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Fuel To Perform: Carbohydrate Nutrition for Strength and Power

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February 1, 2016

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The following is the second of a multi-part series on nutrition for strength and power athletes and finding the optimal recipe for peak performance.

[Click here to read Part I: Strength and Power Calorie Prescription](#)

[Click here to read Part II: Strength and Power Calorie Prescription](#)

Why Carbs?

Let's get it straight from the start: No single macronutrient, carbohydrate, protein or fat is more important than another for developing strength and power. Regardless, strength and power athletes often shy away from carbohydrates for fear that their sculpted muscles will be hidden amongst excess body fat. Research has shown that weightlifters frequently consume excess protein and fat at the expense of carbohydrates, and this resulting macronutrient imbalance may not yield optimal performance gains.¹ Adequate carbohydrate stores (glycogen) are essential for fueling high-intensity resistance training and help preserve hard-earned muscle. So stop blaming carbs for body fat gain, and start using carbs to your advantage. In a similar manner to calories, athletes should vary their carbohydrate intake according to the rise and fall in fuel requirements as dictated by training schedules.²



Credit: Todd Herriott/Métier Seattle

Fill Your Tanks

Carbohydrates from whole grain cereals, breads and pasta, low-fat dairy, and colorful fruits and vegetables provide a strategic combination of immediate and long-lasting energy because of their ability to keep glycogen stores maximally stocked and support intense exercise sessions. Blood glucose and the storage form of glucose, referred to as glycogen, are the major energy sources for high-intensity exercise, including moderate repetition (8-12) and low repetition (4-6) resistance exercise. Think of glycogen stores as gasoline in your car's tank. When you run out of gas in your workouts, you can be sure that your glycogen stores are running on empty. The only way to maintain adequate glycogen stores in order to bang out hard sets, repetitions and exercises is to eat carbohydrates at regular intervals throughout the day. Just don't overdo it (5-7 grams of carbs per kilogram is ideal) and choose the healthy ones mentioned above. Refined, sugary carbohydrates may taste good, but they are nutrient-poor and lead to blood sugar highs and lows that fuel cravings.



Credit: Todd Herriott/Métier Seattle

Going The Distance

When it comes to longer workouts, glycogen stores decline significantly after 60 to 90 minutes.³ This happens even quicker when you exercise at a high intensity or enter your workout under-fueled. Glycogen depletion during exercise will leave you with low energy levels, heavy legs, lightheadedness, poor concentration, a reduced rate of recovery – in other words, ready to call it a day. Proper fueling during exercise allows athletes to workout longer and harder, making for better strength and power gains. Additionally, carbs administered during exercise allow for maintenance of sport-specific skills and

concentration, and can reduce the release of stress hormones that interfere with muscle growth. It appears that carbohydrate-containing beverages and liquid supplements are best tolerated and give you the most return on investment. Choose products that provide multiple transportable carbohydrates such as glucose: fructose mixtures, and offer ~14-16 grams of carbs per 8 ounces. This combination will maximize the rate of carbohydrate absorption while simultaneously preventing gastrointestinal upset.

It's Not Over Until It's Over

At the end of the game or after an intense workout, adequate carbohydrate consumption is a priority. Carbs after exercise promote an “anabolic” – or should we say “non-catabolic” – environment, as they boost the hormone insulin. Carbs and insulin are to muscles what fertilizer is to plants. They're all about growth!!! Furthermore, high-intensity exercise gobbles up your glycogen stores, leaving them yearning for a carbohydrate fix.

Ingestion of 1.5 grams of high glycemic index carbs (carbs that rapidly increase blood glucose levels) per kilogram of body weight immediately after and repeated two hours after an intense bout of exercise can significantly increase the rate of muscle glycogen resynthesis.⁴ Additionally, pairing these carbs with protein in a 4:1 ratio will maximize recovery allowing you to invest in future workouts. Case in point: Research shows that you'll rebuild muscle faster on your rest days if you feed your body carbohydrates.⁵

Klean Recovery is the perfect way to satisfy these recovery requirements. A medium-sized banana and one scoop of Klean Recovery mixed with 12 oz low-fat milk will infuse your body with ~98 grams of carbohydrates and 24 grams of protein.[‡] This recovery snack will meet both the 1.5 g carbohydrate per kilogram body weight recommendation and the 4:1 carbohydrate to protein ratio for an 180 lb individual. It has anabolism (muscle protein synthesis) and refueling (restocked glycogen stores) written all over it.[‡]

Feed Your Gut Microbiome To Enhance Immunity

As an added bonus, adequate carb intake will keep your immune system in tip-top shape. Certain non-digestible carbohydrates (prebiotics) found in some whole grains, onions, garlic, honey, artichokes, and fruits and vegetables such as bananas, can act as a food source for the large community of microorganisms inhabiting your intestines – the probiotics. Consuming these foods with **Klean Probiotic** will boost the beneficial microorganism in your gut.[‡] When we feed the probiotics, they help us produce essential vitamins, absorb minerals more efficiently, keep our waistline trim, avoid nasty bacteria

looking for trouble, synthesize more lactase enzymes so we can break down milk sugar, lower the “lethal” cholesterol (LDL cholesterol), support our immune system (70% of which resides in our gut), and provide numerous other benefits that researchers are learning about every day. Not to be an adrenaline buzz kill, but sugary carbs tend to make bad bacteria flourish, so focus on fresh foods and unprocessed carbs to get the upper edge.[‡]

Carbohydrates are not the athlete’s enemy; on the contrary – when consumed properly, carbs deserve the nutritional gold medal. Calculate your own carb recommendations using the table below, but once you do, keep in mind that you should always experiment during training to develop a race or event fueling plan so there are no surprises when performance is of utmost importance.

Your Personal Carbohydrate Prescription		
Nutrient Timing	The Prescription (Rx)	Foods To Meet Your Carbohydrate Rx
Daily Protein Requirements	<ul style="list-style-type: none"> • 6-10 grams of carbs per kilogram of body weight (1 lb = 0.45 kg) with optimal levels at 5-7 grams/kg to promote strength and power sports • Note: Less than 5 grams of carbs per kilogram of body weight can deplete fuel stores and inhibit glycogen resynthesis after exercise. This is especially detrimental to athletes performing high intensity training where glycogen stores are continually taxed 	Foods Containing 15-20 grams of Carbohydrates <ul style="list-style-type: none"> • 1 slice whole wheat bread • ½ cup pasta or rice (brown and wild are best!) • 1 piece of fruit • 1 small or ¾ cup of sweet potatoes • ¾ cup beans • 8-12 ounces low fat milk • 1 cup yogurt • 2 cups Greek yogurt (Greek yogurt is lower in carbs and higher in protein than regular yogurt)
Before Training	<p><i>1 to 4 hours prior to training</i></p> <ul style="list-style-type: none"> • Aim for 1 to 4 grams of carbohydrates per kilogram of body weight in the 1 to 4 hours 	<ul style="list-style-type: none"> • Post-Exercise: 1

	<p>prior to training. For example, 4 grams of carbs per kilogram, 4 hours before; 3 grams of carbs, 3 hours before, etc.</p> <ul style="list-style-type: none"> Your best bet is to choose carb-rich protein sources that are easy to digest and low in fiber 	<p>rounded scoop Klean Recovery mixed with 12 oz low fat milk</p> <ul style="list-style-type: none"> 8-12 ounces sports drink (14-16 grams carbs per 8 ounces)
<p>During Training</p>	<ul style="list-style-type: none"> High intensity exercise less than 45 minutes: 0 g carb/hr High intensity exercise (continuous or intermittent) ~45-60 minutes: 0-30 g/hr High intensity exercise (intermittent) ~90 minutes: 30 <p>During sustained high-intensity exercise lasting 45-75 minutes, consume small amounts of carbs (10-30 grams), including a mouth rinse with a</p> <ul style="list-style-type: none"> During endurance exercise including “stop-and-start” sports lasting 1-2.5 hours aim for 30-60 grams of carbs per hour <i>Exception:</i> If you enter a workout low on fuel, start repleting with carbs earlier in your workouts to ensure you have a high quality workout 	
<p>After Training</p>	<ul style="list-style-type: none"> 5 grams of carbs/kg body weight immediately after and 2 hours after exercise Aim for 3 to 4 grams of carbohydrate for every 1 gram 	

of protein

- If training more than once per day and sessions are close together, consume carb-rich foods and drink soon after the session to help with rapid refueling



Bio

Karlyn Grimes, MS RD LDN CSSD, is the founder of Simply Simple Health (SSH) and author of *The Everything Anti-Inflammation Diet Book*. SSH creates and administers nutrition, fitness and health education programs for athletes, educators, coaches and sports teams at schools and colleges throughout the Boston area. Its programming includes individual and group sports nutrition counseling, as well as sport-specific personal training. SSH also contributes to numerous academic textbooks and magazines.

Karlyn has a dual Master's degree in nutrition and exercise physiology from Boston University and a Bachelor of Arts degree in biology from Colgate University, with a minor

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Topics Athlete Diary

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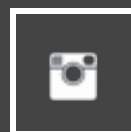
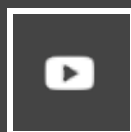
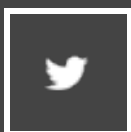
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