

Athlete Nutrition

by Clyde Wilson

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Optimum Health is central to performance.

Health requires balanced nutrition meeting all your body's needs: Protein for tissue building, carbohydrate for energy, and fats for increased metabolism and nerve recovery after exercise. But simply eating healthy foods in balance is not enough; caloric pacing and hydration play critical roles as well. Caloric pacing involves eating moderate amounts throughout the day rather than skipping breakfast and eating a large dinner. Caloric pacing is also the fundamental principle behind proper pre-, during and post-exercise nutrition. Hydration requirements are determined primarily by how much you eat, perspiration losses during exercise and electrolyte needs.

Meal Composition

Dietary fat: Eating less than 20% of total calories as fat or consuming more saturated fat than unsaturated fat (regardless of the % calories) reduces health and performance significantly. Eating more than 30% (up to 50%) of total calories as healthy fat has been shown in several cultures to be the healthiest approach to eating in the world, but that approach will not leave enough room in your diet for carbohydrate and protein to support high levels of exercise training.

Guidelines: Around 25% of total calories as dietary fat, less than 1/3 of these saturated. Include some omega-3 fat each day (1 serving low-mercury fish e.g. salmon or sardines, 1 Tbsp flax seeds, 1 Tsp flax oil, 3 Tbsp canola or soy oil, or a couple servings of tofu).

Protein: Less than 10% of total calories coming from protein will result in reduced recovery, whereas over 25% induces many negative health effects as defined by the American Heart Association (fatigue, bone demineralization, kidney concerns, gout, arthritis, high blood pressure, increased chances for cancer, obesity and diabetes).

Guidelines: 10-25% of total calories, choose protein sources that are low in saturated fat.

Carbohydrate: Carb sources includes whole grains, fruits and vegetables. Vegetables are much higher in fiber and phytonutrients (including anti-oxidants to help with recovery) than any other food. Therefore, any diet not high in vegetable intake requires a greater number of total calories to achieve the same levels of nutrients. Supplements can not replace vegetable intake because the active nutrient profile of a mixture of vegetables, such as in a dark-green salad with other vegetables on top, is much greater than any powder or tablet can contain. The

type of starches (whole grains) you should include in your diet include high-fiber cereals, breads, pastas, rice and yams. Sometimes it is not practical to eat whole grains, such as when in a restaurant or if your meal goes better with white pasta or potatoes. In such cases just reduce the amount you consume a bit relative to the amount of whole grain/high- fiber starches you would eat.

Guidelines: 50-60% Carbohydrate where fully 1/3 of those carbohydrate calories are vegetables. Note that this amount of vegetables corresponds to 20% of your total caloric intake, which would take up a full 1/3 of your plate since vegetables are low in calories compared to their volume. Lunch and dinner should have extra vegetables on sandwiches or both a side of vegetables and a salad when possible. Breakfast should include vegetables when eating eggs (spinach, tomato, etc go well in eggs), but when eating cereal fruit can be used instead. Dark and orange fruit is the healthiest (berries, plums, papaya, passion, guava, red grapes) whereas bananas are relatively high in sugar and digest quickly (which is fine in moderation). Eat at least as many vegetables as fruit, and do not replace fruit with fruit juice (which is essentially sugar water).

Summary: Of your total calories in the day and preferably per meal, 25% fat (less than 1/3 of that saturated), 25% protein, around 50% as carbohydrate. Emphasize vegetables, whole grains, protein low in saturated fat and ensure that your fat intake is both sufficient and not excessive.

Caloric Pacing and Hydration

The body can store fat incredibly well, but does not do such a good job at storing carbohydrate, protein or fluids. Within a few hours after a meal, blood sugar levels, available essential amino acids, and your hydration levels start to slowly fall. For this reason, a healthy snack should come between your main meals and water should be consumed on a regular basis throughout the day. Your main meals should be made smaller to accommodate the addition of 2-3 healthy snacks so that your total calories for the day stay the same. The amount of water you need through the day is 1 Liter or Quart for every 1000 Calories that you eat. For example, if you eat 2000 Cal/day you need 2 L of water, which is about 8 cups. If you only eat 1500 Cal, then you need 1.5 L or about 6 cups. This does NOT include fluid needs to make up for perspiration losses during training (see “Exercise Hydration”).

Weight loss

Often, endurance athletes are interested in reducing body fat and increasing performance simultaneously. The only way to achieve this goal is to minimize how many calories go to fat and increase how many go to muscle. A diet containing healthy fats, high-fiber foods (whole grains, vegetables, some fruit) and moderate (no greater than 25% of total calories) in protein intake dramatically increases muscle fueling and reduces the fueling of fat cells. This is as opposed to diets high in saturated fat, added sugar or refined carbohydrate (e.g. white bread, white rice, white pasta). The types of fats and carbohydrates, as well as the total amount of protein you eat, have a dramatic impact on muscle fueling regardless of how many calories you eat. In other words, reducing calories to lose weight without improving the composition of meals usually results in reduced health and performance. There is no need for this to occur; simply follow the general guidelines in this handout and, equally important, measure out some of the foods you eat. Use a Tbsp measuring device to determine the amount of peanut butter, salad dressing or any other fat source you add to your meals for at least one day (I personally do this almost every day). Use a ½ cup measuring device to put rice or pasta onto your plate or to put cereal into your bowl.

Knowledge is power, and knowing how much fat and carbohydrate you are actually eating is critical to taking charge of your caloric intake.

Fueling and hydrating your body during exercise

Fuel type

Glucose is the sugar your body burns as fuel. Any other sugar, such as fructose, sucrose or galactose, must be converted into glucose by the liver before it can be used by muscle; this occurs at a maximum rate of 1 Cal/min or 60 Cal/hr. You can ingest and get to muscle about 4 Cal/min or 240 Cal/hr of glucose; about 3 times the rate at which you can use non-glucose sugars. For this reason, use primarily glucose sources to fuel your workouts. Look at the label of what you are using. If it does not list maltodextrin (chains of glucose) or glucose itself as the primary ingredient, switch to another product. There are many maltodextrin products on the market, including e-Gel, Hammer Gel, Power Gel, Gu, Carboom, Sustained Energy, Complex Carbs, etc.

Fuel timing

If your muscles are fully stocked with fuel they will not allow more fuel to come in. This means that during the first 30-60 min of exercise or competition, there is little benefit from ingesting calories unless this training is first thing in the morning and you have not had time for breakfast. Also, sugar ingestion uses up a lot of water in the body, so if you are dehydrated (such as in the 3 or 4 hour of a marathon) any calories coming into your body can result in gastrointestinal distress. Since muscle can effectively absorb 4 Cal/min of glucose and 1 Cal/min fructose or sucrose, ramp up your fueling from zero to 100-200 Cal/hour over the first hour and maintain this throughout your marathon. It is critical that the fuel enter your body slowly and continuously every time you drink fluid and that you do not exceed 250 Cal glucose or 300 Cal glucose and fructose per hour even when fully hydrated. This set of recommendations (fuel type and timing during training or competition) helps athletes more than any other advice.

Exercise hydration

Perspiration rate averages 1-2 Liters/hr depending on running intensity and environmental conditions. However, every person perspires at a unique rate. Therefore, each athlete must measure the change in their body weight over a training session. Your body weight at any one time does not matter; it is the CHANGE in body weight that correlates to fluid losses. For every 2 lb (1 kg) that you lose on the scale over the course of a workout, you have perspired roughly 1 L of fluid. Any fluids you consumed during the training increased your body weight back towards normal by replacing some of your perspiration losses. Therefore, the total perspiration rate is your body weight change converted to a volume of fluid (2 lb or 1 kg = 1 Liter or Qt or 32 oz) added to the volume you drank during the training session. Divide by the number of hours you exercised to get the rate per hour. If the amount you drank during exercise is less than half of the total amount you perspired, you are replacing less than 50% of your losses you are reducing your performance significantly, particularly in the last 1-2 hours of your marathon. Determine your fluid losses before the race (during a training session) and practice replacing 50-100% of your losses. Less than this and you can induce muscle cramping, more than this and you can induce hyponatremia (the cause of 10% of all ER visits by marathoners during a competition).

Electrolytes

There is less salt in a Liter of sweat than there is in a Liter of fluids in your body, so the salts in your body concentrate as you perspire. This is the reason that dehydration contributes to muscle cramping. If you replace less than half of your fluid losses (see “exercise hydration” above), do not use salt (electrolyte) supplementation during exercise; instead, replace your salt losses after exercise when you replace all your fluid losses. If you replace more than 50% of your perspiration losses, using some electrolyte supplementation is fine (see below). If you replace all or close to all of your fluid losses during exercise, then replace all of your electrolyte losses during exercise to avoid hyponatremia. Each Liter or quart (32 oz) of perspiration contains roughly 600-1200 mg of sodium and 100-200 mg potassium, depending primarily on fitness level. The average marathoner (i.e. a person with a significant level of fitness) will lose about 700-800 mg sodium/L perspiration, which corresponds to just over ¼ teaspoon of table salt, and ~100 mg of potassium. This amount of potassium loss is relatively small, so potassium supplementation is optional (100 mg/L perspiration), and magnesium supplementation is even less, so supplementation is not warranted. My recommendations for sodium supplementation during exercise are as follows:

If, DURING exercise you replace	use mg sodium/L fluids	use teaspoons sodium/L fluids
50% or less of your fluid losses	none	none
75% of your fluid losses	350-400 mg	just over 1/8 Tsp
100% of your fluid losses	700-800 mg	just over 1/4 Tsp

For a detailed perspective on your exercise hydration, fill out the following for an exercise session

Date: _____ Weight change from before to after exercise: _____

Fluid volume corresponding to weight change (2 lb or 1 kg = 1 Liter or Qt or 32 oz): _____

Fluid volume consumed during the exercise: _____

Total perspiration = Fluid volume consumed plus fluid volume corresponding to wt change: _____

% perspiration losses replaced during exercise = Fluid volume consumed/Total perspiration = _____

Perspiration rate = Total perspiration / Total length of time of exercise = _____

Your notes, comments, or plans for future exercise hydration:

General Plan for Meal Timing and Hydration

Total hydration: 8 cups (2 morning, 4-5 during day, 1-2 evening, none in the ½ hr before bed) Total meals/snacks: 3 small meals, 2-3 snacks (including pre-& post-exercise if exercising)

Morning nutrition and preparation for your day

- Wake up: Drink 2 cups (16 oz) of water immediately, no more than 1 cup of this as coffee
- Critical: Eat breakfast within ½ hour of waking
- Make snack bag for mid morning and mid afternoon (nuts, whole-grain crackers, fresh or dried fruit)
- Take snack bag and either two 16 oz water bottles or one 1L water bottle for the day

Lunch, dinner and hydration throughout your day

- Lunch and dinner at convenient times 2/3 the regular amount you usually eat unless your meals are already less than 600-700 Calories, have about 1/3 of your plate as vegetables (salad, etc).
- Optional: If reducing your lunch and dinner size means not eating all of a meal that you buy or are served, you

can eat the remaining 1/3 of the lunch or dinner 2 hours after the respective meals as your snack and save your pre-prepared snack bag for the next day

- Drink the 1 L water throughout your day, completing it before you go home
- If dinner is more than 4-5 hours before bed, eat a small healthy snack 1-2 hours before bed
- Critical: If dinner is less than 3 hours before bed make it the smallest meal of the day and eat a snack 2 hours before dinner
- Drink 2 cups of water (for a total of 8 cups) in the last 5 hours of your day
- Don't drink water in the last 20-30 min before sleep so you can equilibrate your internal fluid volumes and go to the bathroom to urinate out any excess fluid intake prior to sleeping

On days when your exercise training is low to moderate in intensity

- Eat a small healthy snack 30-60 min before and immediately after exercise
- Example snack: 150 Cal of whole grain bread with 50 Cal peanut butter, 1 small piece fruit
- Replace around ½ -1 Liter of water for each hour of exercise

On days when your exercise training is intensive early in the morning

If your body can handle solid food eat foods you normally eat for breakfast but have two smaller feedings 1 hr apart. Otherwise: Blend ½-1 cup uncooked oats (125-250 Cal), 1 piece fruit (40-80 Cal), 1-1.5 Tbsp peanut butter (80-120 Cal) and ¾-1 cup nonfat milk (75-110 Cal). Use the lower amounts if you weigh closer to 120 lbs (320 Cal), the higher values if you weigh closer to 200 lbs (560 Cal). Consume ½ of this shake ½ hour before exercise and the other ½ within 10 or 15 minutes after exercise. This is a healthy way to rapidly fuel your body without the energy drop that comes 20-30 minutes after consuming the equivalent number of calories of sports drink or bars. For particularly hard workouts or for the actual marathon, add ¼ cup of pure maltodextrin (100 Calories) instead of ½ of the oats you would normally put into the shake. This provides your body a small amount of fuel fairly quickly, but digestion is slowed down by the healthy fiber, protein and fat in the shake (a benefit you do not get from the sports drinks and bars). Pure maltodextrin is in complex carbohydrate (chains of glucose molecules).

The night before a competition

Eat a colorful salad with 1-2 Tbsp vegetable-or olive-oil based dressing, a starch source (whole grain bread, whole wheat pasta or brown rice), and a protein source containing healthy fat (tofu or salmon is the ideal). Split the dinner up into two portions. Eat half 1-2 hours before your regular dinner time and the other half 2 hours later.

Carb loading: Double your carbohydrate intake for 1 day only before endurance competition! This process increases body fat stores. Since excess carbohydrate entering the bloodstream at any one time increases body fat, split your intake into 6 equally-sized meals instead of 3.