



3<sup>RD</sup> EDITION

# SPORTS NUTRITION

*for Endurance Athletes*

RUNNING | CYCLING | TRIATHLON | SWIMMING

MONIQUE RYAN



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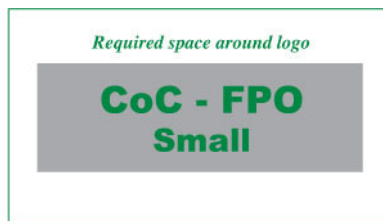
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# CONTENTS

Preface	vii
Acknowledgments	ix

## **PART I** **YOUR DAILY PERFORMANCE DIET**

<i>Optimal Nutrition for Training and Health</i>	<b>I</b>
1 Daily Hydration Essentials: Drinking It In	3
2 Energy Nutrients for Optimal Health and Performance: Building a Solid Nutrition Base	17
3 Vitamins, Minerals, and Electrolytes: The Nuts, Bolts, and Spark Plugs of Your Diet	49

## **PART II** **YOUR TRAINING DIET**

<i>Fine-Tuning Your Diet for Top Performance</i>	<b>75</b>
4 Your Daily Training Diet: Eating for Optimal Recovery	77
5 Food and Fluid Intake for Training and Competition: Timing Is Everything	127
6 Weight Loss, Muscle Building, and Changing Body Composition: Boosting Your Strength-to-Weight Ratio	175
7 Ergogenic Aids: Separating Fact from Fiction	201

## **PART III** **SPORT-SPECIFIC NUTRITIONAL GUIDELINES**

<i>Putting Your Sports Nutrition Plan into Action</i>	<b>231</b>
8 Nutrition for Triathlon (and Other Multisport Events)	233
9 Nutrition for Cycling (Road Cycling, Mountain Biking, Track Cycling, and Cyclocross)	263
10 Nutrition for Distance Running	285
11 Nutrition for Swimming	303

## PART IV SPECIAL NUTRITIONAL CONSIDERATIONS

### *Meeting and Managing the Challenges* **315**

- |    |   |     |
|----|---|-----|
| 12 | The Athlete with Unique Nutrition Considerations      | 317 |
| 13 | Performance Boosts and Problem-Solving with Nutrition | 353 |
| 14 | Nutritional Strategies for Extreme Environments       | 365 |

## APPENDIXES

- |            |   |     |
|------------|---|-----|
| Appendix A | Glycemic Index of Foods                 | 377 |
| Appendix B | Glossary of Vitamins and Minerals       | 381 |
| Appendix C | Comparison of Sports Nutrition Products | 384 |
| Appendix D | Creating the Optimal Training Diet      | 387 |
| Appendix E | Sample Menus                            | 396 |
| Appendix F | Estimating Sweat Loss—Worksheet         | 403 |
|            | Selected Bibliography                   | 405 |
|            | Index                                   | 413 |
|            | About the Author                        | 421 |

## PREFACE

When the first edition of *Sports Nutrition for Endurance Athletes* was published in 2002, and then the second edition in 2007, triathletes, cyclists, runners, swimmers, and adventure racers devoured the wealth of practical, sport-specific nutritional advice found within its covers. Over the years, it has been rewarding and gratifying to hear from readers, clients, and coaches across North America that the book has been an indispensable tool and resource for their training and race programs. With the burgeoning participation in endurance sports, it seemed not only logical but imperative to write the third edition that you are now holding in your hands. As a dedicated endurance athlete, you take your nutrition plans very seriously, and whether this book has found you at the start, peak, or post-event phase of your training season, you need to have the latest and best cutting-edge nutrition strategies.

Of course, cutting-edge sports nutrition research continues to develop, expand, and flourish. This book provides you with a practical working guide to that research. The third edition of *Sports Nutrition for Endurance Athletes* provides updated guidelines that are scientifically sound and practical for athletes participating in endurance and ultra-endurance sports, particularly in the areas of fueling before, during, and after training, and strategies for training and competition or event day.

Navigating the current tide of popular nutrition information can be confusing for the endurance athlete. Many popular diet plans extol the dangers and evils of carbohydrates. Of course, carbohydrate intake has played a key role in the development of sports nutrition and continues to play an important role in exercise performance and recovery. The key to carbohydrates for the endurance athlete is how much, what type, and when to consume carbohydrates. High-quality carbohydrate foods support both health and performance, and the nutritional impact of your training also requires the appropriate use of sports nutrition products when training and racing.

This book is ultimately about improving the quality of your training and performance in events and competition, but endurance athletes know that good health also enables lasting participation in their chosen sport. Part I is filled with updated information on the links among your daily food choices, optimal health, and disease prevention, with a perspective that supports your daily hours of dedicated training and longevity in your endurance career.

Part II contains the greatest amount of updated material, with the well-researched principles that truly distinguish your diet as an endurance athlete. From your perspective,

nutritional timing and portioning are everything. The section on immediate post-training nutritional recovery has been expanded, the information about hydration and electrolyte strategies for training and competition has been fine-tuned, and the nutritional guidelines for muscle building have been updated. Most important, Part II outlines how to adjust and periodize your nutritional intake for the various training cycles so that your daily training diet can be tailored more specifically to each training block and to each exercise session within these blocks. More specifics are given on estimating your energy needs and nutritional requirements for specific training days, and how to adjust these estimates for weight and body fat loss. It is best if you employ weight management strategies that suit an endurance athlete, without compromising energy and recovery, rather than the latest fad weight-loss diet or extreme measures. Use the sample menus in Appendix E, vegetarian included, to help you get started on your latest sports nutrition plan.

Current recommendations on the proper use of the ever-expanding offering of sports nutrition ergogenic aids as outlined in Chapter 7 will help you use these products wisely and safely.

Part III explains how to apply sports nutrition principles to training and competition in a particular endurance sport. These chapters contain detailed practical guidelines for various racing distances and disciplines. The race nutritional strategies of an Ironman® competitor differ from those of a short-course triathlete, and fueling strategies for a mountain bike race differ from those of a cycling road race. This part of the book specifies how to adapt the general principles to your specific sport.

Part IV is dedicated to specific health concerns for endurance athletes, providing guidance as to how diet and nutrition are related to these conditions. Throughout the book, guidelines and food choices that fit a vegetarian diet are also highlighted.

As before, this book addresses nutritional strategies relevant to recreational athletes, serious age-groupers, and elite endurance athletes. Whatever your goals and level of participation, an optimal sports nutrition plan is ultimately about making your participation in your sport more effective, more rewarding, and just plain fun.

## ACKNOWLEDGMENTS

Thanks to all the endurance athletes out there who have embraced this book over the past decade. It has been gratifying to reach enthusiastic cyclists, triathletes, runners, and swimmers who digest and absorb the contents of the book as they train, recover, and compete. Staying on top of all the latest research in sports nutrition is just plain fun for me, and having this great finished product to share with you is my pleasure. I promise that there will always be more sports nutrition advice to support you in your quest to be the best endurance athlete you can be.

While the polished, finished product makes it all look so easy, much work goes into bringing this book to your table. One of the best parts of updating and revising this book every few years is working with the great team at VeloPress. Many thanks to Renee Jardine for embracing the new workings of the third edition, to Casey Blaine for guiding those ideas to fruition, to Kara Mannix for her attention to detail, to Michelle Asakawa for making things clean and clear, and to Dave Trendler for spreading the word for several years to come.

# NUTRITION FOR DISTANCE RUNNING

*Participation in the sport of running currently* stands at an all-time high. The number of marathon finishers in the United States exceeded 500,000 in 2010. In 2010 the majority of large marathons reported being sold-out or enjoyed record fields. In fact, the average running time for the marathon is getting longer, reflecting the extent to which participation in this race has expanded. The half-marathon distance has the highest level of participation of any distance race, with more than 1.4 million finishers in 2010. Much of this increase has been fueled by charity and non-charity training programs, as well as destination events, runners moving up or down from the marathon, and women's participation. Running is no longer just for the lean and elite—people of all ages and fitness levels are joining in and becoming healthier in the process.

Other popular race distances are 8K (4.8 miles), 5 miles, 10 miles, 15K (9.3 miles), and 20, 25, or 30K (12, 15, or 18 miles). There are also ultradistance events, such as 50K (31 miles), 100K (62 miles), and 100-mile events. Although these do not attract as large a number of participants, they are as popular as ever, with more than several hundred certified ultrarunning events in 2010.

Distance runners tend to improve their performance with age, and many run and train for more than a decade before they reach their best running times. Recreational runners are often satisfied to

Fluid and electrolyte replacement is imperative when running in hot, humid climates.

Carb replacement is key to maintaining a desired pace and completing longer runs.

Train with the sports drink offered on the course, and refine drinking skills.

Practice your pre-race eating and fueling plan during weekly long runs.

Prioritize recovery nutrition after hard training runs, after long runs, and if training twice daily.

Runners should determine they have adequate iron stores and increase as needed.

Follow a carbo-loading plan 2 to 3 days before a long-distance race.



simply run for optimal fitness and health and enjoy the social aspects of running. Whatever a runner's level of training and competition, paying heed to nutritional considerations can enhance his or her participation in the sport. For recreational runners, that might mean simply feeling better and enjoying greater health benefits. For elite runners, proper nutrition can provide just the boost in performance that is needed to reach top goals.

## TRAINING NUTRITION

Because there is such wide variation in running—with some runners just starting out at the 5K level and others running marathons or ultradistance events—training programs vary widely. Some runners may have just signed up for their first charity run, while others are planning to race in a dozen or more events during the year, perhaps at a variety of distances. Even an experienced marathoner may choose to compete in an early-season 10K race and a half-marathon while building up to the marathon of his or her choice for the season. Because of the broad range of competitive goals, training programs are somewhat specific to the athlete. Running sessions may include longer runs designed to develop aerobic endurance, on the one hand, and intense runs and interval work designed to improve the anaerobic system and speed, on the other. Training nutrition has to take all this into account and be flexible enough to be adapted to any level.

## COMPETITIVE SEASON

Most large road races are scheduled from spring to late autumn, though some winter-season marathons are held in warmer parts of the country. The schedule of big-city marathons—such as in Boston, Los Angeles, Chicago, and New York—extends from April to November. Cross-country high-school and collegiate racing has a fall season, with many participants competing in winter and spring-season track. Elite runners may compete in a number of races of varying distances over the season, with some key events for preparation and peaking.

Events in hot weather usually have early-morning starts to avoid the heat. Late-season marathoners may train in hot conditions but find that race temperatures can be a wild card, with unseasonable cool or hot temperatures. Weather considerations affect the nutrition plan for race day.

Distance racing is mainly an aerobic activity, with elite runners completing a 10K race in less than 30 minutes and a marathon in just over 2 hours. Recreational runners can take more than twice as long to complete these events. Despite their aerobic natures, there are times when these races require more anaerobic effort, such as in a surge, hill, or sprint finish. Successful runners have a high maximal aerobic capacity and an economical running style, low muscularity in their upper body, and a low level of body fat.

Many factors affect the outcome of a race, including fluid and electrolyte balance and the availability of carbohydrate fuel. Typically runners go more slowly in races in heat and humidity to compensate for their absorption of environmental heat. Smaller runners are more protected from overheating.

With daily and perhaps twice-daily training sessions, attention should be placed on recovery nutrition, pre-run fueling, and fueling during the run, particularly when two hard sessions take place back-to-back. Careful preparation for the long run is crucial to successfully complete their training and be prepared on race day.

## FUELING FOR TRAINING

Eating too much too close to training or competition for your own personal tolerances is probably the biggest nutritional mistake that you can make as a runner. Because running jostles your gastrointestinal system, GI disturbance is a more common problem in running than in other endurance sports. Timing your pre-exercise meals is important for feeling “light” during your run and avoiding unpleasant symptoms such as a sloshing stomach, bloating, cramping, and diarrhea.

Prior to a short, relatively easy run, what you eat before training may simply be a matter of comfort and fending off hunger or hypoglycemia. It is not uncommon for runners to train in the early-morning hours. Some experiment and find that having something light, such as juice and a plain piece of toast, works best at this time. Regardless of your tolerances, make sure that you drink water or even a sports drink to hydrate. On long morning runs, consider taking a fluid bottle or fluid belt with you. Consuming a sports drink maintains blood glucose levels in the latter part of a longer run, but even on shorter runs it is good practice. It prepares you for longer races, and it helps in any run that occurs after you have not eaten for several hours, whatever the time of day.

Consuming regular meals and snacks replenishes your fluctuating liver glycogen stores and consequently helps maintain steady blood glucose levels throughout the day and during training. For afternoon or evening runs, try to time your meals carefully

and eat 3 or more hours before running. Leave enough space between meal or snack times and training times, especially for high-intensity runs and speed work. Emphasize carbohydrate sources that are easily digested. You may want to consider a liquid sports supplement, a meal-replacement product, or an easily digested gel before longer training sessions. Real food products also work well if you have experimented and determined your own tolerances.

## FUELING FOR THE LONG RUN

Experiment with pre-race eating before your long weekend run. This practice sets the stage for race day—it is particularly important to know your tolerances and preferences when racing a distance of 10 miles (16K) or longer. Although it may be tempting to sleep as late as possible before a long early-morning run, the pre-exercise meal is necessary for filling both liver and muscle glycogen stores. Liquid meals may work best, but you can also experiment with carbohydrate foods that are low in fiber. Knowing what works for you in training will help lighten pre-race nerves and help you feel more comfortable about your nutritional choices on the big day.

Ideally, take in as much carbohydrate as you can tolerate up to 1 gram per pound (about 2 g/kg) of body weight 2 hours before the long training run. Although you may leave a longer time interval after eating before a race start, this is still essential practice for having a quality and well-fueled long run. If you decide to eat even closer to the long training run, lower your carbohydrate intake to half a gram per pound (about 1 g/kg) of body weight. Food choices should be kept simple. Two hours prior to a long run, a 160-pound (73 kg) runner could consume more than 100 grams of carbohydrates from 2 slices of toast topped with 2 tablespoons (40 ml) of jam, plus 12 ounces (360 ml) of orange juice. After this meal and leading up to the run, 24 ounces (960 ml) of a sports drink would provide an additional 40 grams of carbohydrate or more.

Some simple morning noshes that sit easy in your stomach and pick up your run include:

- ½ bagel with 1 tsp. (8 ml) peanut butter and 1 tbsp. (20 ml) jam with 8 oz. (240 ml) juice
- ½ cup instant oatmeal with 4 oz. soy milk and 1 tbsp. (20 ml) raisins
- 1 medium-sized high-carbohydrate energy bar and 1 banana
- Pretzels and hummus with a glass of juice

APPENDIX E MEAL PLANS *continued*

## VEGETARIAN MEAL PLANS, CONTINUED

2,200 CALORIES	2,400 CALORIES	3,000 CALORIES
<b>Dinner</b> Kidney beans, 1 c. (240 ml) Rice, cooked, 1 c. (240 ml) Tortilla, 1 medium Green salad, 1 c. (240 ml) Salad dressing, 2 tbsp. (30 ml)	<b>Snack</b> Energy bar, 1 medium Apple, 1 medium	<b>Snack</b> Bagel, 4 oz. (120 g) Cheese, low-fat, 2 oz. (60 g) Apple, 1 medium
<b>Snack</b> Granola bar Peach, 1 medium Yogurt with fruit, 8 oz. (240 ml)	<b>Dinner</b> Tempeh, ¾ c. (180 ml) Rice, cooked, 1½ c. (360 ml) Broccoli, cooked, 1 c. (240 ml) Sesame seed oil, 1 tbsp. (15 ml)	<b>Dinner</b> Tofu, 4 oz. (120 g) Soba noodles, cooked, 2 c. (480 ml) Greens, cooked, 1 c. (240 ml) Sesame oil, 1 tbsp. (15 ml)
	<b>Snack</b> Orange, 1 medium Almonds, 2 tsp. (10 ml)	<b>Snack</b> Pear, 1 large
2,900 CALORIES	3,400 CALORIES	3,700 CALORIES
470 g carbohydrates (62%) 113 g protein (15%) 78 g fat (23%)	550 g carbohydrates (65%) 120 g protein (14%) 77 g fat (21%)	610 g carbohydrates (66%) 134 g protein (14%) 83 g fat (20%)
<b>Breakfast</b> Pancakes, 4 small Syrup, 6 tbsp. (90 g) Raisins, 2 tbsp. (30 ml) Apple juice, 8 oz. (240 ml) Eggs, 2 medium	<b>Breakfast</b> Oatmeal, cooked, 1½ c. (360 ml) Skim milk, 1 c. (240 ml) Wheat germ, 2 tbsp. (30 ml) Orange juice, 12 oz. (360 ml) Yogurt, 1 c. (240 ml) Apple, 1 large Sports drink, 40 oz. (1,200 ml)	<b>Breakfast</b> Bran flakes, 1½ c. (360 ml) Wheat germ, 2 tbsp. (30 ml) Soy or dairy milk, 8 oz. (240 ml) Peach, 1 medium Nuts, 12
<b>Snack</b> Soy or dairy yogurt with fruit, 8 oz. (240 ml) Almonds, 2 tbsp. (30 ml)	<b>Snack</b> Pretzels, 2 oz. (60 g) Hummus, ½ c. (120 ml) Raw vegetables, 1 c. (240 ml)	<b>Snack</b> Recovery Drink Juice, 12 oz. (360 ml) Yogurt, 1 c. (240 ml) Banana, 1 medium
<b>Lunch</b> Bean soup, 1½ c. (360 ml) Rye crackers, 4 Vegetable salad, 1 c. (240 ml) Soy milk, 12 oz. (360 ml)	<b>Lunch</b> Thin-crust pizza, cheese, 3 slices Green salad, 2 c. (480 ml) Salad dressing, 2 tbsp. (30 ml) Soy milk, 8 oz. (240 ml)	<b>Lunch</b> Nut butter, 2 tbsp. (30 ml) Bread, 2 slices Bean soup, 1 c. (240 ml) Raw vegetables, 1 c. (240 ml)
<b>Dinner</b> Potato, 1 large Kidney beans, 1 c. (240 ml) Cheese, low-fat, 1 oz. (30 g) Green salad, 2 c. (480 ml) Salad dressing, 3 tbsp. (45 g)	<b>Dinner</b> Spaghetti, cooked, 3 c. (720 ml) Marinara sauce, 2 c. (480 ml) Parmesan cheese, 3 tbsp. (45 ml) Italian bread, 2 slices Olive oil, 1 tbsp. (15 ml)	<b>Dinner</b> Tofu, 8 oz. (240 g) Peas, 1 c. (240 ml) Noodles, cooked, 2 c. (480 ml) Rolls, 2 Vegetable oil, 2 tbsp. (30 ml) Green salad, 2 c. (480 ml) Salad dressing, 2 tbsp. (30 ml) Sports drink, 40 oz. (1,200 ml)
<b>Snack</b> Frozen yogurt, 1 c. (240 ml) Banana, 1 medium	<b>Snack</b> Sorbet, 1½ c. (360 ml) Fig bars, 2	<b>Snack</b> Yogurt, 8 oz (240 ml) Mango, 1 large Crackers, 12

# INDEX

- Absorption, 132, 144–145, 146, 255, 291, 292
- Acclimatization, 139, 141, 151, 152, 154, 252, 255, 366, 370
- Acute mountain sickness (AMS), 370, 371
- Adenosine triphosphate (ATP), 80–82, 84–85, 86, 181, 208, 222
- Adequate Intake (AI), 5, 6, 52
- Aerobic capacity, 78, 83, 86, 87, 101, 105, 108, 247, 265, 287, 305
  - anaerobic capacity versus, 79–80
- Aging, 324, 326
  - muscle mass and, 175, 325
- Alcohol, 64, 160, 197, 324, 330, 333
  - bone mass and, 351
  - calories from, 8, 9 (table)
  - fat and, 194
  - as nonnutritive nutrient, 8–12, 14
- Allergies, food, 68, 315, 331, 335–340
- Alternatives, whole-grain, 26, 26 (table)
- Amenorrhea, female athletes and, 348–349
- Amino acids, 35, 36, 182, 203, 211, 212–213, 223
- Anaerobic capacity, 78, 79–80, 83, 86, 101, 304
- Anaerobic threshold, 176, 234, 264, 307
- Anemia, 55, 291, 321, 329
  - iron and, 65, 191, 292
- Anorexia, 343, 344, 345, 346, 347
- Antibodies, 35, 336, 339
- Antioxidants, 8, 25, 27, 28, 33, 51, 56, 57, 69, 70, 71, 72, 318, 359, 360, 371
- Artificial sweeteners, 12, 299, 330
- Bacteria, 31, 34, 330, 332, 335
- Base cycle, described, 104
- Beta-carotene, 28, 30, 58, 69, 70, 361
- Bicarbonate, 224, 225–226
- Binge eating, 344, 345, 346, 347
- Bioelectrical Impedance Analysis (BIA), 189
- Bladder hydration systems, 253, 258, 269, 274, 278
- Blocks, 149, 154, 164, 174, 277, 300, 369
- Blood, 159, 367
  - clotting, 60, 72
  - flow, 220, 265, 299
- Blood glucose, 20, 80, 81, 82, 88, 147, 154, 156, 218, 236, 239, 242, 245, 252, 273, 287, 307, 308, 312, 313, 327, 377
  - decrease in, 134, 136, 142
  - exercise and, 130
  - glycemic index and, 21, 23, 25
  - low, 128, 255, 340, 355
  - maintaining, 34, 132, 135, 136, 138, 145, 265, 269, 272, 273, 275, 281, 287, 297, 329, 340, 341, 342, 369
- Blood pressure, 9, 31, 151, 152, 222, 323
- Blood sodium, 250, 297, 367
  - low, 70, 128, 150, 151, 295, 357
- Blood sugar, 20, 21, 255, 270
- Body composition, 76, 175, 200, 290–291
  - changes in, 92, 176, 186, 187, 188, 190–195, 198, 237–238, 323
  - ergogenic aids and, 208, 210–218
  - goals for, 92, 100, 101, 128, 176, 192, 195, 236, 291, 344
- Body fat, 80, 82, 103, 184, 192, 208, 275, 287, 306, 346, 358, 368
  - checking, 177, 187–190, 193, 283
  - decrease in, 106, 175, 291, 302, 324, 344, 371
  - gain in, 186, 191, 284, 312, 359
  - goals for, 191, 192, 268, 343
  - health/endurance sports and, 187 (table)
  - levels of, 238, 268, 308, 309
  - low, 187, 268, 271
  - performance and, 185, 186
  - weight and, 186, 188
- Body mass, 94, 192, 323, 349
  - lean, 106, 185, 188, 193, 194, 196, 216, 268, 319, 325
- Body temperature, 139, 365, 366, 368
- Body weight, 81, 99, 139, 190, 322, 345
  - carbohydrates and, 161, 171, 249
- Bone building, 60, 350–352
- Bone density, 320, 326, 348, 350, 351, 352
- Bone health, 60, 191, 267, 347–352, 363
  - vitamin D and, 63–64, 352
- Bone mass, 60–61, 357
  - increase in, 351–352
  - low, 317, 324, 348, 349, 351, 352
- Brain, 191, 369
  - boosting, 138, 260
  - carbohydrates and, 142, 150
  - glucose and, 142
- Branched chain amino acids (BCAAs), 182
- Breakfast, 163, 310, 372, 374, 388–390
  - carbohydrate-based, 280, 297, 322
  - eating, 197, 297, 314, 322–323
  - ideas for, 288–289, 391
- Build cycle, 105–107, 266–268
- Bulimia nervosa, 343, 345, 346
- Caffeine, 10, 64, 218, 219–221, 229, 279, 337
  - consuming, 7, 349
  - dehydration and, 6–8
  - limiting, 6, 11, 299, 330
  - performance and, 8, 220
  - rehydration and, 160
- Calcium, 13, 39, 68, 69, 71, 123, 150, 318, 321, 332, 356
  - absorption of, 63, 64, 67, 349
  - bone density and, 320, 326
  - consuming, 60–61, 63–64, 267, 308, 326, 329, 330, 347, 348, 349, 350, 351, 357, 358
  - loss, 64, 117, 351, 352
  - pregnancy and, 329–330
  - required, 61 (table), 332, 352
  - sources of, 61, 62 (table), 64, 308, 320, 329–330, 348
- Calories, 18, 31, 51, 36, 75, 122 (table), 167, 183, 213, 237, 252, 283, 306, 314
  - activity level and, 92–93
  - alcohol, 9 (table), 194
  - balance of, 274, 328
  - burning, 191, 248, 359
  - carbohydrates and, 98, 124
  - consuming, 82, 85, 91, 95, 102, 107, 108, 117, 121, 122, 196, 197, 250, 252, 265, 300, 301, 312, 318, 327, 328, 329, 349, 352, 359, 361, 363, 364, 371, 396
  - covert, 11–12, 14
  - decrease in, 108, 191, 195, 266, 325, 359
  - endurance sports and, 92 (table)
  - fat and, 100, 122–123
  - inadequate, 361, 363, 371
  - muscle building and, 178–179
  - required, 90–93, 108, 248, 265, 270–271, 305, 307, 310, 325, 360, 371
  - restricting, 98, 191, 193, 266, 276, 291, 309, 346
  - sources of, 38, 124, 321
  - training and, 91, 92 (table), 93, 94, 95, 114, 192
  - weight loss and, 103, 194–195



- Cancer, 9, 26, 31, 39, 52, 55, 58, 70, 72, 318
- Carbohydrate loading, 107, 164, 245, 246, 248, 249, 261, 270, 275, 277, 278, 293, 296–297, 298, 302, 311–312, 312, 375  
 plan for, 294, 362  
 pre-competition, 164–168
- Carbohydrates, 2, 4, 8, 56, 72, 74, 75, 81, 83, 121, 128, 141, 246, 257, 260, 268, 274, 300, 319, 320, 329, 353, 358, 369, 373, 374, 377  
 adjustments in, 106, 129, 342  
 balance of, 18, 240, 241  
 body weight and, 161, 171, 249  
 boost from, 277, 279, 280, 289  
 calories and, 97–98, 124, 183, 266, 283  
 carrying, 170, 277, 308  
 classification of, 18, 21  
 complex, 19–20, 21, 38, 147, 148, 377  
 concentrated, 18, 23, 145, 167, 313  
 consuming, 11, 17, 18, 20, 36, 51, 76, 82, 85, 97, 98, 99, 106, 108, 109, 113, 114–115, 116, 119, 122, 126, 130, 132, 133, 134, 135, 136, 146, 138, 142, 148, 149, 153–154, 156, 158, 161, 162, 164–165, 168–170, 177, 180, 181, 196, 240, 243, 244, 245, 250, 252, 254, 255, 261, 266, 269, 270, 271, 268, 272, 277, 279, 281, 282, 288, 289, 290, 294, 297, 298, 306, 311, 312, 325, 342–343, 354, 355–356, 357, 361, 362, 363, 364, 366, 371, 396  
 content of, 110–113 (table)  
 decrease in, 104, 194, 196, 253  
 easily digested, 163, 165, 271, 275, 279, 280, 282, 294  
 FODMAPs, 332, 334, 335  
 liquid, 133, 148–149, 156, 242, 269, 271  
 low-fiber, 114, 167, 249, 294  
 low-glycemic, 21, 136, 199  
 muscle building and, 178–179  
 optimal, 18, 146, 161  
 performance and, 20, 135, 145  
 planning, 109, 114–116  
 pre-event, 169–170, 269  
 protein and, 157, 180, 184, 265  
 quality, 20–21, 100  
 recovery and, 96–99, 156–157, 193, 200, 343  
 replacing, 149, 261, 300, 302, 361  
 required, 95, 99, 100, 101, 109, 116, 117, 128, 157, 248, 265, 300, 307, 309, 325, 371  
 simple, 18–19, 19–20, 21, 32, 146  
 solid, 148–149, 156, 242  
 sources of, 1, 90, 114, 146–147, 148–149, 154, 247, 257, 272  
 sports drinks and, 148, 242, 257, 278, 294  
 stored, 35, 36, 79, 88, 98, 132, 164, 171, 270, 320  
 training and, 90, 96–98, 102, 106, 108, 114–115, 126, 132–133, 193, 239, 314, 333, 342, 356  
 wholesome, 21, 109, 163, 320, 372
- Cardiovascular system, 55, 130, 139, 222, 326
- Carotenoids, 28, 30, 58–59, 59 (table), 70, 72
- Celiac disease, 315, 317, 331, 336, 338–339
- Chloride, 60, 68, 71, 150
- Cholesterol, 9, 34, 41, 44, 72, 74, 117, 123, 216–217, 323
- Chromium, 59, 214–215
- Collagen, 64, 359, 360
- Constipation, 67, 331, 334, 335, 339, 345
- Continuous Glucose Monitoring (CGM), 342
- Copper, 59, 67, 292
- Core temperature, 141, 368, 369
- Cramping, 70, 287, 313, 315
- Creatine, 201, 207, 208, 210, 223
- Creatine-phosphate (CP), 79, 83, 84, 178, 181
- Cross-training, 233, 264, 275, 304, 305, 351, 352, 368
- Dairy, 33, 37, 39, 116, 180, 332
- Dehydration, 3, 15, 136, 137, 145, 152, 158, 167, 189, 221, 247, 253, 268, 293, 345, 356, 368  
 caffeine and, 6–8  
 dealing with, 129, 138–139, 140, 295, 299, 300, 321, 366  
 GI problems and, 139, 154  
 minimizing, 32, 131, 138, 139, 140–141, 243, 298, 299  
 risk of, 9, 138–139, 140, 270, 297  
 signs of, 139–140, 154, 321, 326  
 stomach emptying and, 255  
 sweat loss and, 278  
 weight loss and, 11
- Designer waters, 4, 11–12, 14, 12 (table)
- Diabetes, 31, 32, 39, 222, 315, 317, 318, 323, 325, 340–343
- Diarrhea, 287, 299, 331, 339, 345
- Diet, 2, 81, 329, 331–332, 344, 361  
 balanced, 33, 53, 63, 75, 178, 265, 308, 317, 318, 319, 361  
 carbohydrates and, 18, 19–20, 25, 354, 363  
 elimination, 336–337  
 gluten-free, 339–340  
 health and, 17, 20, 33, 53, 124, 324, 372  
 high-carbohydrate, 165, 166, 311, 312, 363, 371  
 high-fat, 100, 354  
 inadequacies in, 50, 51, 191–192  
 modification of, 47, 197, 284, 318, 353  
 muscle-building, 183 (table)  
 optimal, 109, 335, 387–394  
 performance, 50, 129, 203  
 periodizing, 101–102, 354–356  
 planning, 2, 34, 99, 113–117, 164, 387–394  
 rigid, 191, 268, 290, 309  
 training, 17, 75, 77, 129, 202, 235, 248, 276, 304, 317, 331, 340  
 vegetarian, 39, 51, 65, 124, 317, 318, 319
- Digestion, 20, 132, 144–145, 238, 231, 261, 277, 278, 336  
 exercise and, 239  
 fiber and, 34  
 time for, 131, 133  
 water and, 5
- Disordered eating, 324, 343–344, 346–347
- Docosahexaenoic acid (DHA), 42, 45, 46, 330
- Drinking, 147, 155, 159, 252, 254, 267, 296, 307  
 body weight and, 322  
 GI upset and, 153  
 intensity and, 272, 273  
 opportunities for, 141  
 performance and, 254  
 regular, 278, 322  
 timing, 151, 152, 153, 272, 298  
 training and, 136, 158, 160–161, 257
- Eating, 268, 376  
 boredom/stress and, 122  
 disordered, 324, 343–344, 346–347  
 healthy, 47, 305  
 patterns, 122, 196, 198, 358  
 planning, 198, 375  
 pre-exercise, 132–133, 135, 197, 244, 288  
 quality, 2, 291  
 restrictive, 191, 195  
 schedules and, 133–134, 239  
 social, 196, 199, 310, 311  
 timing of, 238, 299  
 training and, 109, 133–134, 239, 257–258, 349  
 travel and, 374–376
- Eating Disorder Not Otherwise Specified (EDNOS), 343, 346, 347
- Eating disorders, 324, 343–347, 348, 349

- Electrolytes, 59, 68, 71, 76, 141, 236, 240, 243, 257, 287, 322, 345, 357, 366  
 consuming, 138, 261, 342  
 loss of, 11, 130, 138, 150–151, 246, 261, 346–347  
 replacing, 152–155, 223, 267, 295, 300, 302  
 tablets, 155, 252, 254, 258, 300
- Elimination diet, 336–337
- Endurance, 228, 245, 256, 260, 263, 264, 354, 362, 365  
 aerobic, 286  
 training, 1–2, 77, 90, 104, 127, 141, 149, 178, 184, 185, 255, 257, 371
- Energy, 50, 145, 147, 176, 194, 218, 252, 269, 299, 307, 320, 359, 361  
 aerobic/anaerobic, 84, 85  
 boosts, 289, 301  
 consuming, 47, 77, 178, 196, 319, 321, 323, 348, 349  
 drop in, 185, 196, 240  
 low, 126, 176, 196, 240  
 needs, 90, 91, 92–96, 98, 149, 236–237, 314, 371  
 production of, 84–86, 90, 126, 203, 304, 319  
 required, 90–96, 126, 200, 309, 325, 328  
 systems, 78, 79–80, 83, 83 (table), 84  
 training and, 28, 38, 79, 96, 101, 106, 196, 265, 276, 307
- Energy bars, 135, 149, 154, 184, 201, 202, 223, 238, 252, 257, 260, 271, 272, 275, 279, 281, 299, 300, 306, 312, 329  
 calcium in, 351  
 carrying, 269, 277, 313  
 consuming, 114, 162, 164–165, 168
- Environmental conditions, 254, 159, 236, 255, 266, 270, 287, 290, 298, 302, 313, 315, 321, 365
- Enzymes, 31, 35, 36, 64, 158, 201, 203–204, 333, 359
- Ergogenic aids, 76, 202, 209 (table), 229  
 body composition and, 208, 210–218  
 checklist for, 225–226  
 common, 207–208, 207–222, 224–228  
 performance and, 218–222, 224–228  
 safety with, 204–207
- Essential fatty acids, 38, 40, 99, 100, 117, 121, 320, 334  
 omega-3, 42, 45, 121, 194  
 omega-6, 42, 194  
 sources of, 43–44 (table), 76
- Estimated Average Requirement (EAR), 52
- Estrogen, 61, 216, 349
- Fat, 2, 4, 8, 56, 86, 88, 116, 117, 118  
 (table), 121, 126, 129, 135, 171, 179, 191, 219, 248, 266, 274  
 alcohol and, 194  
 balancing, 18, 241  
 burning, 37, 89, 130, 162, 193, 201, 203, 218, 261, 266, 283, 353, 354, 355, 359  
 calories from, 100, 122–123, 283  
 consuming, 17, 36, 38, 41, 47, 51, 98, 100, 102, 106, 108, 123, 180, 197, 237, 240, 250, 277, 294, 308, 310, 325, 334, 354, 372, 373  
 dietary, 41, 41 (table), 193, 334, 359  
 facts/figures about, 38, 40–41  
 healthy, 25, 40, 76, 109, 117, 126, 163, 308, 320, 334  
 hidden, 115, 121, 197  
 hydrogenated, 308  
 loading, 353–354  
 losing, 36, 40, 122, 185–199, 211, 219, 374  
 monounsaturated, 41, 42, 117, 194  
 polyunsaturated, 42  
 required, 95, 99–100, 101, 102, 128, 169  
 saturated, 37, 38, 39, 40–41, 123, 308, 317  
 sources of, 1, 41 (table), 90, 120 (table)  
 storing, 35, 37, 100, 130, 353  
 training and, 90, 102, 106, 108  
 trans, 40–41, 44  
 unsaturated, 41,
- Fatigue, 15, 65, 126, 140, 148, 149, 196, 220, 268, 270, 282, 292, 311, 314, 321, 329, 339  
 anaerobic system and, 79  
 described, 127–128  
 mental, 128, 301  
 nutrition and, 128
- Fiber, 2, 21, 23, 25, 30, 84, 123, 161, 299, 327, 334  
 fitting in, 31, 34, 197, 299, 318
- Fluid loss, 3, 4, 5, 128, 139, 140, 160, 252, 268, 281, 307, 321, 363, 368, 375  
 monitoring, 306  
 recovery and, 159  
 replacing, 6, 265, 366, 367, 370
- Fluids, 3, 47, 130, 155, 253, 254, 257, 268, 300, 320  
 accessibility of, 153  
 adequate, 161, 289  
 balance, 155, 246, 287, 297  
 caffeine and, 7, 7 (table)  
 carbohydrates and, 144, 253, 254  
 carrying, 170, 267, 282, 308  
 consuming, 1, 4–7, 10, 11, 12, 119, 121, 136, 137, 138, 140, 141, 143, 152, 153, 154, 155, 158–159, 244, 249, 253, 254, 256, 269, 270, 274, 277, 279, 289, 290, 293, 296, 298, 300, 301, 307  
 obtaining, 140, 152, 268  
 recovery, 121, 158–159, 296  
 replacing, 152–155, 267, 300, 302, 307, 367  
 required, 100, 159, 267, 290, 306–307, 326, 329, 371
- Folate, 55, 327, 328, 338, 371
- Folic acid, 51, 54–55, 327, 328
- Food and Drug Administration (FDA), 14, 203, 204, 217, 336
- Food intolerances, 317, 336, 337
- Food journals, 119–122, 126, 196, 198, 200, 337
- Foods, 113–117, 119  
 animal, 40, 44, 318  
 carbohydrate contents of, 110–113 (table), 115, 119, 293, 310  
 choosing, 106, 109, 196, 242, 311  
 consuming, 17, 198, 314, 322, 342  
 convenience, 47, 308, 392  
 easily digested, 244, 250  
 ethnic, 392–394  
 fatty, 40, 123, 167, 197, 308  
 fiber-rich, 34, 170  
 folate-rich, 55, 55 (table)  
 healthy, 31, 318, 372, 374  
 high-carbohydrate, 162, 168 (table), 294, 296  
 iron-rich, 74, 329  
 low-fiber, 132, 168 (table), 171  
 nutrient-dense, 20, 50, 51, 156, 265, 325, 326  
 plant, 37, 38, 39, 54, 74, 319  
 pre-race, 246, 293, 375, 387  
 preparing, 169, 258, 310, 376, 388  
 processed, 2, 258, 335  
 protein content of, 37 (table)  
 recovery, 121, 162, 241, 296  
 sensitivities to, 331, 335–340  
 training and, 239–240, 300
- Fructose, 19, 23, 32, 33, 146, 148, 299, 332, 333, 377
- Fruits, 26, 33, 56, 58, 71, 72, 115–116, 117, 168, 184, 197, 238, 253, 290, 299, 308, 311, 312, 314  
 choosing, 29 (table)  
 consuming, 28–30, 39, 318, 351, 374  
 fiber from, 31  
 nutrition from, 29, 360
- Fuel, 86, 149, 178, 181, 198, 236, 272, 284, 319, 323  
 adequate, 89, 275  
 calories from, 81 (table)  
 consuming, 129, 152  
 depletion of, 78, 128, 129, 242, 311  
 exercise and, 86 (fig.), 130, 141–142

- heart rate and, 87–88
- high-quality, 17
- intensity and, 77, 83 (fig.), 89
- performance and, 132
- recovery and, 28, 102
- replacing, 129, 131, 141, 152–155
- training and, 89, 98, 102, 128, 134, 257, 261, 287–288
- using, 82–84, 178
- Fueling, 149, 169, 236, 241, 244, 247, 271, 272, 281, 287, 293, 298, 302, 309, 340, 342
  - on bike, 268–269
  - cold and, 368–369
  - leanness and, 283
  - long run, 288–289
  - plans for, 153, 174, 258–259, 293, 341, 343
- Gastric emptying, 145, 146, 154, 161, 271
- Gastrointestinal (GI) distress, 31, 34, 65, 128, 140, 167, 170, 220, 229, 272, 296, 317, 331, 335
  - amino acids and, 212
  - iron and, 67
- Gastrointestinal (GI) system, 19, 132, 135, 140, 146, 153, 247, 248, 249, 253, 254, 255, 299
  - adaptation by, 238, 287
  - blood glucose and, 239
  - dehydration and, 139, 154
  - endurance sports and, 268
  - fiber and, 31
  - gels and, 154
- Gels, 20, 154, 168, 201, 202, 238, 242, 243, 247, 252, 253, 257, 258, 272, 279, 281, 298, 299, 312, 329, 342, 369, 396
  - caffeine-containing, 229, 260
  - carbohydrate, 15, 135, 149, 174, 278, 280, 300
  - carrying, 269, 277, 313
  - choosing, 278, 294
  - consuming, 163, 164, 254, 255, 261, 273, 288, 298
- GI problems and, 154
  - gluten-free, 340
  - sodium-containing, 294, 367
  - water and, 246
- Glucose, 4, 23, 32, 55, 81, 89, 146, 221, 222, 340–341, 371, 377
  - adequate, 255
  - boost from, 301
  - brain and, 142
  - carbohydrates and, 320
  - fiber and, 31
  - fructose and, 148
  - maintaining, 214, 364, 366
  - metabolism of, 71, 214
  - muscle fibers and, 141
  - polymers, 19, 148
  - sucrose and, 148
- Gluten, 338–340
- Glycemic index (GI), 22 (table), 24, 135–136, 147, 377–380
  - blood glucose and, 21, 23, 25
  - low, 25, 161, 199, 341
- Glycemic load (GL), 22 (table), 24
- Glycogen, 5, 36, 53, 82, 153, 156, 167, 218, 248, 254, 269, 294, 311, 320
  - depletion of, 80, 96–97, 129, 131, 194, 220, 242, 272, 297, 346–347, 355
  - loading, 107, 166, 362, 364
  - muscle, 54, 89
  - protein and, 55
  - replenishing, 81, 98–99, 106, 157, 265, 272, 275, 294
  - stores, 81, 82, 89, 166, 179, 239, 249, 281, 294, 354, 355, 361
- Glycolysis, 79, 83, 85, 86, 181, 224
- Good Manufacturing Processes (GMPs), 204–205, 207
- Grains, 2, 72, 114–115, 117, 319, 340
  - whole, 25–26, 27, 33, 39, 47
- Headaches, 222, 321, 339, 370
- Health, 18, 47, 130, 317, 372
  - dehydration and, 140
  - diet and, 17, 20, 323
  - management of, 185, 197, 325
  - optimal, 25, 35, 52, 286
  - problems, 117, 323, 324
- Heart disease, 26, 39, 40, 52, 55, 70, 71, 226, 318
  - fiber and, 31
  - risk of, 8, 9, 38, 41, 117
- Heart rate, 94, 220, 221, 247, 369, 370
  - exercise and, 89
  - fuel and, 87–88
  - increased, 139
- Heart rate monitors, 87, 88, 94
- Heat, 193, 368, 369
  - dealing with, 141, 151, 252, 255, 326, 366
  - dehydration and, 138
  - nutrition and, 367
  - sweating and, 138
- Heat illness, 140, 356, 365–366
- Hemoglobin, 35, 65, 67, 74, 291, 292, 360
- High-density lipoprotein (HDL), 8–9, 40
- High-fructose corn syrup (HFCS), 19, 32–33, 333
- Hormones, 4, 35, 36, 56, 60, 61, 158, 203, 216, 305, 348, 349
  - calories and, 351
  - growth, 212, 214
  - imbalance in, 191, 238
  - replacing, 349
  - sex, 352
  - stress, 361
  - synthesis of, 359
  - thyroid, 217
- Hunger, 80, 131, 197, 241, 248, 270, 287, 293, 372
  - preventing, 143, 196, 198, 297
  - training and, 132, 136, 241
- Hydration, 3, 121, 137, 145, 153, 163, 169, 170, 181, 189, 236, 244, 246, 247, 273, 275, 277, 281, 287, 290, 296, 297, 298, 301, 322, 370
  - adequate, 89, 100, 167, 289, 312
  - caffeine and, 6, 8
  - cold and, 368–369
  - environmental conditions and, 139, 313
  - focusing on, 242, 282, 314
  - guidelines for, 100, 258, 267, 272, 289
  - improving, 10, 11, 148, 174, 321, 329
  - indicators of, 249, 282
  - maintaining, 6, 10–11, 152, 159, 170, 181, 254–255, 258, 259, 277, 281, 308, 357, 374
  - optimal, 4, 236, 273, 280, 369
  - plans for, 174, 258–259, 280, 293
  - pre-race, 171, 293
  - sports drinks and, 171, 282, 300
  - strategies for, 11, 15, 140, 322 (table)
  - systems, 154, 244, 246, 258, 277, 369
  - training and, 11, 136–138, 138–142, 257
- Hyperglycemia, 340
- Hyperhydration, 221, 297
- Hypertension, 39, 318, 325
- Hypoglycemia, 134, 143, 266, 282, 287, 329, 340, 341
  - developing, 131, 135, 154, 255, 270
  - preventing, 269, 270, 342
- Hyponatremia, 70, 150, 250, 295, 296, 297, 298
  - developing, 151–152, 367, 300
- Hypothermia, 255, 369
- Immune system, 1, 17, 35, 42, 49, 63, 72, 76, 213, 271, 315, 336, 356
  - boosting, 155, 360–361
  - carbohydrates and, 18
  - suppressing, 361
- Insulin, 23, 132, 134, 333, 335, 340, 341, 342, 343
- Intensity, 78, 104–105, 181, 255, 256, 257, 258, 264, 300, 366
  - dehydration and, 139
  - high, 105, 276, 280, 282, 305, 327
  - nutrition and, 77, 89, 266, 272, 273, 288

- training, 84, 92, 96, 107, 113, 130, 149, 153–154, 155, 159, 161, 166, 229, 242, 243, 252, 267, 274, 281, 282, 304, 308, 309, 341, 358
- Intervals, 96, 129, 141, 142, 227, 263, 264, 306, 307, 355
- Iron, 37, 59, 60, 68, 123, 291–292, 318, 326, 329, 330, 338, 361, 371
- absorption of, 56, 65, 66, 291
  - anemia and, 65, 191, 292
  - consuming, 64–67, 74, 267, 271, 292, 321, 329
  - menstruation and, 65, 308
  - recovery and, 360
  - required, 74, 308
  - sources of, 66 (table), 67, 74, 267, 291, 321
  - vitamin C and, 66, 291
- Iron deficiency, 65, 74, 291, 292, 321
- Ironman, 146, 152, 165, 233, 234, 236, 249, 255
- calories for, 248, 252
  - nutrition for, 247, 250, 252
- Irritable bowel syndrome (IBS), 315, 317, 331–335
- Juices, 14, 32, 33, 115–116, 117, 145, 168, 183, 184, 197, 242
- Labels, checking, 33, 40, 121, 122–123, 161, 184, 333, 351, 390–391
- Lactate threshold, 87, 88, 89, 105
- Lactic acid, 5, 79, 83, 85, 87, 89, 106, 224, 305, 330, 366
- Lactose, 19, 32, 63, 182, 299, 332–333, 338, 377
- Lactose intolerance, 61, 117, 332, 336, 339
- Laxatives, 344, 345, 346, 347
- Lipids, 31, 40, 58, 325, 327
- Liver glycogen, 80–81, 134, 170, 174
- depleting, 60, 138, 239, 297
  - replenishing, 130, 131, 132, 136, 170, 282, 287, 323
  - stores, 247, 259, 269, 288, 292, 309
- Low-density lipoprotein (LDL), 40, 41, 72
- Magnesium, 60, 64, 68, 69, 71, 356, 358
- Marathons, 285, 287, 295
- nutrition for, 294, 296–298, 302
- Meals, 2, 126, 199, 238, 258, 287
- balanced, 197, 240
  - healthy, 168, 373, 375
  - high-carbohydrate, 169 (table), 239, 266, 302, 309
  - liquid, 133, 288, 300
  - planning, 35, 47, 109, 113, 136, 164, 165, 171, 183, 194, 200, 241, 241 (table), 283, 293–294, 308, 373, 387, 387–388, 389, 390, 395, 396, 396–402
- pre-exercise, 131, 133, 135, 137
- (table), 165, 169 (table), 170, 172 (table), 173, 184, 288, 312, 340
- pre-race, 167, 170, 244, 245, 246, 250, 270, 273, 275, 277, 281, 292–294, 297, 299, 313
- recovery, 241, 322
  - sample, 396–402
  - timing, 171, 172 (table), 238–240, 293, 299, 314, 375
  - travel and, 375 (table)
  - vegetarian, 395
- Meat, 67, 158, 197, 310, 319
- Medium chain triglycerides (MCTs), 221
- Menopause, 61, 326, 348
- Menstruation, 65, 308, 321, 331, 345, 346, 347, 348, 349, 363
- Metabolism, 49, 53, 60, 68, 131, 191, 217, 221, 321, 347, 363, 370, 371
- aerobic/anaerobic, 84, 86, 90, 305
  - carbohydrate, 55
  - energy, 59, 360
  - estrogen, 72
  - fat, 56, 354
  - folic acid, 54
  - glucose, 71, 214
  - protein, 117
  - resting, 92
- Minerals, 13, 21, 25, 28, 29, 30, 32, 33, 39, 49–50, 72, 117, 164, 185, 203, 223, 318, 319, 320, 330, 358
- consuming, 1, 52, 59–61, 63–68, 69–70, 327, 329, 361
  - deficiency in, 338, 356
  - list of, 381–383
  - low-dose, 326
  - required, 371
- Morning noshes, ideas for, 288–289
- Multivitamins, 11, 63, 67, 68, 215, 291, 326, 328, 330, 352, 361, 371
- choosing, 69–70, 327
- Muscle cramps, 155, 246, 356–358
- Muscle damage, 155, 157, 165, 211, 280
- Muscle dysmorphia, 344, 346
- Muscle glycogen, 75, 81–82, 85, 88, 89, 97, 102, 136, 156, 157, 165, 166, 170, 179, 181, 214, 219, 221, 239, 252, 265, 275, 288, 292, 294, 302, 311, 312, 362, 366
- breakdown/synthesis of, 60, 98, 99, 178, 289, 306
  - depletion of, 106, 128, 129–130, 138, 142, 147, 184, 276, 280, 306, 371
  - replenishing, 98, 131, 155, 166, 180, 282, 323
  - storing, 131, 156, 268, 270
  - training and, 97 (fig.)
- women and, 362
- Muscles, 176, 190, 192, 193, 201, 214, 216, 268, 325
- building, 78, 175, 177–181, 183, 183 (table), 185, 196, 203, 212, 219, 229, 265, 304, 305, 308, 320, 344
  - ergogenic aids and, 208
  - loss of, 191, 238, 270
  - repairing/maintaining, 35, 36, 37, 359
  - superloading, 107
  - supplements and, 223
- Nausea, 139, 140, 222, 336, 339, 370
- Nutrients, 3, 4, 12, 18, 25, 30, 31, 34, 50, 64, 67, 68, 69, 115, 119, 123, 207, 318, 330
- balance of, 122, 349
  - bone-building, 352
  - consuming, 17, 47, 161, 323, 332, 396
  - deficiencies in, 52, 206, 346, 356
  - essential, 28, 39, 63, 116, 320
  - required, 90, 96 (table), 236–237, 329
  - specific, 325–327
  - vegetarians and, 318, 319
- Nutrition, 20, 33, 35, 47, 52, 69, 115, 116, 129, 156, 174, 205, 206, 236, 252, 318, 319, 324
- adequate, 1, 75, 106, 286, 373
  - attention for, 278, 282, 314
  - breakdown of, 122–123
  - competition, 150, 258–259, 271–272, 275, 277–278, 286, 292–294, 296–298, 300–301, 304, 309, 311–313
  - considerations about, 231, 235, 244, 246, 271, 286, 315
  - fatigue and, 128
  - guidelines for, 78, 197, 240, 244, 276, 315, 325
  - information on, 92, 122, 200, 203
  - intensity and, 266, 272
  - issues/by specific groups, 307–309
  - long-distance, 251 (table)
  - muscle building and, 178–181
  - optimal, 18, 247, 361
  - performance and, 2, 304, 364
  - post-exercise, 76, 160, 256
  - pre-race, 249, 259
  - problem solving with, 356–364
  - recovery, 12, 76, 155, 165, 197, 240, 256, 257, 260, 265, 266, 267, 272, 274, 276, 282, 287, 289–290, 305–307, 309, 323, 358–360, 361, 362, 364
  - required, 78, 90, 101, 109, 264, 309, 311, 325, 396
  - timing, 162–163, 179–181

- training, 130–138, 235–242,  
240, 252–254, 256, 264–269,  
270–271, 274–275, 276–277,  
286–292, 304–309, 363–364
- triathlon, 245 (table)
- women and, 361–364, 362
- Nutrition plans, 44, 170, 196, 231, 243,  
244, 260, 283, 284, 293, 325, 357,  
358, 379, 396
- competition, 173, 231
- diabetes and, 341
- high-energy, 165
- personalized, 324
- travel and, 375
- vegetarians and, 39
- Nutrition products, 20, 164–165, 201,  
202, 207
- compared, 384–386
- Nutritional periodization, 101 (table)
- Oils
- cod liver, 46
  - fish, 45–46
  - liquid, 40, 41
  - monounsaturated, 41, 42, 121
  - partially hydrogenated, 40, 44
  - polyunsaturated, 41, 57, 121
  - soy/canola, 44
- Osteopenia, 345, 348, 350
- Osteoporosis, 9, 52, 61, 71, 267, 325,  
326, 338, 345, 348
- men and, 349–350
- Overhydration, 154, 246, 250, 279, 293,  
295, 296, 307
- problems with, 278, 297
- Oxygen, 4, 12, 79, 85, 86, 94, 370
- transport, 59, 60
- Pantothenic acid, 51, 55–56
- Performance, 3, 23, 28, 187, 193, 200,  
216, 275, 305, 308, 324, 343
- absorption and, 146
  - aerobic, 265
  - athletic, 201, 202, 205
  - body fat and, 185, 186
  - caffeine and, 8, 219
  - carbohydrates and, 20, 135, 146
  - ergogenic aids and, 218–222,  
224–228
  - impairing, 8, 54, 134, 221, 309,  
321, 368
  - improving, 54, 134, 135, 146, 148,  
175, 176, 185, 202, 206, 218, 219,  
220, 229, 270, 276, 286, 290, 324,  
344, 353–356
  - nutrition and, 2, 50, 129, 270, 304,  
364
  - optimal, 6, 25, 35, 176, 320
  - sports drinks and, 145, 147
  - training and, 134, 192, 291
  - vitamins and, 50, 56, 59, 64
  - women and, 362, 363
- Physiological issues, 50, 60, 127, 171,  
234, 324, 325
- Phytochemicals, 25, 29, 50, 72, 360
- Phytonutrients, 28, 30, 33, 72, 185, 318
- Portions, 18, 102, 198, 238, 277, 281,  
294, 314, 319, 388
- calories and, 122 (table)
  - checking, 199
  - size of, 122, 311
- Potassium, 28, 60, 68, 71, 150, 357
- Power, 77, 78–79, 263, 368
- developing, 34, 99, 127, 276
  - loss of, 191, 238, 268
- Prebiotics/probiotics, 335, 361
- Pregnant athletes, 327–330
- Prohormones, 215–217
- Protein, 2, 8, 56, 76, 86, 118 (table), 126,  
128, 129, 135, 155, 158, 163, 248,  
260, 266, 274, 306, 312, 318, 320,  
338, 358, 373
- animal, 39, 124, 319
  - balance in, 18, 179, 213, 241
  - breakdown of, 162, 191
  - building, 180, 182, 197, 214
  - calories from, 116, 183, 283
  - carbohydrates and, 157, 180, 184, 265
  - consuming, 17, 35, 36, 38, 39, 47,  
51, 64, 85, 99, 102, 106, 108, 117,  
121, 157, 177, 178, 179, 180, 181,  
196, 240, 250, 265, 279, 290, 325,  
326, 349, 363
  - easily digested, 165, 250
  - function of, 35–36
  - high-quality, 47, 158, 182, 184, 212,  
265, 307, 308, 319
  - lean, 47, 117, 121, 126, 163, 197, 242,  
271, 277, 320, 376
  - muscle building, 179, 320
  - plant, 37, 39, 54, 116, 319
  - portions of, 161, 162, 277, 294
  - power from, 34–38
  - recovery and, 82, 99, 157–158, 200,  
359
  - required, 36, 38, 95, 99, 100, 101,  
108, 124, 128, 158, 169, 265,  
307, 360
  - resistance training and, 180, 184
  - sources of, 1, 37–38, 37 (table), 90,  
179, 184
  - storage of, 35, 82, 371
  - synthesis of, 36, 179, 180, 182, 214
  - training and, 35, 37, 90, 102, 117,  
149–150, 150, 161
  - vegetarians and, 124–125
  - weight training and, 181, 185
- Recovery, 15, 71, 90, 92, 93, 100, 106,  
121, 155, 166, 176, 178, 181, 184,  
236, 239, 241, 242, 264, 270, 278,  
284, 302, 308, 312, 336, 340,  
360, 361, 372
- agents, 212
- amino acids and, 213
  - carbohydrates and, 96–99, 156–157,  
193, 200, 343
  - energy for, 28, 102
  - foods/fluids for, 121, 158–159, 296
  - immediate, 98, 156–159
  - improving, 76, 161, 222, 311, 314,  
319, 358–360
  - nutrition for, 1, 12, 47, 76, 77, 78,  
90, 155, 155–161, 161 (table),  
165, 197, 240, 256, 257, 260, 265,  
266, 267, 272, 274, 276, 282, 287,  
289–290, 305–307, 309, 323,  
361, 362, 364
  - optimal, 6, 109, 157
  - poor, 65, 266, 276, 283, 304, 310
  - post-exercise, 160–161, 162
  - protein and, 82, 99, 157–158, 200
  - sodium and, 159–160, 162
  - sports drinks and, 261
  - timing, 238, 240
  - training and, 240, 315
- Recovery drinks, 20, 30, 161, 164, 202,  
249, 290, 351
- Refueling, 149, 157, 239, 242, 243, 248,  
268, 269, 277, 279
- opportunities for, 258, 278
  - planning, 293–294
- Rehydration, 7, 15, 76, 141, 155, 159, 163,  
186, 222, 240, 242, 243, 247, 260,  
274, 277, 278
- techniques for, 160, 290, 367
- Resistance training, 99, 106, 130, 178,  
181, 192, 227, 257, 325
- carbohydrates and, 180
  - glutamine and, 214
  - protein and, 180, 184
- Rest, 85, 93, 108, 167, 271, 273
- Restaurants, dietary rules for, 391–394
- Resting metabolic rate (RMR), 91, 93,  
94, 95, 191
- lowering, 185, 192, 193, 194, 196
- Running, 244, 285–286, 293
- fluid/sodium balance for, 295–296
  - gastrointestinal distress and, 299
  - iron and, 291
  - nutrition and, 254–255
- Salt, consuming, 152, 252, 254, 255, 297,  
300, 357, 367, 374
- Snacks, 2, 115, 121, 126, 197, 238, 311,  
391 (table)
- carbohydrate, 157, 277
  - consuming, 171, 287, 297, 308, 314,  
322–323
  - healthy, 323, 372, 373



- high-carbohydrate, 169, 239, 266, 309
- nutrition, 47, 164
- planning, 241, 312, 388–390
- protein, 180
- recovery, 165, 179, 240, 242
- timing, 173, 238–240, 273, 314
- training and, 135, 160, 277, 288, 332, 340
- travel and, 375 (table)
- Sodium, 6, 60, 68, 76, 163, 249, 256, 257, 260, 278, 368
  - blood pressure and, 151, 152
  - consuming, 70–71, 150–151, 152, 155, 161, 246, 259, 267, 279, 300, 349
  - depletion of, 15, 71, 246, 367
  - fluids and, 295–296
  - gels and, 294, 367
  - loss, 138, 150, 159, 160, 240, 252, 255, 357, 358, 366
  - overhydration and, 250
  - recovery and, 159–160, 162
  - sports drinks and, 137, 151–152, 155, 252, 254, 278–279, 357
  - sweating and, 70, 151, 152, 295, 367
- Sodium bicarbonate, 224–226
- Speed, 78, 127, 201, 306
  - training, 129, 141, 142
- Sports drinks, 4, 11, 20, 47, 71, 119, 133, 135, 149, 157, 174, 202, 241, 243, 275, 277, 281, 287, 293, 311, 312, 313, 329, 396
  - carbohydrates and, 148, 242, 253, 257, 278, 294
  - consuming, 141, 142, 147–148, 153–154, 160, 162, 164, 181, 183, 244, 245, 246, 254, 265, 268, 269, 271, 274, 278, 296, 308, 314, 322, 323, 342
  - experimenting with, 257, 293
  - hydration and, 171, 282, 300
  - performance and, 145, 147
  - sodium in, 137, 151–152, 155, 246, 252, 254, 278, 278–279, 296, 357, 367
  - training and, 147, 154, 155
- Steroids, 215, 216, 219, 346
- Stomach emptying, 140, 253, 254, 255, 268, 272, 277, 279, 299, 300
- Strength, 99, 127, 191, 201, 255, 263, 325
  - building, 34, 175, 184, 195, 229
- Strength-to-weight ratio, 283, 325
- Strength training, 99, 102, 116, 176, 179, 181, 183, 201, 257, 263, 264
- Sucrose, 19, 32, 146, 377
- Sugar, 18, 23, 148
  - complex/simple, 377
  - risks of, 32–33
- Supplements, 50, 51, 58, 59, 63, 68, 76, 109, 121, 133, 136, 164, 168, 204, 208, 215, 249, 348, 350–351
  - banning of, 203, 204, 207
  - choosing, 69–70, 206
  - consuming, 52, 55, 67, 182, 225, 229, 292, 331
  - cross-contamination and, 202, 207
  - evaluating, 225–226, 300
  - high-carbohydrate, 149, 202, 300, 306, 312
  - legal/effective/safe, 202–203, 205, 207, 267
  - nutritional, 206, 207, 223
  - protein, 181, 182, 184, 307
  - sports nutrition, 10, 164, 168, 169, 173, 201, 249, 258, 259, 266, 271
  - testing, 202, 205, 208
  - weight-loss, 201, 217–218
- Sweat loss, 139, 149, 158, 174, 240, 243, 253, 261, 265, 267, 268, 290, 297, 307
  - environmental conditions and, 154
  - estimating, 141, 143–144, 144 (fig.), 295, 306, 403
  - fluids and, 136, 141
  - minimizing, 153, 298
  - replacing, 145, 153, 366
  - sodium consumption and, 152
  - training and, 136, 143
  - weight monitoring and, 153
- Sweat rate, 138, 141, 152, 242, 243, 252, 260, 267, 282, 302, 306, 307, 313, 363, 367
  - acclimatization and, 154
  - determining, 144, 174, 296, 357
  - minimizing, 298
  - training and, 5
  - weight and, 295
- Sweating, 3, 71, 138, 159, 167, 293, 321, 329, 363
  - body weight and, 139
  - calcium and, 60, 352
  - fluid loss and, 4, 5, 6
  - iron and, 65, 74
  - sodium and, 70, 151, 295, 367
- Swimming, 242–243, 303, 305, 306
  - nutrition and, 307–308, 312–313
- Synthesis, protein, 36, 177, 179, 180, 182, 360
- Tapering, 105, 152, 164, 165, 231, 237, 246, 247, 261, 311, 312, 362
  - carbohydrates and, 166–167
  - drinking and, 151
  - eating for, 248–249
  - pre-race, 294, 296, 297
- Tolerances, 132, 133, 145, 254, 258, 271, 289, 298, 302
  - determining, 288, 396
- fluid, 293
- gastrointestinal, 131, 363
- gut, 149, 247
- Train low, compete high, using, 354–356
- Training, 100, 109, 119, 121, 158, 162, 170, 194, 205, 268–269, 311, 319, 349, 364, 372
  - aerobic/anaerobic, 81, 263, 265, 303, 304
  - base, 86, 90, 193, 229
  - blood glucose and, 130
  - calories and, 91, 92 (table), 93, 94, 95, 192
  - carbohydrates and, 90, 96, 97–98, 102, 106, 108, 114–115, 126, 132–133, 193, 239, 266, 314, 333, 342, 356
  - cycles, 75, 90, 101, 102, 104–105, 106, 108, 109, 126, 165, 238, 240, 318, 396
  - diet for, 17, 75, 77, 129, 202, 235, 248, 304
  - duration of, 84, 96, 109, 146
  - early, 133, 134, 239, 323, 355
  - eating and, 109, 131–133, 133–134, 257–258, 265
  - endurance, 90, 95, 99, 104, 157, 178, 193, 304
  - energy for, 28, 38, 79, 96, 101, 107, 118, 196, 265, 307
  - fluids and, 139, 153, 268, 366
  - food and, 129, 239–240, 300
  - fuel for, 86 (fig.), 89, 98, 102, 128, 130, 134, 141–142, 257, 261, 287–288
  - heavy, 77, 94, 114–115, 126, 138, 214, 240, 289–290, 304, 318, 361
  - hot-weather, 138–139, 365–366
  - hunger and, 132, 136, 241
  - hydration and, 11, 136–138, 138–142, 147, 154, 155, 158, 160–161, 257
  - intensity of, 80–87, 92, 96, 105, 106, 109, 149, 153–154, 155, 159, 161, 166, 229, 242, 243, 267, 274, 282, 304, 308, 309, 327, 353, 358, 368
  - muscle glycogen and, 97 (fig.)
  - nutrition for, 96 (table), 130–138, 235–242, 240, 256, 270–271, 274–275, 276–277, 286–292, 287, 304–309, 337, 363–364
  - programs, 1, 78, 88, 89, 97, 113, 174, 203, 236, 243, 256, 264, 285, 286, 305, 310, 315, 327, 353, 396
  - protein and, 35, 37, 90, 102, 106, 108, 117, 149–150, 161
  - quality, 1, 93, 127, 129, 176, 240, 271, 291, 314

- schedules, 98, 126, 133, 235–236, 238, 239, 240, 261, 280, 302, 370, 396
- sweat loss and, 136, 143
- volume of, 105, 276, 290, 358
- weight loss and, 193–194, 307
- women and, 362, 363
- Transition, 105, 108, 250, 256, 264–265
- nutrition in, 252–254, 254–255
- refueling/rehydrating in, 278
- Travel, eating and, 374–376, 375 (table)
- Triathlons, 231, 233, 234, 243, 261
- energy intake for, 236, 237
- nutrition for, 245 (table)
- Ultradistance events, 152, 285, 295, 298
- Ultraendurance events, 86, 149, 354, 357
- Ultrarunning, 298, 300–301
- Urine, 159, 254, 255, 293, 341, 366
- light-colored, 249, 267, 277, 282, 289, 296, 297, 312, 357, 370
- production of, 7, 159, 160, 167, 210, 370
- Vegans, 39, 61, 68, 124, 318
- Vegetables, 26, 28–30, 33, 47, 56, 58, 71, 72, 114, 119, 197, 319, 360, 373
- choosing, 29 (table), 30
- consuming, 28, 30–31, 39, 318, 351
- Vegetarians, 39, 51, 63, 65, 67, 68, 116
- nutrition for, 317–319
- planning for, 125, 395
- protein and, 124–125
- types of, 39, 318
- Vitamin A, 28, 38, 50, 51, 69, 321, 338, 361
- consuming, 58–59, 330
- Vitamin B, 25, 39, 51, 53–56, 68, 69, 318, 326, 338, 360, 361
- consuming, 53, 54, 55, 371
- Vitamin C, 14, 28, 30, 51, 64, 69, 70, 74, 123, 125, 292, 359
- consuming, 56–57, 360, 371
- food sources of, 56 (table), 67
- iron and, 66, 291
- Vitamin D, 38, 39, 50, 51, 68, 69, 318, 320, 321, 338, 347, 361
- bone health and, 63–64, 352
- consuming, 59, 349, 351
- required, 61 (table), 326, 332
- Vitamin E, 38, 50, 51, 57–58, 69, 70, 338, 361, 371
- food sources of, 56 (table)
- Vitamin K, 38, 50, 51, 59, 64, 338
- Vitamins, 21, 25, 28, 30, 32, 49–50, 53–59, 68, 70, 72, 164, 185, 203, 223, 318–320, 358, 371
- consuming, 1, 11, 49, 51, 52, 69, 326, 329, 361
- deficiency in, 50, 51, 338
- fat-soluble, 50, 51, 320, 338
- list of, 381–383
- recovery and, 360
- water-soluble, 51, 56
- VO<sub>2</sub> max, 82, 87, 88, 105, 142, 176, 228, 234, 325, 362, 363, 366
- Water, 3, 4–6, 246, 253, 282, 322, 426
- balance, 35
- bottled, 13–14, 375
- drinking, 12, 31, 142, 159, 254, 269, 355, 367
- Weight, 176, 309
- body fat and, 186, 188
- goal for, 100, 192–193, 236, 343
- sweat loss and, 153
- sweat rates and, 295
- training cycles and, 103
- Weight gain, 91, 100, 195, 222, 248, 249, 298, 327, 344, 345
- pattern of, 328
- preventing, 359
- unwanted, 284, 347
- Weight loss, 11, 51, 91, 143, 186, 237, 240, 266, 271, 302, 310, 344, 347, 371
- calories and, 103, 194–195
- goals for, 191, 193, 194, 195, 200, 291, 302
- guidelines for, 195–199, 268, 309
- performance and, 158
- rapid, 185, 291
- strategies for, 291, 306
- training and, 193–194, 307
- Weight management, 10, 13, 82, 129, 143, 154, 186–187, 197, 198, 261, 290, 296, 308, 344
- Weight training, 102, 106, 178, 179, 180, 184, 263, 265, 270, 290, 325, 351, 352
- diet for, 181, 183
- protein and, 185
- supplements and, 211
- Zinc, 37, 59, 67, 68, 292, 318, 360, 361

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