

6TH EDITION

SPORTS NUTRITION

A Handbook for Professionals

**SPORTS, CARDIOVASCULAR, AND WELLNESS
NUTRITION DIETETIC PRACTICE GROUP**

EDITOR-IN-CHIEF:

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ASSISTANT EDITOR:

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and Dietetics



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FOREWORD

The sixth edition of *Sports Nutrition: A Handbook for Professionals* is an evidence-based complete reference manual written by experienced sports dietitians and others with acclaimed expertise in their respective practice areas. The unique feature of this manual is the focus on key takeaways at the end of every chapter to guide the reader on how to apply the principles presented. Balancing the evidence-based information with practical application points will be valuable for all professionals interested in the health and performance of athletes, including sports medicine professionals, sports dietitians, athletic and fitness trainers, coaches, and educators.

This edition provides a comprehensive overview of the expected core topics, such as nutrition assessment, energy balance, macronutrient and micronutrient basics, and body composition, and it also includes emerging areas of interest. Some of these newly featured topics include detailed discussions on nine endurance events, emerging areas of opportunity for the sports registered dietitian nutritionist, the gut microbiome, and the most recent considerations in weight management.

Your understanding of sports nutrition practice will undoubtedly grow, and you will benefit from owning this sixth edition. I strongly recommend this as the best sports nutrition reference manual available and an absolute must for your professional library! This copy will replace the lovingly worn and repeatedly highlighted fifth edition in my own library. I can't wait to start reading this edition again in its published format!

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PREFACE

Effectively delivering evidence-based guidelines translated into practical information for athletes is critical for improving their health and performance. The sixth edition of *Sports Nutrition: A Handbook for Professionals* is a joint venture between the Academy of Nutrition and Dietetics and the Sports, Cardiovascular, and Wellness Nutrition (SCAN) dietetic practice group. All six editions of this manual have involved SCAN registered dietitian nutritionists, and this edition offers *even more* chapters written or reviewed by SCAN registered dietitian nutritionists. We are pleased with the changes to the sixth edition and hope that you will find this updated edition useful.



ACKNOWLEDGMENTS

The sixth edition of *Sports Nutrition: A Handbook for Professionals* builds on the previous five editions of a book that belongs on the shelf of any health and sports professional. This edition continues to provide evidence-based information, as well as practical applications, for a broad range of athletes of all ages. We would like to extend a special thanks to the following individuals:

- The SCAN executive committee, past and present chairwomen (Carol Lapin, Eve Pearson, and Karen Collins), for their support and recognition of the value of this project
- The SCAN office and our past Executive Director, Athan Barkoukis, for his persistence and attention to detail
- The returning authors and the 11 new authors who provided their time, talent, and expertise in writing such high-quality chapters
- The reviewers who played such a critical role in the process of creating the manual
- The Academy of Nutrition and Dietetics Publications, Resources, and Products Team
- The athletes, coaches, and families of all the athletes we have worked with over the years who motivate us to remain current and relevant

Note from Christine Karpinski:

I cannot thank Chris Rosenbloom, 5th edition editor-in-chief, enough for her invaluable advice, support, and context.

Christine A. Karpinski, PhD, RDN, CSSD, LDN, Editor-in-Chief

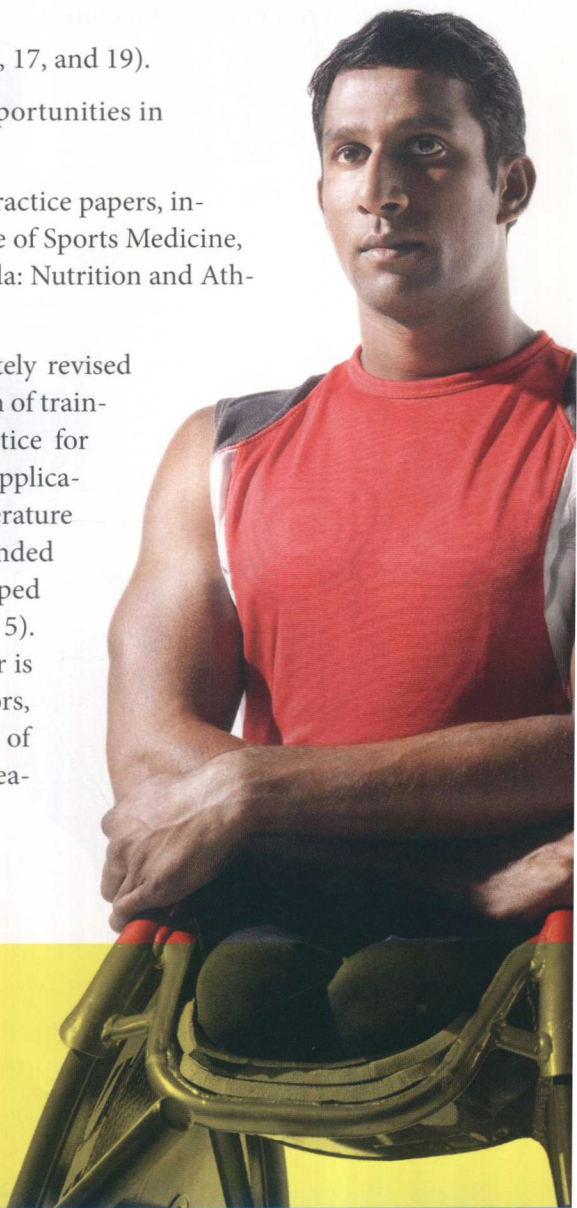
Christine A. Rosenbloom, PhD, RDN, CSSD, FAND, Assistant Editor

OVERVIEW OF THE SIXTH EDITION

The sixth edition of *Sports Nutrition: A Handbook for Professionals* is organized in four sections and designed to be a complete reference manual for practicing professionals that can also be used as resource for undergraduate and graduate sports nutrition classes. We think that we have made some excellent changes to this new edition:

- We have increased the number of authors who are SCAN registered dietitian nutritionists (RDNs), featuring 11 new lead authors. The manual is anchored by our esteemed returning authors who are a mix of SCAN RDNs, international sports RDNs, and our exercise physiologist colleagues.
- We have incorporated more practical information that you can implement into your daily practice. One way we accomplished this was to have authors provide several takeaway points at the end of the chapters.
- This edition includes updated references. If a related study was conducted since the last edition, you will most likely see it in the sixth edition.
- We completely revised seven chapters (Chapters 1, 5, 8, 9, 12, 17, and 19).
- A brand new chapter (Chapter 23) discusses emerging opportunities in sports nutrition.
- We include guidelines from the most current position and practice papers, including the 2016 Position Statement of the American College of Sports Medicine, Academy of Nutrition and Dietetics, and Dietitians of Canada: Nutrition and Athletic Performance.

Section 1 covers sports nutrition basics. It begins with a completely revised overview of exercise physiology (Chapter 1), including a description of training principles and an important discussion about scope of practice for sports RDNs. Chapters 2 through 4 cover the basics and sports applications of dietary carbohydrates, protein, and fat, with updated literature and practical advice. Chapter 4 also contains a significantly expanded discussion of high-fat diets and fat adaptation. A completely revamped vitamin and mineral chapter is featured in this edition (Chapter 5). Instead of an alphabetical review of the micronutrients, the chapter is organized into categories based on risk (due to training, risk factors, and dietary intake) and function. Chapter 7 completes this section of the manual, focusing on the regulation of sports supplements and featuring the Australian Institute of Sport classification system.

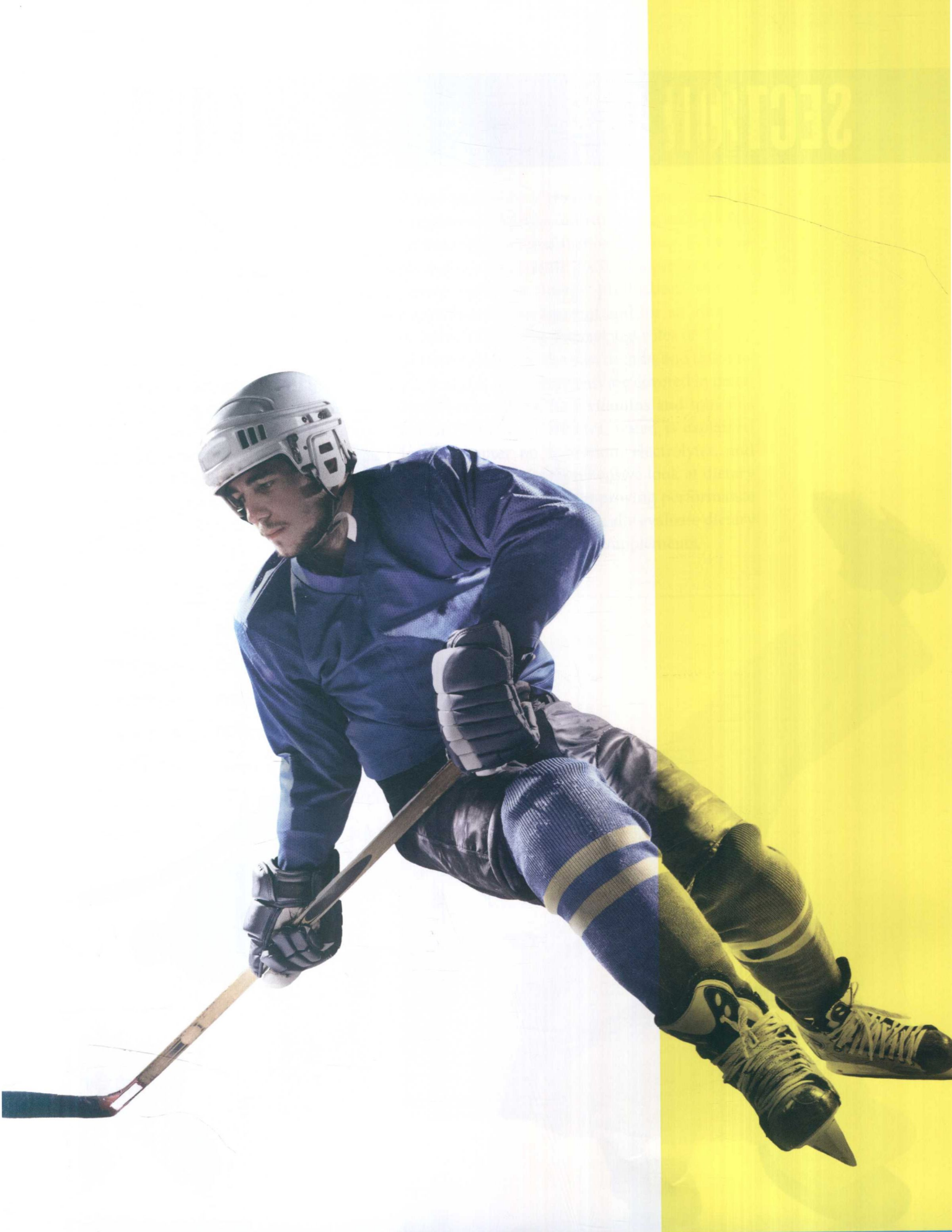


Section 2 focuses on nutrition assessment and energy balance. Chapter 8 has an increased focus on how sports RDNs can translate and incorporate the Nutrition Care Process and the Standards of Practice and Standards of Professional Performance into a sports nutrition practice. A sports RDN and an exercise scientist collaborated to provide a different approach to the assessment of body size and composition (Chapter 9). Three authors worked together to update Chapters 10, which includes a discussion of the emerging research on gut microbiome. Lastly, the seasoned authors of Chapter 11 provide new research in the area of weight management.

Section 3 has been renamed *Principles in Practice* to better reflect the approach of its chapters. Chapters 12 through 19 provide practical application of the sports nutrition basics discussed in Sections 1 and 2. To that end, we have kept the same population-specific topics as we had in the previous edition. It took the collaborative efforts of nine experienced sports RDNs to complete this section, which offers you a plethora of information that you can incorporate into your practice.

Section 4 digs deep into sport-specific recommendations. Chapters 20 and 21 feature updated research for sprint, power, and intermittent sports. Chapter 22 discusses the research behind fueling endurance athletes, and brand new to this edition is an in-depth discussion about considerations for specific endurance events, such as adventure racing, obstacle course racing, cross-country skiing, endurance cycling, endurance running, marathon rowing, triathlons, endurance mountain biking, and multiday events. This section concludes with a new chapter (Chapter 23), which explores emerging areas of opportunities for sports RDNs, such as CrossFit, obstacle course races, motorsports, performance artists (eg, dancers, marching band), first responders, and more.





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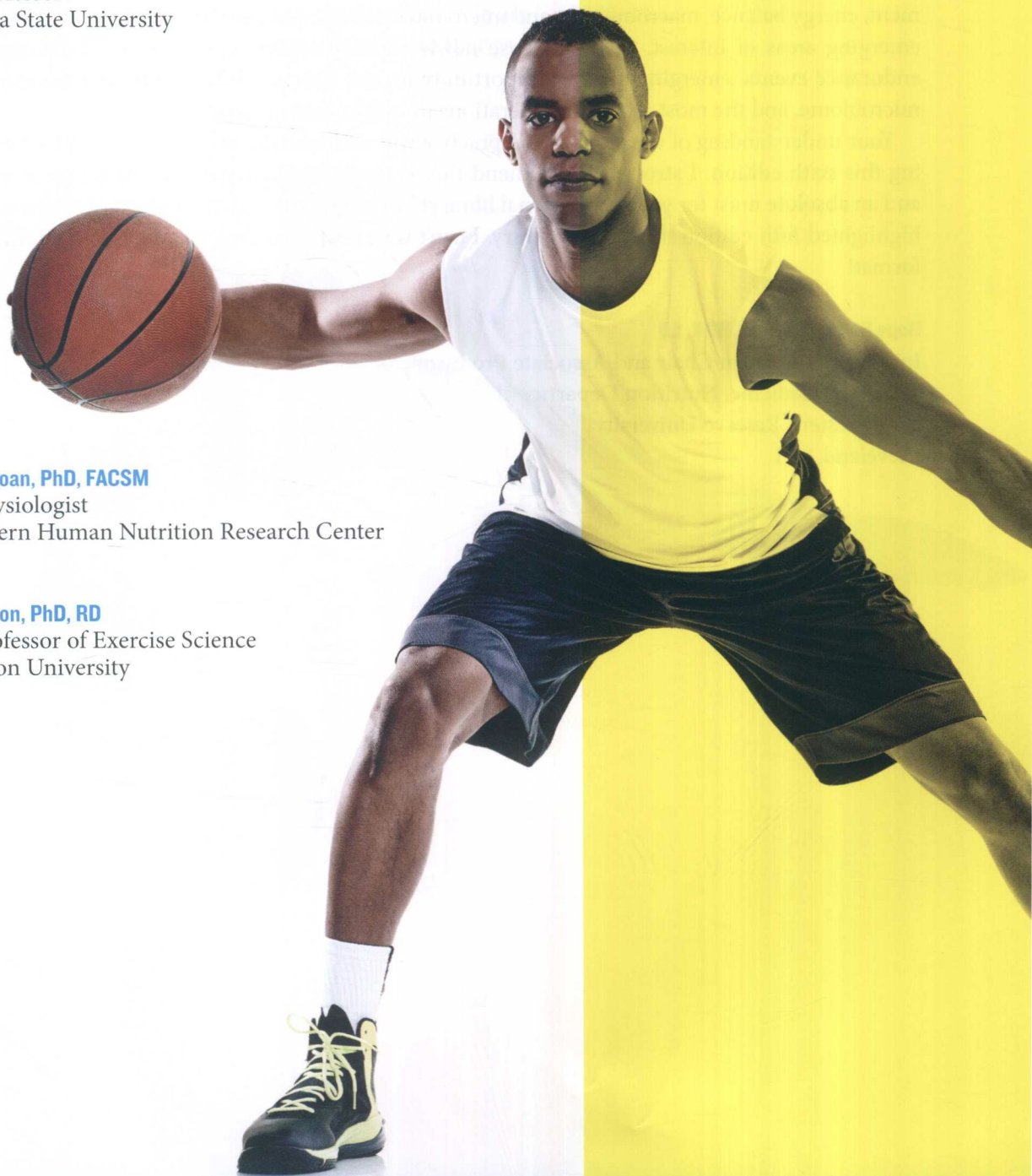
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SPORTS NUTRITION BASICS

A thorough understanding of exercise physiology and the way nutrients support training and competition is essential for the registered dietitian nutritionist working with active people. Because of the importance of this topic, the first section of *Sports Nutrition* examines the critical role of macronutrients and micronutrients in exercise performance.

The physiology of exercise includes more than just energy production. Athletic success depends on proper nutrition for growth and development and for an effective immune system function (Chapter 1). Our knowledge of the interrelated roles of dietary carbohydrate, protein, and fat has increased tremendously in the past decade, and this new information is incorporated into Chapters 2, 3, and 4. Micronutrients are covered in detail in Chapter 5, which presents the most current research on how vitamins and minerals affect sports performance. The most essential nutrient for athletes, water, is explained in both scientific and practical terms in the chapter on hydration, electrolytes, and exercise (Chapter 6). Lastly, this section concludes with a comprehensive look at dietary supplements and ergogenic aids that athletes use in the hope of improving performance (Chapter 7). This chapter discusses how the sports dietitian can critically evaluate dietary supplements and provide sound advice to athletes about using these supplements.

CHAPTER 1	Physiology of Exercise
CHAPTER 2	Carbohydrate and Exercise
CHAPTER 3	Protein and Exercise
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