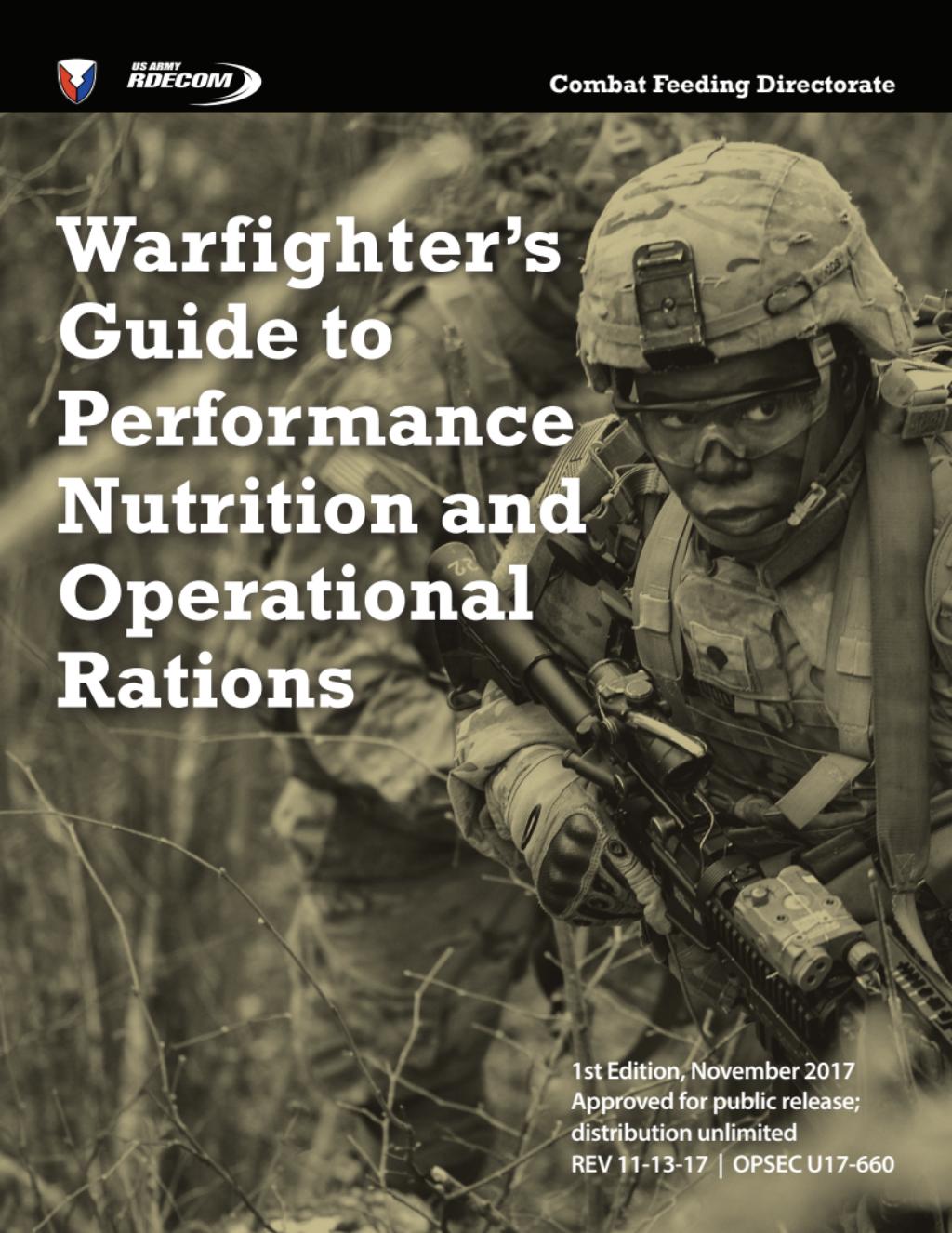


Warfighter's Guide to Performance Nutrition and Operational Rations

A black and white photograph of a soldier in full combat gear, including a helmet with a mounted camera or sensor, looking through the scope of a rifle. He is positioned on the right side of the frame, partially obscured by foliage. The background is a dense, out-of-focus field of tall grass or brush.

1st Edition, November 2017

Approved for public release;
distribution unlimited

REV 11-13-17 | OPSEC U17-660

Warfighter's Guide to Performance Nutrition and Operational Rations



Combat Feeding Directorate (CFD)

**The global leader and technology provider
for military field feeding**

The mission of the Department of Defense Combat Feeding Research and Engineering Program is to provide an operationally relevant research and development base to deliver solutions for evolving field feeding challenges. CFD is responsible for the research, development, engineering, integration and technical support for the entire family of operational rations.

The program is driven by warfighter recommendations and feedback. This guide was created with input from the U.S. Army Research Institute of Environmental Medicine (USARIEM). USARIEM conducts nutritional research that provides a scientific basis for developing new rations, menus, policies and programs to enable the warfighter's health-readiness and optimal performance.

The purpose of this guide is to provide an overview of performance nutrition, as it relates to operational rations designed to support combat readiness and resiliency during deployments, field operations and mission-specific scenarios.

This guide does not replace the need to consult with a physician and/or registered dietitian regarding diet and nutritional requirements for optimal individual performance.

Warfighter's Guide to Performance Nutrition and Operational Rations



CONTENTS

Action Plan.....	1
Check Your Knowledge.....	3
Energy Balance	3
Carbohydrates	4
Protein	5
Fat	6
Viatmins and Minerals	7
Hydration	8
Nutrient Timing and Recovery	10
Analyze Your Options	13
Create Your Plan	15
Resources	20

Warfighter's Guide to Performance Nutrition and Operational Rations



Performance Nutrition and Operational Rations

Providing the Warfighter the Fuel to Fight

Food is your body's fuel. Do you know how to get the maximum benefit from the foods you choose? Do you know the role of macronutrients (carbohydrates, protein and fat) and micronutrients (vitamins and minerals) in fueling your body? Do you know how to eat before and during a mission, and how to refuel afterwards, to maximize your performance?

By providing your body with the proper nutrition, you can improve your alertness, strength and endurance. Operational rations are designed using scientific evidence to ensure warfighter nutritional needs are met in all environments.

Action Plan

1. Check your knowledge of how foods and eating habits impact performance.
2. Analyze your existing operational ration food choices and mission requirements.
3. Create your performance nutrition plan.



Extreme environmental conditions can increase your energy needs.

Energy Balance

Performance Impact

- Operations in extreme environmental conditions (for example, cold, high altitude and heat), along with heavier equipment loads and terrain variances, can increase energy (kcal) needs.
- Not eating enough calories leads to weight loss, muscle wasting and decreased performance.

Recommended Daily Intake*

Activity Level	Men (kcal/d)	Women (kcal/d)
Light	3000	2100
Moderate	3400	2300
Heavy	3700	2700
Very Heavy	4700	3000

Operational Ration Sources**

Operational Ration	Avg kcal/meal
Meal, Ready to Eat (MRE)	1300
First Strike Ration® (FSR) (contains 3 meals)	2900/Ration
Meal, Cold Weather (MCW)	1600
Unitized Group Ration – A (UGR–A)	1300
Unitized Group Ration – Express (UGR–E)	1350
Unitized Group Ration – Heat & Serve (UGR–H&S)	1350
Unitized Group Ration – Marine (UGR–M)	1300
Modular Operational Ration Enhancement [†] (MORE)	1000/pack

* Energy recommendations are estimates only and vary among individuals
AR 40-25/OPNAVINST 10110.1/MCO 10110.49/AFI 44-141, 3 January 2017

** Operational Rations Handbook (Natick PAM 30-25)

† Augments rations to provide extra calories.

Carbohydrates (CHO)

Performance Impact

- During moderate to heavy exercise, CHO is the main fuel source for muscle.
- More strenuous activity levels increase CHO needs.
- Adequate amounts of CHO are needed for endurance, concentration, coordination, and recovery.

Recommended Daily Intake*

Approximately 3 grams (g)/pound of body weight (or 500 g of CHO/day for 165 pound warfighter).

Operational Ration Examples

10-19.9 g CHO	Meat Entrée (beef stew, chicken stew) or Jam/Jelly Packet
20-30 g CHO	Cracker or Side (potato au gratin, oatmeal) or Pasta entrée (chili macaroni, spaghetti w/ beef & sauce) or Beverage (cappuccino, cocoa, electrolyte)
Greater than 30 g CHO	Fruit (spiced apples, CHO enhanced applesauce, dried fruit) or Bread (snack bread, tortilla, filled bakery item) or Pasta entrée (elbow macaroni, cheese tortellini) or Snack (cookie, pound cake, candy) or Beverage (CHO fortified)

Protein (PRO)

Performance Impact

- Essential for proper refueling after physical activity to promote recovery.
- Secondary source of energy for the body.
- Adequate amounts needed to maintain muscle and recover from injuries.

Recommended Daily Intake*

Approximately 0.7 g/pound of body weight (or 115 g of PRO/day for 165 pound warfighter).

When adequate calories are consumed, then protein recommendations are generally met through diet alone, without the need for supplementation.

Operational Ration Examples

5-9.9 g PRO	Spread (peanut butter) or Meat snack
10-20 g PRO	Vegetarian entrée (cheese tortellini) or Snack (trail mix) or Beverage (chocolate protein drink)
Greater than 20 g PRO	Meat entrée (chicken chunks, tuna packet, barbecue beef)

Fat

Performance Impact

- During prolonged physical activity stored fat is used as energy.
- Fat helps your body absorb certain vitamins (A, D, E and K).
- Fat is the most energy dense nutrient and is essential for proper fueling.

Recommended Daily Intake*

20-35% of calories (2500 calorie intake = 56-98 g of fat)

Operational Ration Examples

1-4.9 g Fat	Fruit (spiced apples) or Entrée (chicken chunks) or Cracker or Beverage (cappuccino, cocoa)
5-10 g Fat	Entrée (chicken noodle & vegetable, cheese tortellini) or Bread (snack bread, tortilla, filled bakery item)
Greater than 10 g Fat	Snack (trail mix, cookie, pound cake) or Spread (peanut butter, cheese)

Vitamins and Minerals

Performance Impact

- Vitamins and minerals don't provide energy, but they are necessary for energy production, and other cellular functions.
- Micronutrients have been added to fortify certain ration items to prevent deficiencies and maximize performance.

Recommended Daily Intake*

- Vitamin A: 3000 IU/day (men); 2333 IU/day (women)
- Vitamin C: 90 mg/day (men); 75 mg/day (women)
- Calcium: 1000 mg/day (men and women)
- Iron: 8 mg/day (men); 18 mg/day (women)

See AR40-25 for complete list of military dietary reference intakes.

Operational Ration Examples

Many ration components are good sources of micronutrients. Eat a variety of components to obtain a balance of nutrients. If you are unable to eat your entire ration, then choose the entrée and fortified ration components first.

FORTIFIED COMPONENT	VITAMINS										MINERALS		
	A	B1	B2	B3	B6	B12	C	D	E	Folic Acid	K	Calcium	Zinc
Chocolate Protein Drink							x	x					
Beverages/Pouched Fruit							x						
Beverages, Sugar Free							x					x	
Cheese Spread	x							x					x
Peanut Butter	x	x			x		x						
Crackers/Snack Bread												x	
Pudding								x				x	
First Strike Bars	x	x	x	x	x	x	x	x	x	x			x

*AR 40-25/OPNAVINST 10110.1/MCO 10110.49/AFI 44-141, 3 January 2017

Hydration

Performance Impact

- Fluid requirements may double with physical activity and/or hot weather due to added sweat loss.
- Dehydration in excess of 2-3% of body mass increases risk of injury, interferes with mental functions, and decreases performance.
- Too few electrolytes may lead to muscle cramping and reduce your body's ability to function.

Recommended Daily Intake*

- Cooler Environments
 - 3.2-8.5 quarts (qt) (3-8 liters (L)) of fluid/day (see figure on next page)
 - 2-4 g of sodium/day
- Hot Environments
 - 4.2-12 qt (4-11.4 L) of fluid/day (see figure on next page)
 - 4-9 g sodium/day

Operational Ration Examples

Beverages (Carbohydrate-electrolyte beverage)

NOTE:

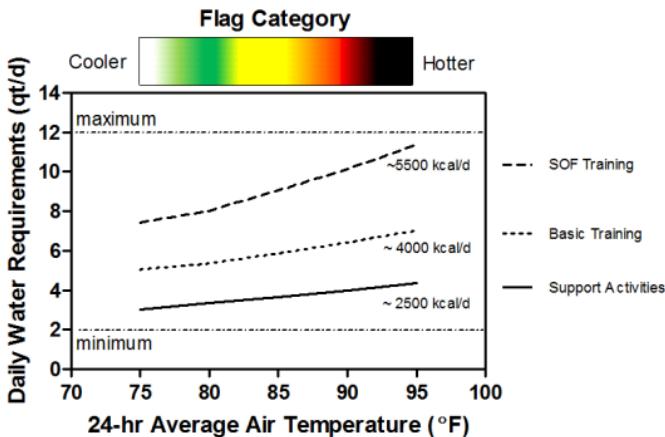
Carbohydrate-containing beverages are also a source of calories (e.g. 5.3 qt [5 L]/day of sports drink can add up to 1600 extra calories).

Sodium needs can generally be met by consuming rations, particularly entrees and salty snacks (jerky, pretzels, corn nuts).

* TC 4-02.3 and TB MED 507 (fluid recommendations) and AR 40-25/OPNAVINST 10110.1/MCO 10110.49/AFI 44-141, 3 January 2017 (sodium recommendations)

Hydration

The graph below depicts water requirements over a range of average daily air temperatures and corresponding heat stress flag categories.



EXAMPLE: On a day when the average air temperature is 75° F (24° C) and your activity level requires 4000 kcal, then your daily water requirement is approximately 5 quarts (4.7 L)/day.

NOTE:

- Hourly fluid intake should not exceed 1.5 qt (1.4 L).
- Fluid needs can vary based on individual differences in sweat rate and sun exposure.

Nutrient Timing and Recovery

PERFORMANCE IMPACT

- Eating regularly, to include before field operations, maximizes physical and mental performance.
- Improper fueling negatively impacts mission outcomes.
- Caffeine can temporarily improve performance. It is not a substitute for sleep.

RECOMMENDATION

- Consume ration items at regular intervals, every 4-6 hours of wakefulness.
- Consume protein over the course of the day (approx. 0.7 g/lb of body weight or 115 g for 165 lb warfighter).
- Consume caffeine up to 200 mg, and re-dose every 3-4 hours, only as needed. Do not exceed 800 mg caffeine per day.

BEFORE FIELD OPERATIONS

(approximately 1-4 hours)

- Eat a snack/small meal to maximize energy stores and focus on CHO (approx. 0.5-1.8 g/lb of body weight).
- Pre-mission intake needs will differ between individuals and during high intensity activity (ex: field assaults) high protein/fat/fiber intake may lead to digestive upset.
- If needed, 30-60 minutes before activity, use caffeine (up to 200 mg) to boost your mental and physical performance.

OPERATIONAL RATION EXAMPLES WITH GREATER THAN 30 g CHO

- **Fruit** (spiced apples, CHO enhanced applesauce,)
- **Bread** (snack bread, tortilla, filled bakery item)
- **Pasta entrées** (elbow macaroni, cheese tortellini)
- **Snacks** (cookie, candy)
- **Beverage** (CHO fortified)

Nutrient Timing and Recovery

DURING FIELD OPERATIONS

- Snack when you can to meet energy needs (every hour if possible).
- Focus on your CHO intake with a goal of 30-60 g CHO/hour during high activity level operations.
- Drink enough fluid to prevent excessive dehydration (0.5 - 1.0 qt [0.5 - 1.0 L])/hour).

OPERATIONAL RATION EXAMPLES WITH GREATER THAN 30 G CHO

- Fruit (spiced apples, CHO enhanced applesauce, dried fruit)
- Snacks (filled bakery item, candy)
- Beverage (CHO fortified)

AFTER FIELD OPERATIONS

(within 30-60 minutes)

- To kick start recovery and refueling, consume 80-120 g CHO and 15-25 g PRO after heavy physical activity.
- Drink to relieve thirst and promote urination.

OPERATIONAL RATION EXAMPLES

- Recovery trail mix and pudding:
CHO 90 g + PRO 17 g
- Chocolate PRO drink, peanut butter, and crackers:
CHO 90 g + PRO 25 g
- Meatballs in marinara sauce, Italian bread sticks, and beverage (CHO fortified):
23 g PRO + 85 g CHO

**Choose foods to
meet your performance
nutrition needs.**



Food Labels

The nutrition facts label provides the operationally relevant nutrition information a warfighter may need. For more information on energy and nutrient levels of operational rations, search the Combat Rations Database (ComRaD) by visiting <https://www.hprc-online.org/page/Combat-Rations-Database-ComRaD>.

- Are you consuming enough energy (kcal) to meet your performance needs?
- Are you consuming enough CHO to meet your performance and recovery needs?
- Are you consuming enough protein to promote recovery and maintain muscle mass?
- Are you consuming enough vitamins and minerals to maximize performance?
- Is your energy requirement greater than 2000 calories/day?

Nutrition Facts		
Serving Size 1 Pouch (227g) Servings Per Container About 1		
Amount Per Serving		
Calories 260	Calories from Fat 90	% Daily Value*
Total Fat 9g		15%
Saturated Fat 4g		20%
Trans Fat 0g		
Cholesterol 30mg		10%
Sodium 300mg		13%
Total Carbohydrate 30g		10%
Dietary Fiber 5g		19%
Sugars 7g		
Protein 16g		%
Vitamin A 10%	Vitamin C 15%	
Calcium 10%	Iron 20%	

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Understand your nutritional needs, and plan ahead to optimize performance.



Plan Ahead

The following table may help you plan your energy and fluid intake before, during and after missions, based on body weight.

Body Weight (lbs)	TIMING		
	Pre-Mission	During**	Post-Mission
<145-165	80-300 g CHO drink to thirst	30-60 g CHO/hr 0.5-1.0 qt (0.5-1.0 L)/hr	80-120 g CHO, 15-25 g PRO drink to relieve thirst and promote urine production*
165-185	90-350 g CHO drink to thirst	30-60 g CHO/hr 0.5-1.0 qt (0.5-1.0 L)/hr	80-120 g CHO, 15-25 g PRO drink to relieve thirst and promote urine production*
>185	100-400 g CHO drink to thirst	30-60 g CHO/hr 0.5-1.0 qt (0.5-1.0 L)/hr	80-120 g CHO, 15-25 g PRO drink to relieve thirst and promote urine production*

- Know your own body tolerances; practice during training and before actual missions.
- If needed, 30-60 minutes before activity, use caffeine (up to 200 mg).
- Know your calorie needs, and eat at regular intervals.
- During multiple hours of heavy to very heavy physical activity, snack regularly with goal to consume 60-90 g CHO/hour.

* fluid needs vary by individual, do not exceed 1.5 qt (1.4 L)/hr (1500 ml/hr)

** cold weather or high altitude increases needs to 50-75 g CHO/hour

Plan Ahead: Vignette 1

You are part of an Infantry Platoon deployed in support of combat operations in a hot climate. Your mission is to conduct dismounted zone reconnaissance patrols throughout the Area of Responsibility. At 0730 you are dropped off by helicopter 5 kilometers away from the objective. At 1530 you are scheduled to be picked up by vehicles upon completion of the mission. The patrol requires travel over varied terrain and significant elevation changes. As the platoon moves towards the extraction point, you receive contact and are stuck on the objective for an additional 5 hours.



Plan Ahead: Vignette 1

IF YOU ARE A 185 LB MAN OR A 150 LB WOMAN:

What are your energy needs?

Heavy activity level = approximately 3700 kcal (man) or 2700 kcal (woman).

Caloric needs can vary based on individual differences in height, weight, age, and gender.

Which ration(s) meet your needs?

FSR + MORE

When will you use the ration items?

Before: (100-400 grams CHO)

- Toaster Pastry + Dried Fruit + Ergo Beverage Base (125 g CHO)
- Consume additional items, including fluids, as needed to meet individual pre-mission needs.

During: (30-60 g CHO/hour)

- Snacks (First Strike Bar, Toaster Pastry, Energy Gel, Corn Kernels), Pocket Sandwiches, and/or Beverages - CHO Beverage Base
- Fluids - 0.5-1.0 qt (0.5-1.0 L)/hr

After: (80-120 g CHO, 15-25 g PRO)

- Italian Style Sandwich + Beef Snacks + First Strike Bar (Mini) + CHO Electrolyte Beverage (93g CHO + 22 g PRO)
- Tortilla + Peanut Butter + Applesauce + Beef Snacks (90g CHO + 23 g PRO)
- Fluids - drink to relieve thirst and promote urination.

The Operational Ration components listed above are only examples — other options may also meet requirements (check the food labels and ComRaD Database)

Plan Ahead: Vignette 2

You are part of an Infantry Platoon conducting a training mission in a moderate climate. Your mission is to emplace surveillance devices on the objective area. Reaching the designated objective area involves a 7 kilometer dismounted movement from the Company area. Your unit will leave the line of departure at 0730. Your uniform includes your individual Weapon, Load Bearing Vest, Advanced Combat Helmet, Camel Back with water and pack. Time on target will require a sustained moderate activity level for patrolling, infiltration of the objective and device installment. Movement back to the Company area is scheduled to start around 1300 and follow the same 7 kilometer route.



Plan Ahead: Vignette 2

IF YOU ARE A 185 LB MAN OR A 150 LB WOMAN:

What are your energy needs?

Heavy activity level = approximately 3400 - 3700 kcal (man) or 2300 - 2700 kcal (woman).

Caloric needs can vary based on individual differences in height, weight, age, and gender.

Which ration(s) meet your needs?

3 MREs (a MRE may be substituted by a UGR meal if provided)

When will you use the ration items?

Before: (100-400 grams CHO)

- [MRE] Hash Browns with Bacon + Granola with Milk and Blueberries + Snack Bread + CHO Beverage Base (134 g) or [UGR H & S, Breakfast] Oatmeal + Milk + Harvest Cake + Grape Juice (125 g)
- Consume additional items, including fluids, as needed to meet individual pre-mission needs.

During: (30-60 g CHO/hour)

- [MRE] Snacks – First Strike Bar, Toaster Pastry, Crackers, Pound Cake
- Beverages – CHO Beverage Base
- Fluids - 0.5-1.0 qt (0.5-1.0 L)/hr

After (within 30-60 minutes): (80-120 g CHO, 15-25 g PRO)

- [MRE] Chili Mac Entrée + Cheese Spread + Candy III (fruit flavored discs) (80 g CHO + 22 g PRO)
- Fluids - drink to relieve thirst and promote urination.

After (several hours):

- [MRE or UGR H&S, Dinner] Consume items to balance daily intake and meet individual post-mission needs.
- Fluids - drink to relieve thirst and promote urination.

The Operational Ration components listed above are only examples — other options may also meet requirements (check the food labels and ComRaD Database).

RESOURCES

- Combat Rations Database (ComRaD) ration nutritional information:
*[https://www.hprc-online.org/page/
Combat-Rations-Database-ComRaD](https://www.hprc-online.org/page/Combat-Rations-Database-ComRaD)*
- Nutrition and Menu Standards for Human Performance Optimization:
*AR 40-25 / OPNAVINST 10110.1 / MCO 10110.49 / AFI
44-141*
- Human Performance Resource Center Warfighter Nutrition Guide:
*[https://www.hprc-online.org/page/Nutrition/
Warfighter-Nutrition-Guide](https://www.hprc-online.org/page/Nutrition/Warfighter-Nutrition-Guide)*
- Heat Stress Control and Heat Casualty Management:
TB MED 507 / AFPAM 48-152
- Fluid and electrolyte replacement guidance:
*[https://www.dir.ca.gov/oshsb/documents/Heat_illness_
prevention_tbmed507.pdf](https://www.dir.ca.gov/oshsb/documents/Heat_illness_prevention_tbmed507.pdf)*
- Operational Rations Handbook (Natick PAM 30-25)
Ration information and menus:
http://nsrdec.army.mil/img/pdfs/OP_Rations08-22-16.pdf
- Academy of Nutrition and Dietetics (AND), Dietitians of Canada (DC), and American College of Sports Medicine (ACSM) performance nutrition guidelines:
*[http://journals.lww.com/acsm-msse/Fulltext/2016/03000/
Nutrition_and_Athletic_Performance.25.aspx](http://journals.lww.com/acsm-msse/Fulltext/2016/03000/Nutrition_and_Athletic_Performance.25.aspx)*



