz turkey	20
½ cup baby carrots	1
1 cup low-fat milk	8
8 oz low-fat yogurt	8
4 oz chicken breast	28
1 cup brown rice	6
1 cup cooked broccoli	2
1 PowerBar Harvest® Energy bar	10
<b>Total grams of protein</b>	<b>103 grams</b>

# Your Sports Nutrition Game Plan



## Promote Full Recovery: After Exercise

### Protein

Focus on timing your protein intake in relation to workouts.

Within 1 hour after exercise, consume 15–25 grams of protein.

# Your Sports Nutrition Game Plan



## Promote Full Recovery: After Exercise

### Fluids and Sodium

Even if you are diligent in your hydration efforts during exercise, you may lose more fluids than you take in.

- Weigh yourself before and after exercise to gauge your net loss of fluids.
- Replace fluids lost by gradually drinking 16–24 fl oz of a sports drink, recovery beverage, or water for every lb of weight lost (1,500 ml/kg weight lost).
- Rehydration will be more effective when sodium is included with the fluid and food you consume as you recover.

# Your Sports Nutrition Game Plan

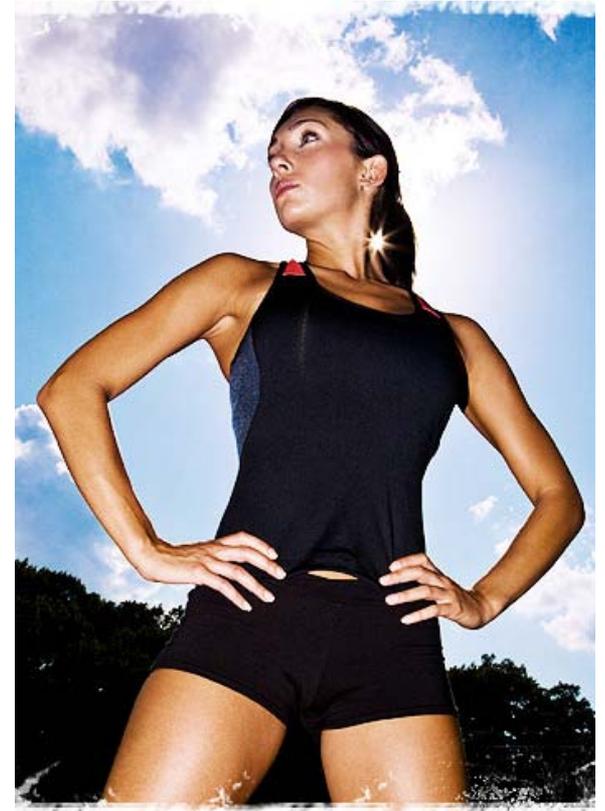
**It can't be overemphasized: Practice it during training.**

- When your training and sports nutrition regimen are in sync, you maximize your performance gains.
- It is only through a system of trial and error during training that you can develop your own personalized sports nutrition plan.
- Practice your sports nutrition regimen during training.
- Don't try anything new on race or game day.

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