SPORTS NUTRITION PLANNING: PRE, DURING & POST PLAY

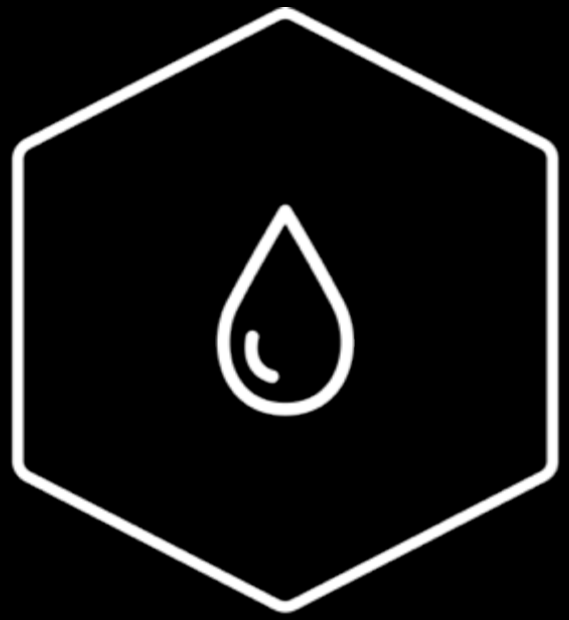
GATORADE SPORTS SCIENCE INSTITUTE

OVERVIEW

- Previous lectures have focused individually on carbohydrate for energy, protein for structure, and hydration.

- This lecture will focus on putting together those concepts, focusing on the pre, during and post needs of athletes.

- We'll begin with a review from previous lectures.



ENERGY ***HYDRATION*** ***STRUCTURE***

Carbohydrates are the primary fuel for muscle contraction

TEAM SPORTS

Carbohydrate recommendations for peak performance

3-4 Hours Before

1-4 g/kg

1 Hour Before

~25 g

During

30-60 g/h

≥ 60 min duration
Mostly quickly oxidized
Performance goal

After

1.0-1.2 g/kg

< ~8 h until next training or competition

Thomas DT, Erdman KA, Burke LM. *Med Sci Sports Exerc*. 2016;48:543-68

ENDURANCE PERFORMANCE

Carbohydrate guidelines are more specific:

Duration	CHO (g/hour)	Type
<30 min	None	-
45-75 min	Very small amounts	Most carb forms or mouth rinse
1-2 hours	Up to 30 g/h	Most carb forms
2-3 hours	Up to 60 g/h	Rapidly oxidized sugars Examples: sucrose, glucose, maltodextrin
> 2.5-3 hours	Up to 90 g/h	Blend glucose + fructose

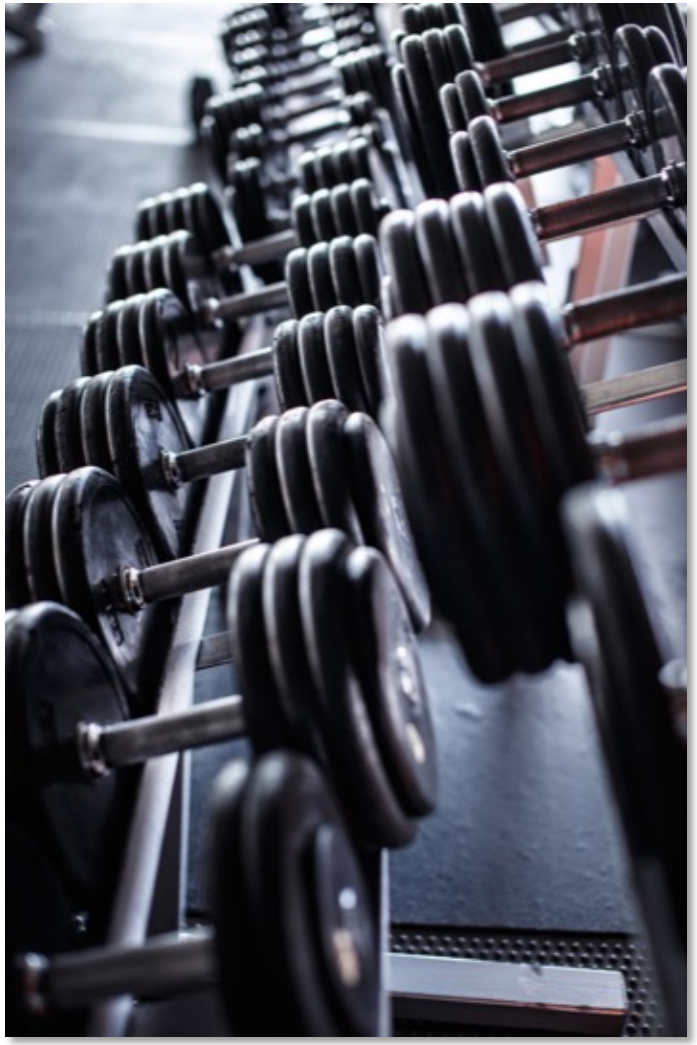
Thomas DT, Erdman KA, Burke LM. *Med Sci Sports Exerc*. 2016;48:543-68

STRENGTH TRAINING

Before Training: “topping off” glycogen is beneficial since it is the fuel for high intensity muscle contraction and could possibly increase the total amount of work. However, specific recommendations do not exist.

During Training: Carbohydrate intake is not necessary.

Recovery: Intake depends on goals. If you are a team sport or endurance athlete lifting to support your sport, consider 0.3 g/kg. If your goal is to increase mass, getting carbohydrate in your total daily intake is likely adequate.



Slater G & Phillips S. *Journal of Sports Sciences*. 2011;29(1):S67-77
Thomas DT, Erdman KA, Burke LM. *Med Sci Sports Exerc*. 2016;48:543-68

~60 g/h

Quickly Oxidized Carbohydrates

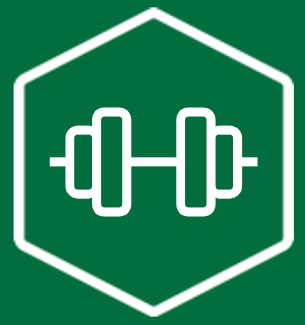
- Glucose
- Sucrose
- Maltodextrins
- Amylopectin

~30 g/h

Slowly Oxidized Carbohydrates

- Fructose
- Galactose
- Amylose

Jeukendrup A. *Sports Science Exchange*. 2007;20(3):1-8



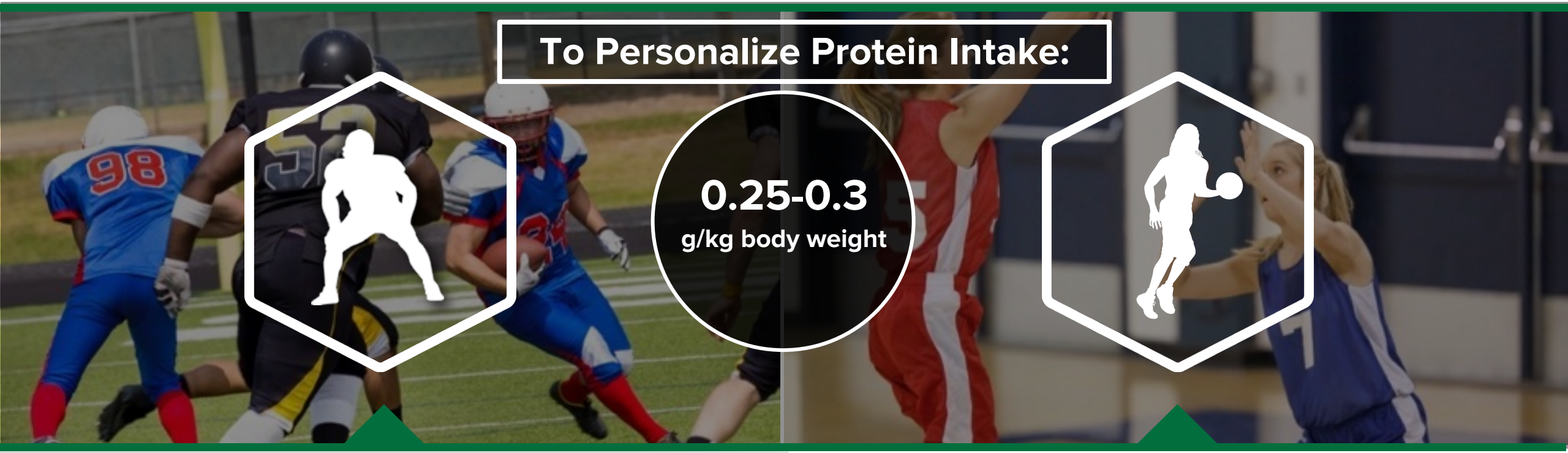
PROTEIN FOR RECOVERY

Goal: to provide the amino acid building blocks for muscle protein synthesis.

Thomas DT, Erdman KA, Burke LM. *Med Sci Sports Exerc*. 2016;48:543-68

BASED ON DOSE-RESPONSE RESEARCH

~20G IS RIGHT FOR MOST ATHLETES



288 LBS
X 0.25 (g/kg)
33G PROTEIN

135 LBS
X 0.25 (g/kg)
15G PROTEIN

Moore DR, Robinson MJ, Fry JL, et. al. AJCN. 2009;89(1):161-168
Witard OC, Jackman SR, Breen L, et. al. AJCN. 2014;99(1):86-95
Thomas DT, Erdman KA, Burke LM. Med Sci Sports Exerc. 2016;48:543-68

3 CRITERIA FOR THE **APPROPRIATE PROTEIN**

- Complete protein
- Rapidly digested & absorbed
- Rich in Leucine

More is Not Better

Eating more than ~0.25 g/kg at one time is not helpful. The excess amino acids will be oxidized, and waste products excreted.

Philips & van Loon. *J Sports Sci*. 2011;29:S29-S38

PROTEIN SPACING

~20g

after exercise

~20-40g

before bed

For the best recovery outcomes, the pattern of protein intake throughout the day is important, eating smaller amounts regularly.

Res PT, Groen B, Pennings B, et. al. *Med Sci Sports Exerc*. 2012;44(8):1560-1569
Snijders T, Res PT, Smeets JSJ, et. al. *J Nutr*. 2015;145(6):1178-1184
Moore DR, Areta J, Coffey VG, et. al. *Nutr & Metab*. 2012;9(91):DOI: 10.1186/1743-7075-9-91

Dehydration impairs the ability to remove heat

Cardiovascular strain
Increased glycogen use
Altered metabolic & CNS function
Decreased fluid absorption
Risk of heat illness

DEHYDRATION

Increases physiological strain

Can impair performance, especially in the heat

Thomas TD, Erdman KA, Burke LM. *Med Sci Sports Exerc*. 2016;48(3):543-68

Replace sodium to improve fluid retention and distribution

HYDRATION TIMING AND AMOUNTS

~4 hours before exercise

5-7 mL/kg fluid

~2 hours before exercise

3-5 mL/kg Fluid

*IF urine is dark or not produced

During exercise

Fluid with sodium, amount based on body weight changes

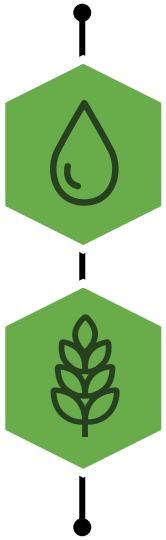
After exercise

20-24 oz of fluid with sodium for every pound body weight lost during exercise

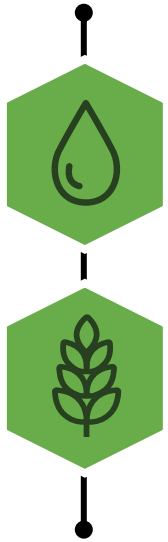
Shirreffs S & Sawka M. *Journal of Sports Sciences*. 2011;29:S39-S46

PUTTING IT TOGETHER

BEFORE



DURING



*

AFTER

**

Hydration (fluid + sodium)

Carbohydrate Energy

Structure (protein)

*when training or competing ≥ 60 min
**when recovery time is short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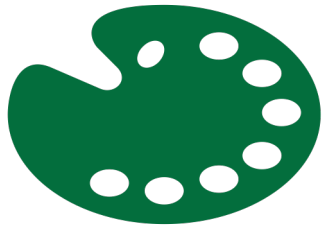
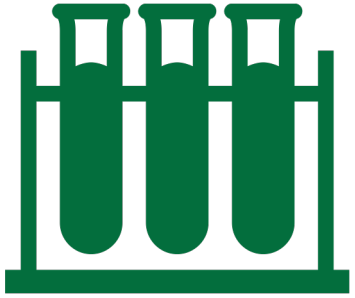
Pulmonary Function Equipment

EXAMPLES

USING THE RECOMMENDATIONS: ART & SCIENCE



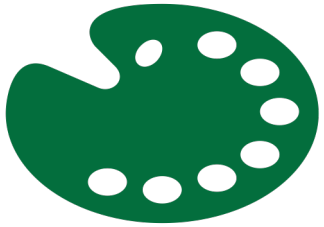


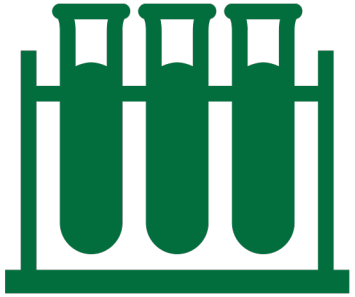
Calculated needs from the published recommendations is a starting point.

The role of a sports dietitian is to use the recommendations as a guide, and tweak to how the athlete responds, their likes/dislikes, etc.

For example, the pre-exercise carbohydrate recommendation of 1-4 g/kg, 1-4 hours prior is a huge range! Take into account the athlete's hunger, nerves, game time, when the team stops for a meal on the road, etc. etc.

USING THE RECOMMENDATIONS: ART & SCIENCE





Know the GOALS of your athlete! Within the recommendations, there will be much variation between in-season and off-season for a team sport and power athlete, phase of training for an endurance athlete, and what an athlete wants to get out of the weight room.

EXAMPLE: IN-SEASON BASKETBALL PLAYER

SSE#168

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Osterberg K. *Sports Science Exchange.* 2016;28(168)1-4

EXAMPLE: IN-SEASON BASKETBALL PLAYER

Athlete Information:

- Male
- Senior in high school
- 81 kg (180 lb)
- Starter, averages 30 min/game
- Game time: Thursday 7:00 PM
- Next game: Saturday afternoon
- Mom prepares pre-game snack, eats with the team post-game
- Sweat rate: 1.0 L/h (34 oz/h)

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EXAMPLE: IN-SEASON BASKETBALL PLAYER

Pre-Game

Marcus needs to be at the gym by 5:00 to watch the JV game, so mom gives him his pre-game snack at 4:00, 3 hours before his game starts.

A good starting point in the recommendation range could be 2 g/kg carbohydrate, which is 162 g (648 calories). This may sound like a lot, but he is hungry after school. He prefers spaghetti, and two cups cooked spaghetti, 1 cup marinara sauce, 1 dinner roll and a medium banana provide ~150 g carbohydrate.

Starting after school through his meal, he should drink ~ 405-567 mL (14-19 oz). He likes to have a 20 oz bottle of lemonade, which also provides some additional carbohydrate to reach the ~162 g goal.

Marcus is nervous and not hungry before the game, so he does not have anything before the game besides sipping a sports drink. He has urinated and has been drinking water since his meal, so no need for more specified fluid intake.

EXAMPLE: IN-SEASON BASKETBALL PLAYER

During the Game

His actual time on-court is 30 minutes, but the total length of the game is about an hour.

His goal is to perform at his best.

Based on his sweat rate he should drink ~34 oz of fluid with sodium.

He plays a lot of minutes at high intensity, so he should aim for the upper end of the carbohydrate energy range (60 g).

For practicality, he uses a 32 oz bottle of a traditional sports drink provides 56 g carbohydrate plus sodium to help retain the fluid.

EXAMPLE: IN-SEASON BASKETBALL PLAYER

After the Game

After home games, the team eats at their favorite pizza restaurant, but it takes about 90 minutes for them to change, drive, and get their food.

In the locker room, as a bridge to his meal, Mark eats a protein bar with 20 g of whey protein and carbohydrate.

81 kg * 0.25 g protein = 20 g protein
He'll meet the rest of his carbohydrate needs from his meal (81 kg * 1.0 g/kg = 81 g)

He drank his 32 oz bottle during the game, and since that meets his sweat rate he likely doesn't need a specific drinking plan for recovery beyond drinking water when thirsty. Recovery is important since he has practice tomorrow and another big game Saturday afternoon.

EXAMPLE: IN-SEASON BASKETBALL PLAYER

What would you do differently for recovery fluid needs if Mark only drank about half of his 32 oz bottle during the game?

Let’s say Mark was usually hungry shortly before the game, what would you suggest?

LEARNING ACTIVITY: ENDURANCE ATHLETE

Athlete Information:

- Female
- 22 years old
- 66 kg (145 lb)
- Has always been a runner, but never raced further than a 5K, averages 7 min/mile
- Training for her first marathon
- Sweat rate: 1.3 L/h (44 oz/h)
- She can see salt on her clothes and face
- She is training and competing in Florida. The race is in September

Develop a pre-during-post fueling and hydration plan for Sarah to use during her first 18-mile run. This run is expected to take her just over 2 hours to complete.

She'll use this plan, with any tweaks needed based on how she feels, to continue training and practicing her race-day nutrition.

PRE, DURING, POST MYTHS

PRE, DURING, POST MYTHS

Myth

Sugars are bad right before practice.

The sugars will cause my blood sugar to spike and then crash which will hurt my performance.

Fact

While a rise and “dip” of blood sugar may occur, research shows that this does not impact overall performance.

Carbohydrates consumed an hour before practice or games metabolically behaves the same as carbohydrates consumed during activity. Quickly oxidized carbohydrates (sugars) eaten shortly before exercise contribute to “during” exercise energy needs.

Jeukendrup A & Killer S. *Ann Nutr Metab*. 2010;57(2)18-25

PRE, DURING, POST MYTHS

Myth

Consuming protein during practice, games, or endurance competition will improve performance.

Fact

Research has shown protein consumed during or before practice, games or endurance activity does not provide additional performance benefits.

Phillips S & Van Loon L. *Journal of Sports Sciences*. 2011;29(1):S29-S38
Maughan RJ, Leiper JB, Vist GE. *Exp Phys*. 2004;89:101-108

PRE, DURING, POST MYTHS

Myth

Potassium is the most important electrolyte for performance.

Fact

Sodium is the primary electrolyte lost in sweat

Replacing sweat sodium losses is important for fluid retention, helps maintain the physiological desire to drink and promotes fluid balance.

Shirreffs S & Sawka M. *Journal of Sports Sciences*. 2011;29:S39-S46
Maughan RJ, & Murry R. *CRC Press*. 2001

KEY TAKEAWAYS

- ✓ Guidelines are well-established for carbohydrate, protein and hydration needs before, during and after exercise for a performance benefit
- ✓ Remember the sport nutrition recommendations are guidelines that should be applied based on the goals and preferences of the athlete.

www.GSSIweb.org