

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 steadily 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 (fluid and electrolyte) losses during exercise.

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.

Dietary Fat Guidelines: Around 25% of total calories in meals 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).

Protein 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, slowing digestion so that more of the entire meal goes to lean tissues. Without vegetables (the coarser the better) digestion is faster, and more of the meal goes to body fat. Body fat generates only 1/3 the power of burning sugars, so loading up on meals creates slow fuel reserves. Therefore, any diet not high in vegetable intake reduces power-to-weight ratio, endurance, strength, and recovery. Supplements and cooked vegetables (which are soft) do not have the coarse structure of raw vegetables and therefore do not slow digestion to increase how much time muscle has to absorb what you have eaten. 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 and increase vegetable intake by 20%.

Carb Guidelines: 50-60% Carbohydrate where fully 1/3 of those carbohydrate calories are vegetables. Note that this amount of vegetables corresponds to 1/6 of your total caloric intake, which would take up a full 1/3-1/2 of your plate since vegetables are low in calories compared to their volume. Be creative in how to add vegetables to meals. Celery sticks, snap peas, or a small bag of broccoli and cauliflower are portable muscle fueling aids for whatever lunch or dinner you might end up eating on the go.

Meal composition summary: Of your total calories in the day and preferably per meal, 25% fat (less than 1/3 of that saturated), 10-25% 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”).

Athletic 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 consumed with no vegetables to slow their digestion rate). 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 both reduced health and performance.

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), dextrose (dimers 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, Carbo Hit, 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 a full breakfast. Also, sugar ingestion uses up a lot of water in the body, so if you are dehydrated (e.g. the 3rd or 4th hr 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, ramp up your fueling from zero to 100-200 Cal/hour over the first hour and maintain this throughout your marathon as long as you hydrate. It is critical that the fuel enter your body slowly and continuously every time you drink fluid and that you do not to exceed 250 Cal glucose or 300 Cal glucose and fructose per hour even when fully hydrated.

Exercise hydration

Perspiration rate averages 1-2 Liters/hr depending on training intensity and environmental conditions. However, every person perspires at a unique rate. Therefore, each athlete must measure their body-

weight **change** over a training session. 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 for training lasting longer than one hour. Determine your fluid losses before the race (during a training session) and practice replacing at least 50% 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, 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. 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 mg of sodium and 100 mg potassium, or just over ¼ teaspoon of table salt and almost no potassium. My recommendations for sodium supplementation during exercise are as follows:

If, DURING exercise you replace	use mg sodium/L fluids	use teaspoons sodium/L
50% or less of your fluid losses	none	none
75% of your fluid losses	200-400 mg	1/8 tsp
100% of your fluid losses	600 mg	1/4 tsp

Fill out the following for an exercise session at each intensity

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:

Competition nutrition

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 to avoid spiking blood sugar.

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 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). If your meals are averaging 800 Cal you should be in intensive training mode and eating large amounts of raw vegetables to slow digestion of those meals.
- 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 (not including 2 cups upon waking and the water with and after dinner), 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

For your training

- Small healthy carb snack (e.g. fruit or for harder training a piece of toast) 30-90 min before exercise
- Large starch snack (e.g. 2 pieces of bread with anything you want on it such as PB) right after exercise
- If you cannot handle solid calories at these times: Any malto drink (50 Cal before, 100-200 Cal after)
- Replace around 0.5-1.5 Liter of water for each hour of exercise depending on your perspiration rate

On days when your exercise training is intensive or right after waking consider this shake

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).