GATORADE SPORTS SCIENCE INSTITUTE®

FOODS & FLUIDS FOR BASKETBALL







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Success in many sports relies on each individual doing their 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 to work hard. Good nutrition and hydration practices are one 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. As a court sport, basketball is defined by a fairly small playing area, and the rules of the game allow for frequent substitutions. Tournament play with little recovery time is also common.[1] Therefore, one of the greatest nutrition considerations is the consumption of adequate carbohydrate to maintain glycogen levels over the course of a practice or game to support the frequent high-intensity bursts of muscle activity.[1]

Basketball players should also focus on hydration before, during and after practices and games. The research literature suggests that basketball players' pre-game hydration habits may be inadequate and players often begin practices and games dehydrated.[2] During play, dehydration by ≥2% of body weight has been found to impair basketball skill performance, and greater levels of dehydration can further degrade performance.[3,4] However, the rules of the game with frequent breaks and the accessibility of fluids on the sidelines should provide basketball players with ample opportunity to maintain hydration.

This guide provides an overview of sports nutrition guidelines for basketball, which should be adapted to individual athletes. 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, a basketball player may have a goal to lose fat mass and gain lean mass in the off-season, which would require a different nutrition strategy than during-season maintenance of lean mass. The recommendations below are focused on practices and games in the competitive season.



SUGGESTED DAILY MACRONUTIRENT INTAKE

(per kilogram of body weight)

Carbohydrate:[1] 5-7 g/kg/day

Protein:[5,6] 1.2-2.0 g/kg/day

PRE-PRACTICE OR GAME FOODS & FLUIDS

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

The pre-event meal should be eaten ~1-4 hours before exercise, contain ~1-4 g/kg carbohydrate and be low in protein, fiber 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.[5,7] 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 if the urine is dark.[8,9]

Ingesting carbohydrate within the hour prior to training or competition essentially begins to meet the athlete's during-exercise fueling needs,[10] 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/GAME MEALS

(Examples for a 250 lb [114 kg] athlete)

Menu #1

(~4 hours prior, target ~4 g/kg, 456 g carbohydrate)

- Large baked potato with 1 Tbsp fat-free sour cream
- 4 oz grilled chicken breast sandwich on a Kaiser roll with 1 Tbsp barbeque sauce
- 2 cups cooked white rice with 1/2 cup black beans, use butter sparingly
- 32 fl oz grape juice
- 1 1/2 cup strawberry sherbet with 1 cup sliced strawberries, 1 medium banana

Approximate totals: 2,210 calories, 458 g carbohydrate, 21 g fat, 65 g protein, 25 g fiber



Menu #2

(~3 hours prior, target ~3 g/kg, 342 g carbohydrate)

- Pasta (2.5 cups cooked) with 1.5 cups marinara sauce
- Medium piece French bread (~4 oz)
- 16 fl oz apple juice
- 1 cup vanilla fat-free pudding (not sugar free!) with 1/2 cup sliced banana

Totals: 1,610 calories, 336 g carbohydrate, 7 g fat, 43 g protein, 11 g fiber

Menu #3

(~2 hours prior, target ~2 g/kg, 228 g carbohydrate)

- Turkey sandwich
  - 4 oz low-fat deli turkey
  - Mustard/low-fat mayo (use mayo sparingly)
  - Plain bagel
- ~40 tiny twist pretzels
- 1 large apple
- 6 fig cookies
- 20 fl oz Gatorade

Totals: 1,096 calories, 234 g carbohydrate, 5 g fat, 32 g protein, 10 g fiber

CARBOHYDRATE ENERGY FOR TRAINING AND COMPETITION

Product	Serving Size	Carbohydrate (g)	Sodium (mg)
Gatorade Energy Chews	6	25	70

PRE-PRACTICE OR GAME KEY MESSAGES

- Basketball players 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 of muscle contraction and prolonged muscle contractions that occur during "stop and go" activity.
- Drink 5-7 ml/kg (2.3-3.1 oz/lb) of fluid with sodium starting about 4 hours before a practice or game.

DURING-PRACTICE OR GAME FOODS & FLUIDS

SPORTS NUTRITION ADVICE

Basketball players spend several hours each day training, sometimes twice a day, and often in hot and humid gyms. 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 heat illness.

HYDRATE THE RIGHT WAY

Since practices are often longer than games, especially early in the season, it is important to develop a hydration strategy for both practices and games. 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 (lbs) + fluid intake (L))/exercise time (hours). This measurement will likely need to be made several different times for practices and competitions, especially as the weather changes. Reference the Sweat Rate Calculator on Page 10.

SODIUM

Athletes sweat, and that 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.[11] 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.[9] To estimate if an athlete is a "salty sweater," look for white residue on dark-colored clothing after a training session.

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

- Am I thirsty?
- Is my urine a dark yellow color (like apple juice)?
- Is my body weight noticeably lower than yesterday?

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.
- Begin practices and games hydrated. Monitor your urine color; it should be a light yellow color (like lemonade) to indicate adequate hydration.
- 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

Consuming carbohydrate during practice and games provides fuel to the muscle, brain and nervous system. Carbohydrate has been demonstrated to improve indices of performance in team sports, particularly intermittent high-intensity exercise capacity.[12] For example, in a study using a simulated basketball game, athletes who consumed carbohydrate throughout the game compared to water had 14% faster 20 m sprint time in the 4th quarter, improved motor skills in the second half and decreased reported feelings of fatigue late in the "game".[13] The recommended amount of carbohydrate ingestion every hour of exercise for a team sport athlete, including basketball players, is 30-60 g/h.[1,5,7] The amount within this range may be tailored by the athlete's playing time and the form (solid, semisolid or liquid) should be determined by the preferences of the individual athlete.

CARBOHYDRATE AND SODIUM CONTENT OF GATORADE PRODUCTS

Product	Carbohydrate (g/12 fl oz)	Sodium (mg/12 fl oz)
Gatorade Thirst Quencher	22	160
Gatorade Lower Sugar	5	160
Gatorade Endurance Formula	21	310
Gatorade Zero	<1	160
Gatorade Endurance Gatorlytes*	0	780**
Gatorlyte	9	300

** Gatorade Endurance Gatorlytes to be added to 20 oz Gatorade Thirst Quencher RTD.*

*** Per Gatorade Endurance Gatorlytes packet.*

EXAMPLES OF STRATEGIES TO MEET THE 30-60 G/H CARBOHYDRATE RECOMMENDATION

- 20 oz Gatorade Thirst Quencher = 36 g carbohydrate
- 12 oz Gatorade Thirst Quencher + 6 Gatorade Energy Chews = 47 g carbohydrate
- 28 oz Gatorade Thirst Quencher = 51 g carbohydrate

Plan ahead to take advantage of timeouts and halftime to refuel.



DURING-PRACTICE OR GAME KEY MESSAGES

- Basketball players should determine their individual sweat rate and consume fluids with sodium to minimize body weight changes during practices and games.
- Carbohydrate intake during exercise can help maintain performance in “stop and go” activities such as basketball; athletes should aim to consume 30-60 g (120-240 calories) per hour of practice or games.
- 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

In-season recovery nutrition should support the daily energy and hydration needs of the athlete while helping the muscles withstand the rigors of a long season. Nutrients and fluids consumed throughout the time between practices and games support recovery; highlighted here are the specific recommendations for the immediate recovery period.

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 basketball players. 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.[1,7]

While consuming carbohydrate for recovery will help replenish energy stores in the muscle to help the athlete be ready for the next practice or game, eating protein is important to rebuild muscle and adapt to the demands of basketball, helping the athlete recover over the course of a long season. Athletes should consume about 20-40 g [14,15] or 0.25-0.3 g/ kg[5] 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 rapidly digested, complete protein rich in the amino acid leucine, such as milk, whey, meat[9] or eggs.[5,14,15] Research is emerging on the use of plant-based proteins for recovery and muscle gain. Athletes consuming plant-based proteins should ensure they are eating a variety of foods in order to meet their essential amino acid needs to support recovery and training adaptations.[16]

Following practices and games, athletes should drink 20-24 oz per pound of body weight lost of fluid with sodium, to replace the amounts lost during training and competition.[1,5,9]

RECOVERY OPTIONS

Product	Calories	Carbohydrate (g)	Fiber (g)	Protein (g)	Fat (g)	Sodium (mg)
Muscle Milk Pro Protein Shake 14 fluid ounces	240-250	14-15	<1-2	42	2-2.5	310-350
Muscle Milk Pro Protein Shake 11 fluid ounces	190-200	11-12	<1-2	33	1.5-2	250-280
Muscle Milk Protein Shake 14 fluid ounces	170	13	1-2	26	1-1.5	290-330
Muscle Milk Protein Shake 11 fluid ounces	160	10-11	<1-2	26	1-1.5	240-270
Gatorade Recover Protein Bar	330-360	39-43	0-2	20	10-13	160-310

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 ~20-25 g, or 0.25-0.3 g/kg of high-quality protein as soon as possible following training or competition to help rebuild muscle tissue.
- Rehydrate with 20-24 oz of fluid with sodium for every pound of body weight lost during exercise.



AN EXAMPLE: PUTTING THE SCIENCE-BASED RECOMMENDATIONS INTO PRACTICE



ATHLETE PROFILE

Name: Mike

Age: 17

Weight: 170 lbs (77 kg)

Type of athlete: Boys high school basketball player

Goal: To determine a fueling strategy for games

Background: Mike is the starting point guard for his high school basketball team and averages 30 minutes per game. He is looking for some help to maintain his energy levels in the fourth quarter.

PRE-GAME

We want to make sure Mike eats adequate carbohydrate before the game to top off the stores in his muscle (called glycogen), since glycogen is an important fuel source during a basketball game. Weeknight games start at 7:30 PM and school ends at 4:00 PM. 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 231 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 red gelatin before a game. In order to help stay closer to his traditional food but provide more carbohydrate and less fat, we suggested homemade pizza bread, 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 20-oz Gatorade Thirst Quencher to meet his fluid needs (385-539 mL, or 13-18 oz) and provide additional carbohydrate. We also made sure his red gelatin (~1/2 cup) was NOT sugar-free, to ensure he was getting enough carbohydrate. The nutritional totals for this meal are approximately 1,306 calories, 240 g carbohydrate, 49 g protein, 18 g fat and 6 g fiber.

Mike gets fairly nervous before a game so he doesn't think about eating again but does feel like he could use a little energy at the start of the game. During practices we had him try a Gatorade Prime Sports Fuel Drink shortly before starting to give him some extra carbohydrate energy. The pouch was a bit too much liquid for him, so we had him try three Gatorade Prime Energy Chews (a serving of six is equivalent to the carbohydrate in one Gatorade Prime Sports Fuel Drink). This strategy didn't upset his stomach, so now Mike's pre-game ritual includes three chews and some water while listening to his coach in the locker room.

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 (51 oz/h), which is fairly high. Mike doesn't report any issues with cramping and we didn't observe salt on his dark green clothing during the practice, so he likely doesn't have higher-than-average sodium needs. Carbohydrate intake throughout the game is going to be important for Mike to help maintain his energy level in the fourth quarter. Not to mention, research shows carbohydrate intake during a simulated basketball game, as well as maintaining hydration, helps skills such as free-throw shooting.[3] Therefore, it will be important for us to help Mike consume close to the upper end of the 30-60 g/hour recommendation.

Mike averages 30 minutes of playing time and a high school basketball game usually lasts a little over an hour. Since Mike has high fluid needs, we suggested he try to consume one 32 oz and one 20 oz bottle of Gatorade G2 over the course of a game, which will provide 52 oz of fluid to match his sweat rate and 32 g of carbohydrate. Since we want him to be a little closer to 60 g of carbohydrate, we will also have him eat Gatorade Prime Energy Chews at halftime to provide an additional 21 g of carbohydrate, for a total over the course of the game of 53 g. It is important that Mike practices this amount of fluid and carbohydrate intake and plans ahead to take advantage of every timeout, and break, between quarters and halftime to refuel and rehydrate.

AFTER THE GAME

Good recovery practices can help an athlete persist through a long season like basketball. Since Mike plays a lot of minutes, 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 Muscle Milk Protein Shake or eat the Gatorade Recover Protein Bar to get 20 g of protein to rebuild muscle, carbohydrate to replace the stores in his muscles, and electrolytes to help replace 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 or eat the bar while he is icing down after the game. Also, since every game is different, we recommend that he weigh himself before and after each game and drink his shake, as well as drink ~20 oz of water for every pound of body weight lost.

Any opinions or scientific interpretations expressed in this document are those of the author and do not necessarily reflect the position or policy of PepsiCo, Inc.

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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:

Body weight in pounds _____ / 2.2 = [ ] kg

2. DAILY MACRONUTRIENT NEEDS

Carbohydrate:

_____ body weight (kg) * 5 g/kg = [ ] grams per day

TO

_____ body weight (kg) * 7 g/kg = [ ] grams per day

Protein:

_____ body weight (kg) * 1.2 g/kg = [ ] grams per day

TO

_____ body weight (kg) * 2.0 g/kg = [ ] grams per day

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)

C. Pre-exercise carbohydrate intake = _____ body weight (kg) * _____ carbohydrate amount from line 2 (g/kg) = [ ] g carbohydrate

4. BEFORE-EXERCISE FLUID NEEDS

A. 4 hours prior to exercise:

_____ body weight (kg) * 5 mL/kg = [ ] mL

TO

_____ body weight (kg) * 7 mL/kg = [ ] mL

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

_____ body weight (kg) * 3 mL/kg = [ ] mL

TO

_____ body weight (kg) * 5 mL/kg = [ ] mL

To convert mL to oz: _____ mL * 0.03 = _____ fluid oz

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 = _____ lbs

B. Fluid consumed during exercise = _____ L

(_____ fluid oz / 33.8 = _____ L)

C. Post-exercise weight = _____ lbs

D. Weight change = Pre-exercise weight _____ lbs - Post-exercise weight _____ lbs = [ ]

E. Exercise time = _____ hours

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

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

Body weight _____ (kg) * 1 g/kg = [ ] g carbohydrate

TO

Body weight _____ (kg) * 1.2 g/kg = [ ] g carbohydrate

8. POST-EXERCISE FLUID NEEDS

Weight lost = Pre-exercise weight _____ lbs - Post-exercise weight _____ lbs = [ ]

Fluid needs:

_____ body weight lost * 20 oz = [ ] oz

TO

_____ body weight lost * 24 oz = [ ] oz

9. POST-EXERCISE PROTEIN NEEDS

About 20 g is appropriate for most athletes; however, to calculate your individual needs use this equation:

Body weight _____ (kg) * 0.25 g = [ ] g protein

TO

Body weight _____ (kg) * 0.3 g = [ ] g protein


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