



GATORADE SPORTS SCIENCE INSTITUTE



FOODS & FLUIDS FOR **TEAM SPORTS**

FUELING ATHLETIC PERFORMANCE



FOODS & FLUIDS FOR TEAM SPORTS

Success in many sports relies on each individual doing his or her part on behalf of the team. Athletes set individual and team performance goals for the season but rarely set nutrition goals. For example, one goal might be to arrive at practices hydrated and properly fueled in preparation of working hard. Good nutrition and hydration practices are two of several important behaviors that together can be key to successful individual performances.

Every team sport is different and factors such as rules of play, frequency of games, length of season and position-specific requirements alter the nutritional plans. While the characteristics of team sports vary (see table below), one common feature is the “stop and go” nature of team sport, with high-intensity bursts followed by lower intensity or rest periods.⁵ Based on this pattern, all team sports use a combination of the anaerobic and aerobic energy systems, both of which rely on carbohydrate as the primary fuel source.⁵



Suggested Daily Macronutrient Intake

(per kilogram of body weight)

Carbohydrate:⁵ 5-7 g/kg/day

Protein:¹ 1.2-1.7 g/kg/day

Team Sport Classifications

Classification	Examples	Sport Distinctions	Nutrition Considerations
Court/Rink Sports	Basketball, Volleyball, Ice Hockey, Box Lacrosse	Smaller playing area, shorter duration games, frequent substitution, often several games per day or over several days	Glycogen and fluid depletion over time
Strength & Power Field Sports	American Football, Rugby	Less distance covered, frequent short bursts, high contact	Carbohydrate provision to maintain frequent high-intensity bursts
Endurance-Based Field Sports	Soccer, Field Hockey, Lacrosse	Larger distances covered, most at high speeds	Maintenance of glycogen stores, hydration strategies
Batting Field Sports	Baseball, Softball, Cricket	Lower overall energy demands, many hours on playing field during summer months	Hydration concerns in the heat, adequate blood glucose for attention, decision making

Adapted from Holway & Spriet 2011⁵

This guide provides an overview of sports nutrition guidelines for team sports, which should be adapted to individual athletes and teams based on the distinct characteristics of each sport and athlete.⁵ It should be noted that off-season workouts and training programs likely require different considerations, based on the nature and goals of the off-season program. For example, energy requirements may be much higher in the pre-season during training camps or two-a-day workouts, during which time recovery is also of great importance. In another example, during the off-season an athlete may be looking to lose fat mass and gain lean mass, which would require a different nutrition strategy than during-season maintenance. The recommendations in this guide are focused on practices and games in the competitive season.

PRE-PRACTICE OR GAME FOODS & FLUIDS

Eating before a practice or game tops off the body's carbohydrate stores (called glycogen), especially if the practice or game is in the morning. Carbohydrate is the primary fuel source for muscle contraction during both high- and low-intensity points of the game or match, so it is important athletes start practices and games with enough carbohydrate stored in their body.

The pre-event meal should be eaten ~1-4 hours before exercise, contain ~1-4 g/kg carbohydrate and be low in protein, fibre and fat to minimize the risk of gastrointestinal upset. The exact timing and amount of carbohydrate consumed during this time should meet the individual preferences of the athlete.³ Additionally, it is recommended that athletes drink ~5-7 mL/kg of fluids with sodium approximately 4 hours prior to a workout or competition and another 3-5 mL/kg about 2 hours prior if they cannot urinate or the urine is dark.^{9, 10}

Ingesting carbohydrate within the hour prior to training or competition essentially begins to meet the athlete's during-exercise fueling needs⁶ and may also help the athlete decrease feelings of hunger. The amount and form of carbohydrate, such as a beverage, chew or solid food, is the individual choice of the athlete.

Sample Pre-Practice or Game Meals

(Examples for a 81.8 kg [180 lb] athlete)

Menu #1*

(~4 hours prior, target ~4 g/kg, 326 g carbohydrate)

- Large baked potato with 1 tbsp fat free sour cream
- 150 g of chicken breast with 1 tbsp barbeque sauce
- 2 cups white rice
- 1 medium apple
- 2 cups Tropicana Pure Premium® Orange Juice
- 2 cups frozen yogurt

Approximate totals: 1750 calories, 330 g carbohydrate, 20 g fat, 77 g protein, 21 g fibre

Menu #2*

(~3 hours prior, target ~3 g/kg, 245 g carbohydrate)

- 2 cups spaghetti with 1 cup marinara sauce
- 2 slices garlic bread
- 2 ½ cups Pure Leaf™ Lemon Iced Tea
- 1 medium banana
- 1 Quaker Chewy® Rocky Road Granola Bar

Approximate totals: 1289 calories, 247 g carbohydrate, 21 g fat, 30 g protein, 18 g fibre

Menu #3*

(~2 hours prior, target ~2 g/kg, 164 g carbohydrate)

- 6" turkey submarine sandwich
- 30 Rold Gold® Tiny Twists Pretzels
- 1 small box (42 g) raisin
- 591 mL Gatorade Perform® Thirst Quencher

Approximate totals: 908 calories, 160 g carbohydrate, 18 g fat, 29 g protein, 7 g fibre

*Based on values from the Canadian Nutrient File except where specific brand information was available

Pre-Practice or Game Key Messages

- Team sport athletes should consume carbohydrate before a practice or game to ensure adequate carbohydrate is stored in the muscle. Carbohydrate is the primary fuel for both the high-intensity bursts and prolonged muscle contractions that occur during "stop and go" activity.
- Adequate fluids should be consumed about 4 hours before a practice or game.
- Team sports and positions within them vary greatly based on a number of factors; a nutrition plan should take into account rules of the sport, the position, environment, etc.



DURING-PRACTICE OR GAME FOODS & FLUIDS

Dehydration

It is generally accepted that dehydration of a ~2 % or more decrease in body weight (approximately a 1.4 kg loss in a 68 kg athlete) may negatively affect an athlete's performance, especially when exercising in hot and humid conditions.¹⁰ Specific to team sports, two research studies have indicated that dehydration at this level has been found to impair skill performance in basketball players.^{2, 4}

Answering “yes” to any of these questions may indicate inadequate hydration:

- Am I thirsty?
- Is my urine a dark yellow color?
- Is my body weight noticeably lower than yesterday?

Importance of Hydration

Team sport athletes spend several hours each day training, sometimes twice a day and often under layers of equipment, in the sun or in a hot and humid gymnasium. Therefore, for both safety and performance paying attention to hydration is important. Athletes should be sure to drink enough fluid to prevent dehydration without over-drinking. Dehydration may strain the cardiovascular system and increase body temperature, which increases the risk of heart-related illness.

Hydrate the Right Way

To determine an athlete's sweat rate, measure body weight before and after a training session, in the same environment as a competition. Also keep track of all the fluid consumed. A rough estimate of sweat rate can be obtained by using the following equation: sweat rate (L/h) = (weight loss + fluid intake (L))/exercise time (hours).

Sodium

Athletes sweat and sweat contains sodium. Consuming fluid with sodium, such as in a sports drink, is important because sodium helps maintain the physiological desire to drink and helps retain the fluid consumed.⁷ Athletes, especially when training or competing for more than 2 hours or those who have high sweat losses, should replace both fluid and sodium during exercise.¹⁰ To estimate if an athlete is a “salty sweater,” look for white residue on dark-colored clothing after a training session.

Tips for Hydration

- Know your sweat rate in the environments where you will train and compete to customize a plan to meet your unique needs.
- Rehearse your game-day strategy during team practices and make sure you can tolerate the fluids without problems.
- Use sports drinks to provide fluid and electrolytes for hydration as well as carbohydrate for energy.

Carbohydrate

In some studies, carbohydrate has been demonstrated to improve indices of performance in team sports. For example, in one study, athletes were asked to complete four 15-minute quarters of shuttle running at different intensities followed by jumping to reach a target while consuming fluid with carbohydrate or water before the task and during each break. The athletes who consumed fluid with carbohydrate had faster 20-meter sprint times and higher average jump height in the fourth quarter as compared to when they drank water alone. The carbohydrate-fed group also had improved mood, motor skills and reduced force sensation after the testing.¹¹

Consuming carbohydrate during exercise provides fuel to the muscle, brain and nervous system.³ The recommended amount of carbohydrate ingestion every hour of exercise for a team sport athlete is 30-60 g/h.^{1,3,5} The form (solid, semisolid or liquid) should be determined by the preferences of the individual athlete.

Sodium and Carbohydrate Content of Gatorade Beverages

	Carbohydrate (g/500 mL)	Sodium (mg/500 mL)
Gatorade Perform® Thirst Quencher	32	210
G2 Perform™ Electrolyte Beverage	10	230

Examples of Strategies to Meet the 30–60 g/h Carbohydrate Recommendation

- 591 mL Gatorade Perform® Thirst Quencher = 38 g carbohydrate
- 710 mL Gatorade Perform® Thirst Quencher = 45 g carbohydrate
- 710 mL G2 Perform™ Electrolyte Beverage = 16 g carbohydrate (2 bottles = 32 g carbohydrate)

Plan ahead to take advantage of timeouts and halftime to refuel

During-Practice or Game Key Messages

- Team sport athletes should determine their individual sweat rate, taking into account specific equipment and environmental conditions, and consume fluids with sodium to minimize body weight changes during training and competition.
- Carbohydrate intake during exercise can help maintain performance levels in “stop and go” activities; athletes should aim to consume 30-60 g (120-240 calories) per hour of practice or competition.³
- It is possible to train the gut! If athletes are currently consuming less than the recommendations, gradually increase intake to minimize gastrointestinal issues.



POST-PRACTICE OR GAME FOODS & FLUIDS

Restoring the carbohydrate used from the muscle and liver during both aerobic- and anaerobic-type muscle contractions is a key focus of the post-exercise fueling needs of team sport athletes. When athletes have less than 8 hours between practices or competitions, 1.0-1.2 g/kg carbohydrate should be consumed every hour for 4 hours. When athletes have more than 8 hours between sessions, they should follow daily carbohydrate needs for team sport athletes (5-7 g/kg/day) and choose carbohydrate-rich meals and snacks with some protein regularly throughout the day.^{3,5}

Athletes should consume about 20 g of protein to start the recovery process as soon as possible after each training session, practice and game to help rebuild muscle tissue as well as adapt to the demands of training. Choose a high-quality, complete protein such as milk protein, whey, egg or meat.⁸

Following exercise, athletes should drink 1-1.5 L per kilogram of body weight lost of fluid with sodium to replace the amounts lost during training and competition.^{1,5,10}



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Recovery Food and Fluid Examples:

		Calories	Fat (g)	Sodium (mg)	Carbohydrate (g)	Fibre (g)	Protein (g)
Option 1	Gatorade Recover® Protein Shake <i>Water (amount based on body weight changes)</i>	270	1	320	45	2	20
Option 2*	2 large boiled eggs and 2 slices of whole grain bread <i>Water (amount based on body weight changes)</i>	327	13	285	32	5	21
Option 3*	2 strips Beef Jerky (40 g) & 10 low-salt, saltine crackers <i>Water (amount based on body weight changes)</i>	288	13	982	26	2	17

*Based on values from the Canadian Nutrient File

Post-Practice or Game Key Messages

- Restore carbohydrate after practices and games to replace used glycogen (carbohydrate stored in the muscle and liver) and to store more glycogen as an adaptation to training.
- Athletes should consume ~20 g of high-quality protein as soon as possible following training or competition to help repair muscle tissue.
- Rehydrate with 1-1.5 L of fluid with sodium for every kilogram of body weight lost during exercise.



AN EXAMPLE: PUTTING THE SCIENCE-BASED RECOMMENDATIONS INTO PRACTICE

Athlete Profile

Name: Mike

Age: 17

Weight: 77 kg (170 lbs)

Type of athlete: Boys Hockey Player

Goal: To determine a fueling strategy for games

Background: Mike is the starting forward for his junior hockey team and averages 20-25 minutes of playing time. He is looking for some help to maintain his energy levels in the third period and in overtime.

Pre-Game

We want to make sure Mike eats adequate carbohydrate before the game to top off the stores in his muscle and liver (called glycogen). Muscle glycogen is used to provide energy for the contracting muscles, while the liver glycogen is released into the blood as glucose, both providing an important fuel source during a hockey game.

Week night games start at 7:30 p.m. and school ends at 4:00 p.m. Since Mike doesn't like to eat too close to the start of a game, he will need to eat his pre-game meal about 3 hours before game time. We recommend he then follow the same timing for weekend games. Aiming for ~3 g of carbohydrate per kilogram of body weight and taking into account his favorite foods, we designed a meal to deliver 230 g of carbohydrate. Mike likes to eat the same thing before every game so he knows how his stomach will react and has a superstition about eating red gelatin before a game, so we incorporated that into his pre-game meal.

In the past, Mike usually ate his favorite food, pepperoni pizza, with the red gelatin before a game. In order to stay close to his traditional food, but provide more carbohydrate and less fat, we suggested a homemade pizza made with



French bread (1/3 loaf), pizza sauce (1/2 cup) and a small amount of shredded mozzarella cheese (~2/3 cup). With that he had a 591 mL Gatorade Perform® Thirst Quencher to meet his fluid needs and provide additional carbohydrate. We also made sure his red gelatin (~1 cup) was NOT sugar-free, to ensure he was getting enough carbohydrate. The nutritional totals for this meal are approximately 1,250 calories, 230 g carbohydrate, 49 g protein, 18 g fat and 8 g fibre.

In the hour leading up to Mike's game, he can get the additional carbohydrate and fluid that he needs by drinking 591 mL of Gatorade Perform® Thirst Quencher. Mike gets a nervous stomach before games so he likes to slowly sip at the Gatorade while he is getting dressed for the game.



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During the Game

To determine Mike's sweat rate, we attended a practice when the team was scrimmaging to simulate the game situation as closely as possible. We weighed him before and after practice and measured his fluid intake. Based on that information, we've estimated Mike's sweat rate to be 1.5 L/h, which is fairly high. This rate of sweating in practice will translate into about 2.5–3 L fluid loss in an entire game because a junior game usually lasts between 2 hr 15 min and 2 hr 30 min. Mike doesn't report any issues with cramping and we didn't observe salt on his clothing after the practice, so he likely doesn't have higher than average sodium needs.

Carbohydrate intake, specifically sugars, throughout the game is going to be important for Mike to help maintain his energy level in the third period and any overtime play. More than 75% of the fuel used by hockey players in practices and games comes from carbohydrate.^{12, 13, 14} Therefore, it will be important for us to help Mike consume close to the upper end of the 30-60 g/hour recommendation (70-150 g per game).

Since Mike has high fluid needs, we suggested he try to consume at least 2-2.5 L of fluid, which is easily done over 3 periods and 2 intermissions. If he drank Gatorade, this would provide a total of 120-150 g of carbohydrate or 60-75 g if G2 was consumed. Mike can sip the drink on the bench between shifts, but also between periods in the dressing room. Sipping and drinking a carbohydrate solution stimulates sensors in the mouth to send signals to the brain, which keeps the brain alert, focused and feeling less fatigued during exercise.¹⁵ It is important that Mike practices this amount of fluid and carbohydrate intake and plans ahead to take advantage of every shift change and break between periods to refuel and rehydrate.

After the Game

Good recovery after practices can help an athlete persist through a long season like hockey. Since Mike plays a lot of minutes and nearly every day, we want to make sure he recovers well after each practice and game. Mike reports feeling very hungry after games, so we recommend he drink the Gatorade Recover® Protein Shake to get 20 g of protein to rebuild muscle, carbohydrate to replace the

stores in his muscles and liver and electrolytes to help replace the sodium lost in sweat. The total amount of carbohydrate he eats at this point isn't of great importance since Mike's next practice isn't until after school the next day and this shake will serve as a bridge to his next meal (which should contain ample carbohydrate). It will be easy for him to drink the shake while he is showering and getting dressed after the game. Also, since every game is different, we recommend he weigh himself before and after each game and drink his shake, as well as drink ~1-1.5 L per kg of body weight lost (600 mL of fluid for every pound of body weight lost).

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CALCULATIONS/YOUR WORKSHEET

1. BODY WEIGHT

For many calculations, you need to know your body weight in kilograms. To do this calculation:

$$\text{Body weight in pounds} \text{ _____} / 2.2 = \text{[] kg}$$

2. DAILY MACRONUTRIENT NEEDS

Carbohydrate

$$\text{_____ body weight (kg)} * 5 \text{ g/kg} = \text{[] grams per day}$$

$$\text{_____ body weight (kg)} * 7 \text{ g/kg} = \text{[] grams per day}$$

TO

Protein:

$$\text{_____ body weight (kg)} * 1.2 \text{ g/kg} = \text{[] grams per day}$$

$$\text{_____ body weight (kg)} * 1.7 \text{ g/kg} = \text{[] grams per day}$$

TO

Amounts within these ranges should be determined based on the requirements of the individual sport and athlete

3. BEFORE-EXERCISE CARBOHYDRATE NEEDS

A. Enter the time before exercise you like to eat (1-4 hours): _____ (h)

B. Enter your desired amount of carbohydrate (1-4 g/kg body weight): _____ (g/kg)

C. **Pre-exercise carbohydrate intake** = _____ body weight (kg) * _____ carbohydrate amount from B. (line above)
(g/kg) = [] g carbohydrate

4. BEFORE-EXERCISE FLUID NEEDS

A. 4 hours prior to exercise:

$$\text{_____ body weight (kg)} * 5 \text{ mL/kg} = \text{[] mL}$$

$$\text{_____ body weight (kg)} * 7 \text{ mL/kg} = \text{[] mL}$$

TO

B. 2 hours prior to exercise (if needed):

$$\text{_____ body weight (kg)} * 3 \text{ mL/kg} = \text{[] mL}$$

$$\text{_____ body weight (kg)} * 5 \text{ mL/kg} = \text{[] mL}$$

TO

5. DURING-EXERCISE CARBOHYDRATE NEEDS

The recommendation is 30-60 g/hour, no calculation needed. Amount should be determined based on the requirements of the individual sport and athlete.

6. DURING-EXERCISE FLUID NEEDS

A. Pre-exercise weight = _____ kg

B. Fluid consumed during exercise = _____ L

C. Post-exercise weight = _____ kg

D. **Weight change** = Pre-exercise weight _____ kg - Post-exercise weight _____ kg = kg

E. Exercise time = _____ hours

F. **Sweat rate** = (Weight change _____ kg + Fluid intake _____ L) / _____ hours = L/h

7. POST-EXERCISE CARBOHYDRATE NEEDS (WHEN <8 HOURS RECOVERY)

body weight _____ (kg) * 1 g/kg = g carbohydrate

body weight _____ (kg) * 1.2 g/kg = g carbohydrate

8. POST-EXERCISE FLUID NEEDS

Weight lost = Pre-exercise weight _____ kg - Post-exercise weight _____ kg = kg

Fluid needs:

_____ body weight (kg) lost * 1 L = L

_____ body weight (kg) lost * 1.5 L = L

9. POST-EXERCISE PROTEIN NEEDS

No calculations are needed, ~20 g is appropriate for everybody.

For more information on the science of sports nutrition, please go to: www.gssiweb.org



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