Athletes used to think that if you wanted to bulk up your muscles, you just ate a lot of calories. Bodybuilders were notorious for eating several pounds of meat and up to a dozen raw egg yolks daily. Today we know not only that high-fat, high-protein diets are unhealthy, but that they don’t promote lean tissue growth. The diet that will give you the greatest increase in lean body mass without causing a lot of fat gain is still high in calories—but the recommendations about where these calories should come from have changed a lot.

**Muscle-Building Basics**

Building muscle requires tremendous energy, both to do the muscle-building exercise and to build the tissue itself. One study (Gail Butterfield, PhD, personal communication, January 1997) showed that each day strength-trained athletes needed about 20 calories per pound of body weight (44 calories [kcal] per kilogram [kg]) just to maintain their muscle mass—about 2,800 calories per day for a 140-pound person, 4,000 for a 200-pound person (table 1). Apparently even more—25 to 30 calories per pound of body weight (54 to 66 kcal/kg) per day—is required to build muscle (1,2).

<table>
<thead>
<tr>
<th>Table 1. Daily Calorie, Carbohydrate, Protein, and Fat Intake for Strength Training: Sample Recommendations</th>
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<tr>
<td><strong>Body Weight (Pounds)</strong></td>
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**Carbohydrate.** Getting enough calories is important, but so is getting the right kind of calories. Carbohydrate, stored in the body as glycogen, is the predominant energy source for muscle-building exercise. The harder and longer you work out, the more glycogen your muscles require. Once your muscles are depleted of glycogen, you have no more energy to continue your workout.

There are different ways to figure out your carbohydrate needs, but the bottom line is that with at least 500 to 600 grams of carbohydrate per day, your muscles will stay packed with glycogen. One method is to base your intake on 3.6 grams per pound of body weight (8 g/kg). At 4 calories per gram of carbohydrate, this means about 504 grams per day or about 2,000 carbohydrate calories for a 140-pound person, and 720 grams or 2,900 carbohydrate calories for a 200-pound person.

A second strategy for computing your carbohydrate needs is based on a percentage of total calories. When total energy intake is below 4,000 calories a day, getting 70% of those calories from carbohydrates will ensure the muscle power and endurance required to strength train.
With a diet above 4,000 total calories a day, a lower percentage of calories can be obtained from carbohydrates, as long as you take in at least 500 to 600 grams of carbohydrate.

**Protein.** At this point you might be wondering, "What about protein?" Protein is the basic building material for muscle tissue, and strength trainers need to consume more than the rest of us. In the same study that looked at energy needs, researchers found that during weight lifting, those who ate enough calories required about 0.6 grams of protein per pound of body weight (1.2 to 1.3 g/kg) daily to maintain muscle mass. If the intensity of the exercise was increased to build muscle, the daily requirement went up to almost 0.7 grams per pound (1.5 g/kg).

Based on a wide review of scientific data (3), current daily protein recommendations for serious strength trainers are about 0.6 to 0.8 grams per pound (1.4 to 1.8 g/kg). This equals 90 to 115 grams of protein per day for the 140-pound strength trainer and, 128 to 164 grams for the 200-pounder.

**Fat.** Once you've determined your carbohydrate and protein needs, all the leftover calories—less than 30% of total calories—can come from fat. To keep your heart healthy, make sure that most of your fat calories are from unsaturated fats.

**Water Needs**

Next on the list of important nutrients is water. Good hydration is just as essential for strength training as it is for endurance training. Your body requires at least eight 8-ounce cups of caffeine-free, nonalcoholic fluids every day. You need to drink even more to replace fluids that are lost during exercise.

Make sure you go into your workouts well hydrated by drinking 2 cups of fluid 2 hours before exercise. During exercise, drink 4 to 8 ounces every 15 to 20 minutes. After exercise, replace any further fluid losses with 16 ounces of fluids.

Another approach is to weigh yourself before and after exercise: Any weight lost is fluid. Replace every pound lost with at least 16 ounces of fluid.

**Supplement Sense**

Most supplements that are supposed to help build muscle don't work. But some, such as creatine, fluid and electrolyte replacers, carbohydrate supplements, and liquid meal replacers may offer some benefits to strength training athletes.

**Creatine.** In the past several years, creatine has gained attention among athletes because it has the potential, when combined with a good diet and strength training program, to produce slightly more power during workouts. In addition, loading creatine into the muscles may help speed up muscle gain.

Meat is the best dietary source of creatine, and vegetarians generally have lower muscle creatine concentrations than meat-eaters. People at the lower end of the normal range for muscle creatine are the most likely to benefit from supplementation.

The usual dosage for creatine loading is 5 grams of creatine monohydrate four times per day for 5 days. A maintenance dose of 2 grams per day can follow. Taking more than the usual dosage of creatine offers no added benefit. Also, users should be aware that creatine and other popular supplements are subject to little government regulation, so there is no guarantee that they are pure.
**Sports drinks.** Fluid and electrolyte replacers are beneficial if exercise lasts longer than 1 hour. Carbohydrate supplements can be useful to help fit adequate carbohydrates into a busy day. Additionally, one study (4) indicated that by taking creatine with 17 ounces of liquid carbohydrate supplement, muscle creatine concentrations can be boosted by up to 60%.

Consuming a meal-replacement beverage just after muscle-building exercise may be a convenient way to help stimulate muscle growth. Protein and carbohydrates trigger the release of insulin and growth hormone, which are integrally involved in muscle growth. Meal replacement beverages are also great for adding well-balanced calories when you just don't have the time to eat a meal.

**Don't Forget Sweat**

Even though supplement purveyors promise easy results, gaining muscle takes determination, a good diet, and lots of sweat. Stick to it, and you'll be pleased with your results.

**References**


**Remember, you, your physician, and your nutritionist need to work together to discuss nutrition concerns. The above information is not intended as a substitute for appropriate medical treatment.**

Dr Kleiner is a private nutrition consultant to athletes in the Seattle area. She is a member of the American College of Sports Medicine; a member of the American Dietetic Association and its practice group, Sports and Cardiovascular Nutritionists (SCAN); and a fellow of the American College of Nutrition.