

HOW LOW CAN YOU GO—CONSIDERATIONS FOR LOW-CARBOHYDRATE DIETS

DEBRA WEIN, MS, RDN, LDN, NSCA-CPT,*D, AND ESTHER BUSTAMANTE, RD, NSCA-CPT

Traditional diets tend to have carbohydrates comprise the majority of the kilocalories of overall intake. This is due to the fact that glucose has long been known to be the body's preferential source of energy, especially in brain function and during high-intensity exercise (2,4,7). However, recent research has developed new ways of approaching macronutrient ratios that challenge this conventional way of thinking. This article aims to take a look at what is usually recommended for athletes, as well as different lower carbohydrate variations. This way strength and conditioning coaches and athletes can better determine which approach is best for them to reach their specific goals. Furthermore, working directly with a Registered Dietitian may be the best way to approach any dietary plans.

MACRO GUIDELINES FOR GENERAL POPULATION/HEALTH

The health and wellness of the general population can be achieved by following the dietary guidelines set forth by the United States Department of Agriculture (USDA) and Institute of Medicine. The goal of these guidelines is to promote overall health and stave off chronic diseases (i.e., diabetes, hypertension, cardiovascular disease, etc.). These guidelines recommend that at least half of the carbohydrates consumed should be from complex, whole grains (12). They also advise a diet laden with fruits and vegetables. The protein sources should be lean and fat sources should be unsaturated fats predominately. The guidelines indicate that these macronutrients should be consumed in the ratio of 45 – 65% carbohydrates, 10 – 35% protein, and 20 – 35% fat (12).

GUIDELINES FOR ATHLETES

Because athletes are not the general population, different recommendations have been made for them. The Academy of Nutrition and Dietetics and the International Society of Sports Nutrition have recommended carbohydrate intake at 5 – 10 g/kg of bodyweight for athletes in general, protein intake of 1.2 – 1.4 g/kg of bodyweight for endurance athletes, and 1.2 – 1.7 g/kg of bodyweight for strength athletes (8,11). However, athletes involved in high-intensity training can consume protein amounts up to 2.0 g/kg of bodyweight (8). Fat intake is consistent with USDA recommendations at 20 – 35% of total kcals (8,11). Due to the potential risk of an unbalanced diet resulting in nutrient deficiency, general health concerns, and performance issues, high fat diets are not generally recommended for athletes (11). These recommendations may need to be adjusted based on individual goals, bodyweight, total kcals needed, and training volume and intensity.

PROS

1. Appropriate and easily adaptable for everyone from physically active general populations to elite athletes.
2. Balanced ratios, similar to USDA guidelines, promote healthy athletes with no risk of nutrient deficiencies.

3. Higher carbohydrate recommendations ensure sufficient energy to power through training and games/races and for recovery.

4. Moderate protein and fat for building and maintaining muscle mass and energy stores.

CONS

1. Macronutrient ratios may be inappropriate for weight or body composition changes for athletes in weight-dependent sports.

LOW CARB

The Paleo Diet™ is notorious for cutting out grains, dairy, and legumes while emphasizing animal-based protein. This is just one of many low-carb diet options but it will be used as an example for the purposes of this article. This low-carbohydrate diet involves slightly higher protein and fat than is generally recommended for athletes with ratios of about 23% carbohydrates, 38% protein, and 39% fat (5). The “Paleo for Athletes” version of the diet provides exceptions, such as higher carbohydrate intake of up to 40% and an emphasis on timing of carbohydrate intake for training, competition, and recovery (5). The diet touts improved physical performance and body composition with increased energy levels. Although no research had been conducted specifically on athletes, there have been positive changes for subjects who are afflicted with metabolic syndrome (3).

PROS

1. Cuts out processed foods, refined sugars, and grains; it also encourages fruits and vegetables.
2. Recognizes carbohydrates as a source of energy during training and events.

CONS

1. Cuts out entire food groups, grains, and dairy. Without supplementation, diet can be low in fiber and calcium—which are needed for muscle and nerve contraction as well as bone health.
2. Encourages animal protein, which can be high in saturated fat and may lead to elevated cholesterol levels.
3. It can be expensive to maintain because it consists of grass-fed meats, fish or seafood, organic coconut oil, and grass-fed butter.
4. Currently, there is not much research available on athletes using the diet.

VERY LOW CARB

Ketogenic diets restrict carbohydrates anywhere from less than 30 g to 130 g per day, or less than 10% total kcals. These diets include moderate amounts of protein with the remainder of total kcals in fat to place the body in a state of ketosis—high levels of ketone bodies in the blood from increased fat oxidation (1). The premise of the ketogenic diet is to train the body to tap into stored fat and run on ketones instead of glucose for any activity,

from daily living to intense endurance exercise. There is a finite amount of glucose stored in the body as glycogen, and when it eventually runs out, the athlete will “hit a wall” in terms of energy. There is much more potential energy from stored fat than stored glycogen that can be used when the triglycerides are oxidized to form ketone bodies. Researchers have noted improvements in bodyweight, body composition, energy, and endurance after adaptation to running while using ketones; however, if intensity of training were to increase, the ketone bodies may not be able to properly fuel the activity (9,14).

PROS

1. Effective in weight loss for overweight or obese populations and improvement of metabolic syndrome symptoms.
2. Improvement in body composition and weight can positively impact athletic performance (10).
3. Can be beneficial in endurance athletes and those performing at submaximal levels; however, no evidence for intermittent sport athletes or high-intensity exercise.
4. Adaptation can take as little as two weeks (13).

CONS

1. Adaptation can take as long as a few months (13).
2. During adaptation, performance may suffer (9).
3. Not practical for high-intensity sports or exercise; those bouts require glycogen (9,14).
4. The body synthesizes adenosine triphosphate (ATP) from glycogen at a faster rate than from ketone bodies.
5. High-fat diets can impair cardiac and cognitive function (6).
6. Unfavorable lipid levels and diseases associated with them can be a concern.

CONCLUSION

All of these diets have positives and negatives associated with them. Because each individual is unique in their needs and metabolism, eating plans should be adjusted to fit their specific needs. Important items to consider are the athletes' goals, training volume, and intensity. The best macronutrient distribution ratios are the ones that can be sustained without hindering performance.

REFERENCES

1. Accurso, A, Bernstein, RK, Dahlqvist, A, Draznin, B, Feinman, RD, Fine, EJ, et al. Dietary carbohydrate restriction in type 2 diabetes mellitus and metabolic syndrome: Time for a critical appraisal. *Nutrition and Metabolism* 5: 9, 2008.
2. Berg, JM, Tymoczko, JL, and Stryer, L. Each organ has a unique metabolic profile. In: *Biochemistry*. (5th ed.) New York: WH Freeman; 2002.
3. Boers, I. et al. Favourable effects of consuming a Palaeolithic-type diet on characteristics of the metabolic syndrome: A randomized controlled pilot-study. *Lipids in Health and Disease*; 13: 160, 2014.
4. Burke, LM, Hawley, JA, Wong, SHS, and Jeukendrup, AE. Carbohydrates for training and competition. *Journal of Sports Sciences* 29(suppl 1): 17-27, 2011.
5. Cordain, L, and Friel, J. *The Paleo Diet for Athletes: The Ancient Nutritional Formula for Peak Athletic Performance*. New York, NY: Rodale; 2012.
6. Holloway, CJ, Cochlin, LE, Emmanuel, Y, Murray, A, Codreanu, I, Edwards, LM, et al. A high-fat diet impairs cardiac high-energy phosphate metabolism and cognitive function in healthy human subjects. *American Journal of Clinical Nutrition* 93(4): 748-755, 2011.
7. Kenney, WL, Wilmore, J, and Costill, D. *Physiology of Sport and Exercise*. (6th ed.) Champaign, IL: Human Kinetics; 51-71, 2015.
8. Kreider, RB, Wilborn, CD, Taylor, L, Campbell, C, Almada, AL, Collins, R, et al. ISSN exercise and sport nutrition review: Research and recommendations. *Journal of the International Society of Sports Nutrition* 7:7, 2010.
9. Maughan, RJ, and Shirreffs, SM. Nutrition for sports performance: Issues and opportunities. *Proceedings of the Nutrition Society* 71(1): 112-119, 2012.
10. Rhyu, H, and Cho, SU. The effect of weight loss by ketogenic diet on the body composition, performance-related physical fitness factors and cytokines of Taekwondo athletes. *Journal of Exercise Rehabilitation* 10(5): 2014.
11. Rodriguez, NR, DiMarco, NM, and Langley, S. Position of the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and athletic performance. *Journal of the American Dietetic Association* 109(3): 509-527, 2009.
12. United States Department of Agriculture and United States Department of Health and Human Services. *Dietary Guidelines for Americans* (7th ed.) Washington, DC: U.S. Government Printing Office; 2010.
13. Volek, JS, and Phinney, SD. *The Art and Science of Low Carbohydrate Performance*. Miami, FL: Beyond Obesity, LLC; 2012.
14. Zajac, A, Poprzecki, S, Maszczyk, A, Czuba, M, Michalczyk, M, and Zydek, G. The effects of a ketogenic diet on exercise metabolism and physical performance in off-road cyclists. *Nutrients* 6(7): 2493-2508, 2014.

ABOUT THE AUTHOR

Debra Wein is a nationally recognized expert on health and wellness. She has nearly 20 years of experience working in the health and wellness industry and has designed award-winning programs for both individuals and corporations across the country. She is President and founder of Wellness Workdays, (www.wellnessworkdays.com) a leading provider of worksite wellness programs. Wein is also the Program Director of the Wellness Workdays Dietetic Internship, the only worksite wellness-focused internship for dietetics students interested in becoming Registered Dietitians that is approved by the Accreditation Council for Education in Nutrition and Dietetics (ACEND).

Esther Bustamante is a Registered Dietitian (RD) and National Strength and Conditioning Association-Certified Personal Trainer® (NSCA-CPT®). She has nearly seven years of experience in the health and wellness field with a background in fitness and sports medicine. She completed her dietetic internship with a focus on worksite wellness through Wellness Workdays.

TABLE 1. CARBOHYDRATE, PROTEIN, AND FAT RATIOS

DIET/ FUELING PLAN	CARBOHYDRATES	PROTEIN	FAT
United States Department of Agriculture (12)	46 – 65% of total kcals	10 – 35% of total kcals	20 – 35% of total kcals
Academy of Nutrition and Dietetics (11)	6 – 10 g/kg bodyweight	1.2 – 1.7 g/kg bodyweight	20 – 35% of total kcals
International Society of Sports Nutrition (8)	5 – 10 g/kg bodyweight	1.4 – 2.0 g/kg bodyweight	~30% of total kcals
Paleo Diet (5)	23% of total kcals; athletes can increase up to 40%	38% of total kcals	39% of total kcals
Ketogenic Diet (1)	< 30 g/day or < 10% of total kcals	Moderate	High