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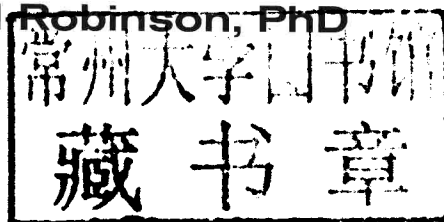
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Susan M. Kleiner, PhD, RD

High Performance Nutrition, LLC
Mercer Island, Washington

with

Maggie Greenwood Robinson, PhD



运动与营养

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*In loving memory of Mom and Dad, who showed me
how to gracefully embrace strength and power*

Preface

I am so excited to bring you the fourth edition of *Power Eating*. The fields of sport nutrition and exercise physiology are booming as the discovery of the human genome has resulted in an explosion of technology that has deepened our understanding of how the body works. For this edition I have cast a wide net to explain how the chemical properties of food, botanicals, and supplements turn genes on and off to affect our ability to gain muscle, burn fat, and enhance training. I also discuss how you can harness the power of the brain to drive metabolic processes through food, taste, mood, training, environment, and relationships.

As always, input from readers has been invaluable. You asked, and I have answered with a new chapter of menus for cross-trainers. All of the chapters and menus have been updated to stay on the cutting edge of the science for competitive athletes as well as novice and more casual trainers.

Power Eating has held its place at the top of the bookshelf because I give you not only the latest published research, but a play-by-play of the research being conducted in laboratories around the world, just as I'm writing the book. Then, I tell you how to put it all together to reach your goals. This edition offers a true insider's view of the latest news on muscle-building supplements and state-of-the-science diet and supplement strategies for gaining energy, getting cut, enhancing mood, and tightening mental focus.

Power Eating is the leader in guiding you through all your training periods throughout the year. The Power Eating menus are unsurpassed in their level of detail yet practical to customize and follow in your busy life. Whether you are trying to maintain, build, taper, or cut, the Power Eating diet plans will get your body where you want it to be when you want it to be there, and keep you healthy, safe, and legal. You *can* have it all! Train hard and POWER EAT!

Acknowledgments

It is humbling that my readers have looked to *Power Eating* as their trusted resource for 16 years, since we published the first edition in 1998. You have inspired me through your stories in person and online, through emails and hand-written notes, encouraging me to write a fresh, fourth edition that once again breaks new ground in the pursuit of strength and power. Thank you once again to my teammate in creating this legacy, Maggie Greenwood-Robinson. You are an all-star writer whose chops only keep getting better. Writing books is like an endurance relay, and your smooth hand-offs make it look easy all the way to the finish line! To Amanda McQuade Crawford, medicine hunter and herbalist extraordinaire, thank you for sharing your elite expertise on botanicals. Thank you to my dear friend, Shar Sault, two-time consecutive winner of the drug-tested World Figure Title of Ms. Natural Olympia, for sharing some of your fast, delicious and nutritious recipes in this fourth edition of *Power Eating*. To our acquisitions editor, Justin Klug, thank you for taking me seriously when I proposed a new edition and for shepherding it through the publication process with understanding and zeal. The entire team at Human Kinetics is fantastic. I always know that the intensive editorial process will produce a final product that is extraordinary. To Anne Hall, Martha Gullo, Tyler Wolpert, Kim McFarland, Sue Outlaw, and others, thank you for your unwavering support of my vision for *Power Eating* and your dedication to excellence. To my entire family, from the bottom of my heart thank you for your support and love. This has been a journey we have all taken together.

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PART I

Foundation

Since the publication of the third edition of *Power Eating* several years ago, huge strides have been made in the science of nutrition for strength training, particularly in the “neurobiology” of food. What I mean by that is how food influences the way your brain controls your body and appetite, and how a positive relationship with food helps you focus on building your body up rather than tearing it down. Addressing the neurobiology of food is now a key strategy for championship performance, recovery, and growth. When you put the latest nutritional science into practical application, your body will function at peak levels; your detoxification and cleansing mechanisms will operate optimally; and fat burning, energy metabolism, and muscle growth will move forward at a rapid pace. This is an exciting time in sport nutrition, because we now understand the nutritional needs of muscle, right down to the molecular and genetic level—and with that knowledge athletes like you can perform at higher levels than ever before. Chapters 1 through 6 explore this cutting-edge information and guide you on how to put it to use.

1

Eating for Power

Think about how you'd like to look and feel. Imagine yourself with a body that's fit and firm with just the right amount of muscle. Imagine the joy of high strength and energy that give you the power to perform, day in and day out.

Keep those images in your mind's eye. This book will show you how to achieve them with a few nips and tucks in one of the most important fitness factors of all—nutrition. But we're not talking about just any type of nutrition. This is a book for people who strength train to stay in shape, compete in strength-training sports, or want to improve their athletic ability. In other words, you're a strength trainer if you lift weights a few times a week or train for competition. As a strength trainer, you have specific nutritional needs that depend on your type and level of activity.

So, what kind of strength trainer are you? Are you a bodybuilder, a powerlifter, an Olympic weightlifter, an athlete who strength trains for conditioning and cross-training, or someone who works out with weights to stay in shape? These activities have different physical demands and different nutritional requirements, which is why you will find several individualized strength-training diets in chapters 12 through 16. But the common denominator is that all strength trainers, from competitors to recreational exercisers, are interested in the same thing: building lean muscle.

What Builds Muscle?

Most certainly, strength training builds muscle. But for this construction to take place, you have to supply the construction material: protein, carbohydrate, and fat. In a process called metabolism, the body breaks down these nutrients and uses the products to generate the energy required for growth and life.

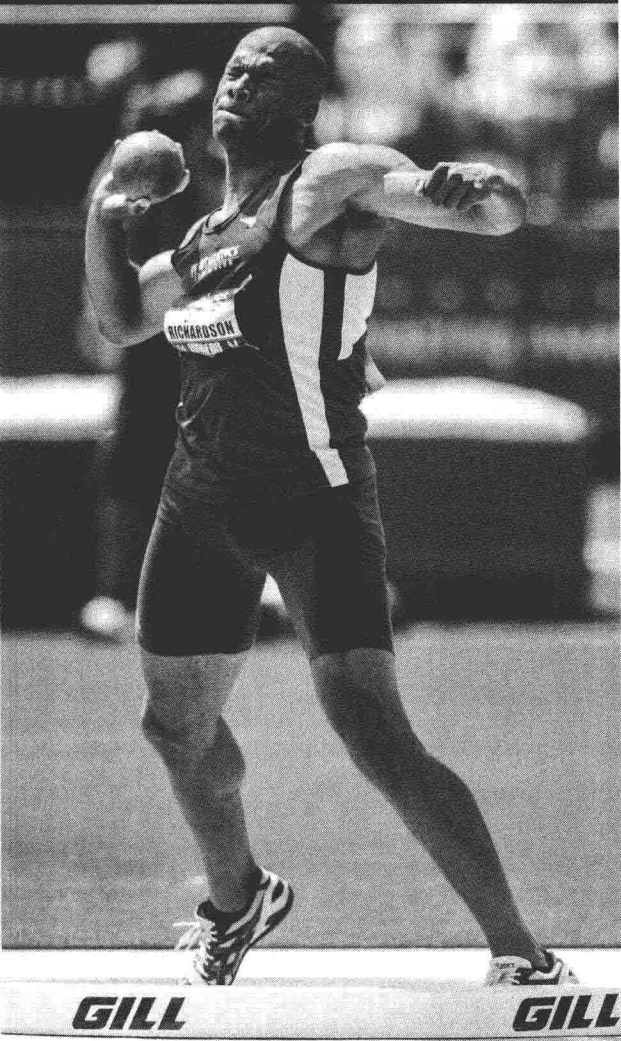
During metabolism, proteins are broken down into amino acids. Cells use amino acids to make new proteins based on instructions supplied by DNA, our genetic management system. The DNA provides information on how amino acids are to be lined up and strung together. Once these instructions have been carried out, the cell has synthesized a new protein.

On the basis of this process, logic would tell you that the more protein you eat, the more muscle your body can construct. But it doesn't work that way. Excess protein is converted to carbohydrate to be used for energy or converted to fat for storage.

The way to make muscles grow is not by gorging on protein but by demanding more from it—that is, by making protein work harder. The muscles will respond by taking up the nutrients they need, including amino acids from protein metabolism, so they can grow. If you work your muscles hard and give them comprehensive nutritional support, your muscle cells will synthesize the protein the muscles need.

What Fuels Muscle?

Intense activities like the shot put rely on CP to replenish depleted ATP.



To work your muscles hard, you have to provide the right kind of fuel. Muscle cells, like all cells, run on a high-energy compound known as adenosine triphosphate (ATP). ATP makes muscles contract, conducts nerve impulses, and promotes other cellular energy processes. Muscle cells make ATP by combining oxygen with nutrients from food, mainly carbohydrate. Fat is also used for fuel by muscles, but fat can be broken down only when oxygen is present. Muscle cells prefer to burn carbohydrate, store fat, and use protein for growth and repair.

Your cells generate ATP through any one of three energy systems: the phosphagen system, the glycolytic system, and the oxidative system.

The Phosphagen System

The phosphagen system rebuilds ATP by supplying a compound called creatine phosphate (CP). Once ATP is used up, it must be replenished from additional food and oxygen. During short, intense bursts of exercise such as weight training and sprinting, the working muscles exhaust the available oxygen. At that point, CP kicks in to supply energy for a few short seconds of work.

CP can help create ATP when ATP is depleted. Any intense exercise lasting for 3 to 15 seconds rapidly depletes ATP and CP in a muscle; these compounds must then be replaced. Replenishing ATP and CP is the job of the other energy systems in the body.

The Glycolytic System

The glycolytic system makes glucose available to the muscles, either from the breakdown of dietary carbohydrate during digestion or from the breakdown of muscle and liver glycogen, the stored form of carbohydrate. In a process called glycolysis, glycogen is disassembled into glucose in the muscles and, through a series of chemical reactions, ultimately converted into more ATP.

The glycogen reserve in your muscles can supply enough energy for about two to three minutes of short-burst exercise at a time. If sufficient oxygen is available, a lot of ATP will be made from glucose. If oxygen is absent or in short supply, the muscles produce a waste product from glucose called lactic acid. A buildup of lactic acid in a working muscle creates a burning sensation and is part of what causes the muscle to fatigue and stop contracting. Lactic acid exits the muscle when oxygen is available to replenish CP and ATP. A brief rest period gives the body time to deliver oxygen to the muscles, and you can continue exercising.

The Oxidative System

The third energy system is the oxidative system. This system helps fuel aerobic exercise and other endurance activities. Although the oxidative system can handle the energy needs of endurance exercise, all three energy systems kick in to some degree during endurance exercise. The phosphagen and glycolytic energy systems dominate during strength training.

Oxygen is not a direct source of energy for exercise; it is used as an ingredient to produce large amounts of ATP from other energy sources. The oxidative system works as follows: You breathe in oxygen, which the blood subsequently takes from your lungs. Your heart pumps oxygen-rich blood to tissues, including muscle. Hemoglobin, an iron-containing protein of the blood, carries oxygen to the cells to enable them to produce energy. Myoglobin, another type of iron-containing protein, carries oxygen primarily to muscle cells. Inside muscle cells, carbohydrate and fat are converted into energy through a series of energy-producing reactions.

Your body's ability to produce energy through any one of these three systems can be improved with the right training diet and exercise program. The result is a fat-burning, muscle-building metabolism.

Nutrition Principles for Strength Trainers

If you are serious about improving your physique and your strength-training performance, you'll do everything you can to achieve success. Unfortunately, advice given to strength trainers today is a hodgepodge of fact and fiction. What I'd like to do is

separate one from the other by sharing several principles with you—principles that all strength trainers can follow to get in shape and achieve their personal best in performance. These principles are the same ones I have advocated for world-class athletes, Olympic contenders, and recreational strength trainers for more than 25 years. Let's review them here.

Eat Enough Calories

A key to feeling energized is to eat the right amount of calories to power your body for hard training. In the United States, the terms *calorie* and *energy* are often used interchangeably. Elsewhere, the joule is used as a measurement of energy. Although this book refers to calories, you can convert to kilojoules by multiplying the number of calories by 4.1868. A lack of calories will definitely make you feel like a wet dishrag by the end of your workout. A diet that provides fewer than 1,600 calories per day, for example, generally does not contain all the vitamins and minerals you need to stay healthy, prevent disease, and perform well. Very low-calorie diets followed for longer than two weeks can be hazardous to your health, and they do not provide the dietary reference intakes (DRIs) of enough of the nutrients needed for basic health.

Historically, the recommended dietary allowances (RDAs) were the national standard for the amount of carbohydrate, protein, fat, vitamins, and minerals we need in our diets to avoid deficiency diseases and to maintain growth and health. The DRIs were established to update the RDAs based on more functional criteria rather than criteria based on deficiency diseases. Rather than focusing on avoiding disease, the DRIs focus on optimal performance both mentally and physically. But under certain conditions—stress, illness, malnutrition, and exercise—we may require a higher intake of certain nutrients. Studies have shown that athletes, in particular, may have to exceed the DRI of many nutrients. Some competitive bodybuilders have estimated their caloric intake to be greater than 6,000 calories a day during the off-season—roughly three times the DRI for the average person (2,000 calories a day for women and 2,700 calories a day for men).

How much you need of each nutrient depends on a number of factors, including your age and sex, how hard you train, and whether you are a competitive or recreational strength trainer. Generally, we find that strength trainers need to eat more protein, more of the right kinds of carbohydrate, and more of the right kinds of fat. What's more, they may be wise to supplement their diet with antioxidants and certain minerals. You'll learn more about these considerations as you read this book. If you are trying to gain muscle and lose body fat, eating enough calories and taking in enough nutrients will make the difference between success and failure.

Eat the Carbohydrate You Need

It's well known that most athletes, strength trainers included, don't eat enough carbohydrate, the primary fuel for the body. Most athletes follow diets in which less than half of the total daily calories come from carbohydrate, but 5 to 7 grams

of carbohydrate per kilogram of body weight should be consumed daily. That's more than half of an athlete's total calories, which is extremely important for a heavyweight competitive bodybuilder or Olympic weight lifter. Lots of bodybuilders practice very low-carbohydrate dieting because they believe it promotes faster weight loss. The problem with these diets is that they deplete glycogen, the body's storage form of carbohydrate. Once glycogen stores are emptied, the body starts burning protein from tissues, including muscle tissue, to meet its energy demands. You lose hard-earned muscle as a result.

Many fitness-minded people shy away from foods high in carbohydrate. They think these foods will make them fat—a myth that is partially responsible for the unbalanced proportion of carbohydrate, fat, and protein in strength-training diets, which are typically too high in protein.

The real story on carbohydrate for weight control and muscle building is that you should select whole-food carbohydrate—natural, complex carbohydrate as close to its natural state as possible—instead of refined, processed carbohydrate. What's the difference? A blueberry is a whole-food carbohydrate; a blueberry toaster muffin is a processed carbohydrate.

One important reason whole foods are better than processed foods has to do with their high fiber content. Fiber is the remnant of plant foods that remains undigested by the body. It's what keeps your bowel movements regular. Fiber is also a proven fat fighter. Research shows that people who eat healthy high-fiber diets have smaller waistlines, for example, and are able to better control their weight. The bottom line is that the right types of carbohydrate can help you manage your weight. The only types of carbohydrate you should shy away from are sugars and highly processed foods. Even so, when used in a targeted way, sugars can be an athlete's best friend by providing the right fuel at the right time. But without a plan, they can be fattening.

You will learn more about carbohydrate in chapter 3, especially how to select the right types of carbohydrate in the right amounts at the right times so that you take in enough to fuel your muscles without gaining fat.

Sport Nutrition Fact Versus Fiction: Is Carbohydrate Fattening?

Much misinformation exists about whether carbohydrate is fattening. Here's the real deal: Eating too much food is fattening. Further, eating sugary foods and highly processed foods, plus consuming carbohydrate alone (without protein and fat) is what triggers fat gain. By contrast, the right kinds of carbohydrate, meaning natural, unprocessed carbohydrate, will help you build muscle and get lean. What's more, these foods are low in calories, and the healthiest diet for weight loss, disease prevention, and physical performance is one that combines carbohydrate, protein, and fat. So the problem does not lie in high-carbohydrate foods; the problem is poor selection of carbohydrate, in particular, and food, in general.

Vary Your Diet

You have probably admired the physiques of bodybuilders in magazines, and for good reason. They are muscular, well defined, and in near-perfect proportion—they look like the picture of health. But in many cases, bodybuilders follow incredibly unhealthy diets. The first study I ever conducted investigated the training diets of male competitive bodybuilders. What I found was that they ate a lot of calories, roughly 6,000 a day or more. The worrisome finding from this study was that they ate, on average, more than 200 grams of fat a day. That's almost as much fat as you'd find in two sticks of butter! In the short term, that's enough to make most people sick. Eaten habitually over time, such an enormous amount of unhealthy fat may lead to heart disease.

Bodybuilding diets, especially precontest diets, tend to be monotonous, with the same foods showing up on the plate day after day. The worst example I've ever seen was a bodybuilder who ate chicken, pepper, vinegar, and rice for three days straight while preparing for competition. The problem with such a diet is that it lacks variety, and without a variety of foods, you miss out on nutrients essential for peak health. By contest day you certainly are not the picture of health, either.

Most bodybuilders don't eat much fruit, dairy products, and red meat. Fruit, of course, is packed with disease-fighting, health-building antioxidants and phytochemicals. Dairy products supply important nutrients such as bone-building calcium and bioactive proteins that promote lean muscle growth. And red meat is an important source of vital minerals such as iron and zinc.

When people limit or eliminate such foods from their diet, potentially serious deficiencies begin to show up. In studies conducted by myself and others, the most common deficiencies observed are those of calcium and zinc, particularly during the precompetition season. Many female bodybuilders have dangerous shortages of these minerals year round. A chronic short supply of calcium increases the risk of osteoporosis, a crippling bone-thinning disease. Although a woman's need for zinc is small (8 mg a day), adequate zinc is an impenetrable line of defense when it comes to protecting against disease and infection. In short, deficits of these minerals can harm health and performance. But the good news is that skim milk, red meat, and dark-meat poultry will help alleviate some of these problems. A 3-ounce (90 g) portion of lean sirloin beef has about 6 milligrams of zinc; nonfat, 1 percent, or 2 percent milk has about 1 milligram of zinc in one 8-ounce (240 ml) glass; and 3 ounces (90 g) of dark-meat turkey have about 4 milligrams of zinc.

Another nutritional problem among bodybuilders is fluid restriction. Just before a contest, bodybuilders don't drink much water, fearing it will inflate their physique to the point of blurring their muscular definition. Compounding the problem, many bodybuilders take diuretics and laxatives, a practice that flushes more water, as well as precious minerals called electrolytes, from the body. Generally, bodybuilders compete in a dehydrated state. At one contest, I saw two people pass out on stage—one because of severe dehydration, the other because of an electrolyte imbalance.

After a competition, bodybuilders tend to go hog wild with food. There's nothing wrong with this, as long as it's a temporary splurge for a few days or a week. But such dietary indulgence over a long time can lead to extra body fat.

Most bodybuilders, however, do a lot of things right, especially during the training season. For one thing, they eat several meals throughout the day—a practice that nutritionists recommend to the general public.

Time and Combine Your Food and Nutrients

To achieve superb shape and maximum performance, forgo the usual approach of three meals a day. Active people must fuel themselves throughout the day, eating small meals and snacks every two to three hours, preferably timed around their workout schedules. As we'll see, these meals don't include just any type of food.

When eating multiple meals, you always want to combine protein with carbohydrate and fat. Examples would be a turkey sandwich, a sprouted grain bread with peanut butter, or an apple with nuts. Eating multiple meals also promotes variety in your diet and keeps your blood sugar levels even so that you avoid peaks and valleys throughout the day (a cycle that happens to promote fat storage).

By including small amounts of protein in meals and snacks, you can control your appetite, feed your muscles more efficiently, and maintain muscle when you're trying to lose fat. You also burn fat better because protein, as well as eating multiple small meals, has been shown to increase thermogenesis, the process by which your body converts ingested calories and stored fat into heat. Another advantage of multiple meals is mental performance. Eating regular, timed meals helps you think and process information more effectively, increases your attention span, and boosts your mood.

The bottom line is that eating small, frequent meals throughout the day is the best fat-burning, muscle-building strategy you can integrate into your lifestyle. Table 1.1 provides a look at how to time your meals properly and the benefits of doing so. The supplements listed in the table are discussed in detail elsewhere in this book.

Use a Food Plan

Any nutritional program aimed at losing body fat and building muscle should be based on a food plan that emphasizes lean protein, natural carbohydrate, and good fat. It should also include sample menus and recipes as well as information on how to make healthy selections that are personalized to your lifestyle. It should be neither so restrictive that it invites failure nor so unstructured as to be confusing. These are precisely the guidelines for food planning that you will find here.

More specifically, if your goals are to develop lean muscle while reducing body fat, then your plan should take into consideration several factors, including balancing protein, carbohydrate, and fat; increasing your water intake; organizing your food into multiple meals; timing your intake; and incorporating certain dietary supplements into the mix.