

Essentials of Sports Nutrition and Supplements



Beverly International is a proud sponsor of the International Society of Sports Nutrition. This textbook was made possible via an educational grant from Beverly International.

Essentials of Sports Nutrition and Supplements

Edited by

Jose Antonio, PhD
Douglas Kalman, PhD, RD
Jeffrey R. Stout, PhD
Mike Greenwood, PhD
Darryn S. Willoughby, PhD
G. Gregory Haff, PhD

Editors

Jose Antonio, PhD
International Society of Sports
Nutrition
Deerfield Beach, FL, USA

Jeffrey R. Stout, PhD
Department of Health and Exercise
Science
University of Oklahoma
Norman, OK, USA

Darryn S. Willoughby, PhD
Department of Health, Human
Performance, and Recreation
Baylor University
Waco, TX, USA

Douglas Kalman, PhD, RD
Division of Nutrition and
Endocrinology
Miami Research Associates
Miami, FL, USA

Mike Greenwood, PhD
Department of Health, Human
Performance, and Recreation
Baylor University
Waco, TX, USA

G. Gregory Haff, PhD
Division of Exercise Physiology
West Virginia University
Morgantown, WV, USA

ISBN: 978-1-58829-611-5
DOI: 10.1007/978-1-59745-302-8

e-ISBN: 978-1-59745-302-8

Library of Congress Control Number: 2007932994

© 2008 Humana Press, a part of Springer Science+Business Media, LLC

All rights reserved. This work may not be translated or copied in whole or in part without the written permission of the publisher (Human Press, 999 Riverview Drive, Suite 208, Totowa, NJ 07512 USA), except for brief excerpts in connection with reviews or scholarly analysis. Use in connection with any form of information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed is forbidden.

The use in this publication of trade names, trademarks, service marks, and similar terms, even if they are not identified as such, is not to be taken as an expression of opinion as to whether or not they are subject to proprietary rights.

While the advice and information in this book are believed to be true and accurate at the date of going to press, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Cover illustration: By Shirley Karina.

Printed on acid-free paper

9 8 7 6 5 4 3 2 1

springer.com

Dedication

In memory of Joseph Allen Chromiak A Father, Husband, Friend, and Scientist

This book is dedicated to the memory of Joseph Allen Chromiak, 47, of Starkville, Miss. He passed away after a long battle with cancer. Joseph is survived by his wife, Anna; son, Joseph; parents, Joseph and Bonnie; and his brothers, David and John. Joseph was born in Pennsylvania and earned his B.S. degree from Clarion State College. He continued his education through graduate studies, receiving his M.S. degree from the University of Michigan in 1984, from the Department of Kinesiology, and a Ph.D. degree in physiology from Auburn University in 1990. Joseph was a faculty member of the Department of Sport Health Science at Life University in Georgia and eventually joined the faculty at Mississippi State University in 2000. He rose to the rank of associate professor in the Department of Kinesiology, and served as the department's graduate coordinator and interim head. Joseph touched the lives of many students as a graduate adviser and committee member, mentoring more than 25 students in his discipline. With an always positive attitude, Joseph was a devoted husband, father, and friend to many. He will be missed.

Preface

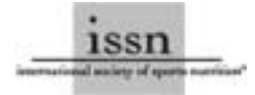
Essentials of Sports Nutrition and Supplements brings credible information, research-based education, and validated sports nutrition protocols to the sports nutrition professional and academician. It is the single best resource for anyone interested in the field. This book contains information from the thought leaders in the field, provides the latest scientific (basic and applied in the category) findings, is the culmination of thousands of hours of work, as well as the genesis of an academic society dedicated to sports nutrition. That is, the International Society of Sports Nutrition (ISSN) was founded several years ago to fill the needs of consumers, scientists, and students of sports nutrition. Prior to the genesis of the ISSN, there was no single place that one could go to learn sports nutrition. Certainly, we saw enormous potential in the field of sports nutrition. Advances in the scientific understanding of the link between specific nutritional and supplementation protocols and human performance will make this a tremendously exciting field for decades to come. As scientists, we have dedicated our lives to the sports nutrition field out of passion to see its potential further realized. Many of the current sports nutrition marketing companies work against fulfilling that potential. By featuring physiques that are largely unattainable and unbelievable claims in their advertising, they create an aura of incredibility around their brands. By focusing on hyperbolic advertising instead of clinical research and consumer education, they are failing the professional and serious consumer who simply wants to know the truth. Despite a high level of advertising communications, we think the sports nutrition market (both academic and industrial) is largely underserved. We believe there should be a place that professionals and serious consumers can come for access to the real science and intelligent commentary on sports nutrition. Our goal, via this book as well as the world-class conferences organized by the ISSN, is to bring you scientifically-based information on the sports nutrition and supplement category.

Essentials of Sports Nutrition and Supplements should be required reading for all students of exercise physiology and dietetics, and for fitness professionals. As sports nutrition scientists, we are *always* looking for novel breakthroughs in basic and applied sports nutrition. With the introduction of creatine monohydrate in the early 1990s, the sports nutrition industry (both on the research side and the business side) grew rapidly. Not only is the sports supplement industry a \$20 billion business, but when you add to the mix the category of functional foods (i.e., foods with supplements added to them), you have an industry that is worth \$40 billion or more. With such rapid growth comes consumer confusion (and academic confusion for that matter) regarding what's true and what's marketing hyperbole. Unfortunately, there is no quick way to learn the science of sports nutrition. However, our goal through this textbook is to give you the tools to make an educated and wise decision about the sports nutrition category.

The field of sports nutrition is not "owned" by exercise physiologists or clinical dietitians. It is its own field. It is part exercise, part nutrition, combined with a bit of biochemistry, cell biology, physiology, and anatomy. Thus, with the diverse background of the editors and authors, we truly have accomplished

the gargantuan task of culling the latest science in this new and exciting field and delivering it to you in a timely fashion.

Jose Antonio, PhD
Co-Founder and CEO of the International
Society of Sports Nutrition



Contents

<i>Preface</i>	vii
<i>About the Editors and Contributors</i>	xi
<i>Companion CD</i>	xvii

Part I Basic Exercise Physiology

1 Thermodynamics, Biochemistry, and Metabolism	3
<i>Christopher B. Scott</i>	
2 Skeletal Muscle Plasticity	21
<i>Joseph A. Chromiak and Jose Antonio</i>	
3 The Endocrinology of Resistance Exercise and Training	53
<i>William J. Kraemer, Nicholas A. Ratamess, Disa L. Hatfield, and Jakob L. Vingren</i>	
4 Cardiovascular and Pulmonary Responses to Exercise	85
<i>Rick Seip</i>	
5 Molecular Biology of Exercise and Nutrition	103
<i>Darryn S. Willoughby</i>	
6 Aspects of Overtraining	121
<i>Mike Greenwood</i>	

Part II Exercise Principles and Assessment

7 Principles of Exercise Training	145
<i>Steven J. Fleck</i>	
8 Laboratory and Field Techniques for Measuring Performance	159
<i>Ronald W. Mendel and Christopher C. Cheatham</i>	
9 Methods of Body Composition Assessment	183
<i>Joe Weir</i>	
10 Nutritional Assessment and Counseling of Athletes	201
<i>Susan M. Kleiner</i>	

Part III Basic and Applied Nutrition

11 An Overview of Macronutrients	237
<i>Jennifer Hofheins</i>	
12 Protein	251
<i>Tim N. Ziegenfuss and Jamie Landis</i>	
13 Fat	267
<i>Lonnie Lowery</i>	
14 Carbohydrates	281
<i>G. Gregory Haff</i>	
15 Vitamins and Minerals	313
<i>Darin Van Gammeren</i>	

16	Nutritional Needs of Endurance Athletes	329
	<i>Suzanne Girard Eberle</i>	
17	Nutritional Needs of Strength/Power Athletes	349
	<i>Jim Stoppani, Timothy P. Scheett, and Michael R. McGuigan</i>	
18	A Different Look at the Food Guide Pyramid	371
	<i>Alan E. Shugarman</i>	
19	Special Needs of Youth, Women, and the Elderly	395
	<i>Marie Spano</i>	

Part IV Supplements

20	Sports Applications of Creatine	417
	<i>Richard B. Kreider</i>	
21	Weight Loss Ingredients	441
	<i>Christopher R. Mohr</i>	
22	An Overview of Sports Supplements	459
	<i>Chris Lockwood</i>	
23	Hormonal Supplements: <i>Legal and Illegal</i>	541
	<i>Jamie Landis and Tim N. Ziegenfuss</i>	

Part V Special Topics

24	Special Legal Review: <i>The Androstenedione Ban and the Criminalization of Steroid Precursors—Implications for the Sports Nutritional Supplement Market</i>	567
	<i>Richard D. Collins and Alan H. Feldstein</i>	
25	Very-Low-Carbohydrate Diets	581
	<i>Jeff S. Volek and Cassandra Forsythe</i>	
26	Eating to Improve Body Composition	605
	<i>Jose Antonio and Anssi H. Manninen</i>	
27	Nutrition Before, During, and After Exercise for the Endurance Athlete	621
	<i>John L. Ivy</i>	
28	Nutrition Before, During, and After Exercise for the Strength/Power Athlete	647
	<i>Christopher J. Rasmussen</i>	
	<i>Answer Key</i>	667
	<i>Index</i>	679

About the Editors and Contributors

Jose Antonio, PhD, is the CEO of the International Society of Sports Nutrition (www.theissn.org). He earned his doctorate at the University of Texas Southwestern Medical Center in Dallas, Texas, and completed a postdoctoral fellowship (at UT Southwestern) in Endocrinology and Metabolism. He has coauthored or coedited several books in the sports nutrition field (www.joseantonioiophd.com). Contact: DrJoseAntonio@aol.com; Web: www.theissn.org.

Christopher C. Cheatham, PhD, is currently an Assistant Professor of Exercise Science in the Department of Health, Physical Education, and Recreation at Western Michigan University. Previously, Dr. Cheatham completed his Bachelor of Science at Miami University, his Master of Science at Ball State University, and his PhD at Kent State University. Before joining the faculty of Western Michigan University, Dr. Cheatham completed a Postdoctoral Fellowship at the John B. Pierce Laboratory, Yale University School of Medicine. His research interests include environmental physiology, the role of exercise and environment on the control of plasma volume, and the impact of nicotine on human performance and thermoregulation. Contact: chris.cheatham@wmich.edu.

Joseph A. Chromiak, PhD, CSCS, FACSM, is an Associate Professor in the Department of Kinesiology at Mississippi State University. Dr. Chromiak is a Fellow of the American College of Sports Medicine and is a Certified Strength and Conditioning Specialist. Dr. Chromiak earned a BS degree in biology from Clarion University of Pennsylvania, received an MS degree in kinesiology at the University of Michigan, and earned a PhD in the Interdepartmental Physiology program at Auburn University. Dr. Chromiak was awarded a National Institutes of Health Postdoctoral Fellowship to study with Dr. Herman Vandenburg at Brown University. His recent research has examined the effects of nutritional supplements and resistance training on body composition and muscular performance. Contact: jchrom@colled.msstate.edu.

Richard D. Collins, Esq., is a lawyer who practices primarily in the area of nutritional supplement law and sports drug defense. He has extensive experience in criminal defense and has successfully tried many serious cases to verdict, including acquittals on a variety of felony charges. He has also conducted civil litigation, including genealogic kinship hearings in Stockholm, Sweden, on behalf of the Public Administrator of Nassau County. He has successfully represented people from all walks of life, from coast to coast, and is known for his thorough and attentive service to all of his clients. A former competitive bodybuilder and certified personal trainer, he often advises legal clients in the strength, health, and fitness community. He is the legal advisor to the International Federation of BodyBuilders and the International Society of Sports Nutrition. Contact: rcollins@cmgesq.com or www.rickcollinsonline.com.

Suzanne Girard Eberle, MS, RD, author of *Endurance Sports Nutrition* (Human Kinetics Publishers), is a sports dietitian who practices what she teaches. A

former elite runner (4:28 mile/32:40 10K, 5000-meter national champion, member 3 USA teams), Dr. Eberle lectures, writes and maintains a private practice in Portland, Oregon. She is an avid runner, cyclist, and mountaineer and rock climber. Dr. Eberle holds a master's degree in clinical nutrition from Boston University. She is a member of the American College of Sports Medicine, the American Dietetic Association, and its Sports, Cardiovascular and Wellness Nutritionists Practice Group. Contact: ebcruz@aol.com; www.eat-drinkwin.com.

Alan H. Feldstein, JD, brings with him more than a dozen years of advertising and marketing law experience and more than seven years in the dietary supplement industry. His legal career began as a successful civil trial lawyer prosecuting business litigation cases for his clients. He then joined and became a partner in a New York advertising and marketing law firm representing film, television, and music clients, business clients, advertising agencies, direct response television clients, marketing firms, and advertisers. Known for his negotiating skills and business acumen, Dr. Feldstein's clients always have appreciated his business perspective on resolving legal issues affecting their business. Contact: info@cmgesq.com or by phone: 516-294-0300.

Steven J. Fleck, PhD, is Chair of the Sport Science Department at Colorado College in Colorado Springs. He earned a PhD in exercise physiology from Ohio State University in 1978. He has headed the physical conditioning program of the U.S. Olympic Committee; served as strength coach for the German Volleyball Association; and coached high school track, basketball, and football. Dr. Fleck is a former vice president of basic and applied research for the National Strength and Conditioning Association (NSCA) and is a Fellow of the American College of Sports Medicine (ACSM). He was honored in 1991 as the NSCA Sport Scientist of the Year. Contact: sfleck@coloradocollege.edu.

Cassandra Forsythe, PhD, is a student at the University of Connecticut studying exercise science and nutrition under the supervision of Jeff Volek, PhD, RD. In December 2007, her first diet and weight loss book entitled *The Perfect Body Plan*, written for Women's Health Magazine, was released. Also in December 2007, her second book with Lou Schuler and Alwyn Cosgrove, entitled *The New Rules of Lifting for Women: Lift Like a Man, Look Like a Goddess*, was available on shelves. Contact: cassforsythe@hotmail.com.

Mike Greenwood, PhD, is a Professor in the Department of Health, Human Performance, and Recreation at Baylor University. At Baylor he serves as the HHPR Graduate Coordinator as well as the Research Coordinator primarily involved with the Center for Exercise, Nutrition & Preventive Health and the Exercise & Sport Nutrition Laboratory. Dr. Greenwood is a Fellow of ISSN and ACSM and is certified as a strength and conditioning specialist with distinction by the NSCA. He was honored with the NSCA Educator of the Year Award in 2004. He has previously served as a collegiate athletic coach as well as a strength training/conditioning professional. Contact: Mike_Greenwood@baylor.edu.

G. Gregory Haff, PhD, is an Assistant Professor of exercise physiology in the medical school at the University of West Virginia. He was awarded the National Strength and Conditioning Association's Young Investigator Award in 2001. He is a member of the National Strength and Conditioning Association's Research Committee and the United States Weightlifting Association's Scientific Committee. Dr. Haff received his PhD from the University of Kansas and his MS from Appalachian State University. Dr. Haff is actively involved in research examining carbohydrate supplements and anaerobic performance. Contact: ghaff@hsc.wvu.edu.

Disa L. Hatfield, MA, is currently a Doctoral Fellow in the Department of Kinesiology at the University of Connecticut. She earned her Bachelor of Science degree in Exercise Science from The Pennsylvania State University.

Her first MA was in Health and Human Development Psychology from Antioch University, Santa Barbara, and her second was in Kinesiology from The University of Connecticut. Her research interests are in the areas of resistance training as it relates to exercise endocrinology, children, and nutrition.

Jennifer Hofheins, MS, RD, LD, is currently an Exercise and Sports Nutritionist at the Ohio Institute of Health & Human Performance and for the Ohio Research Group (ORG). Research at ORG primarily focuses on the effects of sports and dietary supplements on athletic performance and body composition. She is also active in developing worksite wellness programs as well as disease prevention counseling at local athletic clubs. Jennifer is an active member of the International Society of Sports Nutrition and the American Dietetic Association. She received her Masters in Dietetics from D'Youville College in Buffalo, New York. Contact: jennifer@ohioresearchgroup.com.

John L. Ivy, PhD, FACSM, is Chair and Margie Gurley Seay Centennial Professor in the Department of Kinesiology and Health Education, and Professor in the College of Pharmacy, Division of Pharmacology, University of Texas at Austin. He received his PhD in Exercise Physiology from the University of Maryland and his postdoctoral training in physiology and biochemistry from Washington University School of Medicine. He has published more than 140 research and review articles on exercise physiology and the effects of nutrition on physical performance and exercise recovery. He has authored two books on sports nutrition, *Nutrient Timing: The Future of Sports Nutrition* and *The Performance Zone*. Contact: johnivy@mail.utexas.edu.

Douglas Kalman, PhD, RD, is the Director at Miami Research Associates in the Nutrition & Endocrinology Division. Mr. Kalman is also a nutrition consultant to NIKE Inc. and the Executive Vice-President of the International Society of Sports Nutrition (www.theissn.org). He is a Fellow of the American College of Nutrition and an original cofounder of the ISSN. He has published extensively in the sports nutrition and supplements field. Contact: dkalman@miamiresearch.com.

Susan M. Kleiner, PhD, RD, FACN, CNS, is the owner of HIGH PERFORMANCE NUTRITION™, a consulting firm specializing in media communications, industry consulting, and personal counseling, on Mercer Island, Washington. She is also an Affiliate Assistant Professor in the Department of Medical History and Ethics at The University of Washington School of Medicine. Dr. Kleiner is the author of POWER EATING®, 2nd Edition (Human Kinetics Publishers, 2001). Contact: susan@powereating.com.

William J. Kraemer, PhD, FACSM, CSCS, is a Full Professor in the Department of Kinesiology in the Neag School of Education working in the Human Performance Laboratory at the University of Connecticut, Storrs, Connecticut. He also holds an appointment as a full professor in the Department of Physiology and Neurobiology along with an appointment as a Professor of Medicine at the UCONN Health Center/School of Medicine. Contact: william.kraemer@uconn.edu.

Richard B. Kreider, PhD, FACSM, is a Professor and Chair of the Department of Health, Human Performance & Recreation at Baylor University and the Director of the Center for Exercise, Nutrition & Preventive Health Research. Dr. Kreider has published more than 100 peer-reviewed articles in the field of sports nutrition and is considered one of the foremost experts in the area of sports nutrition and supplementation. Contact: Richard_Kreider@baylor.edu.

Jamie Landis, MD, PhD, CSCS, received a BS in Biology from Ferris State University, an MS in Endocrine Physiology, and a PhD in Neuroscience, both from Bowling Green State University. His MD was earned at the Medical University of Ohio, followed by a residency appointment at the Mayo Clinic. He also holds

the CSCS and volunteers his time as a youth weightlifting and football coach. Dr. Landis is currently an Associate Professor of Biology at Lakeland Community College.

Chris Lockwood, MS, CSCS, was formerly the Senior Category Director of Diet and Energy for the GNC Corporation (Pittsburgh, PA), and Senior Brand Manager of ABB/Science Foods, formerly a division of Weider Nutrition (Salt Lake City, UT). Mr. Lockwood also worked as the Health and Fitness Writer for *Muscle@Fitness*, and remains an active author and editor of trade publication articles with more than 100 works to his credit, including a scientific review chapter on creatine (*Sports Supplement Encyclopedia*, 2001). Contact: cmlockwood2@yahoo.com.

Lonnie Lowery, PhD, holds graduate degrees in both exercise physiology and nutrition and is currently President of Nutrition, Exercise and Wellness Associates, LLC. His company develops academic materials and lay writing regarding exercise and nutrition while providing weight management programs and sports performance services for persons at all levels. Contact: lonman7@hotmail.com.

Anssi H. Manninen, MHS, is a well-published research scientist in the sports nutrition field. He holds an MHS in sports medicine from University of Kuopio Medical School. His current position is Senior Science Editor at Advanced Research Press, a publisher of *Muscular Development*, *FitnessRx for Women*, and *FitnessRx for Men*. He is also an Associate Editor for *Nutrition @ Metabolism*, a BioMed Central publication. Contact: sportsnutrition@luukku.com.

Michael R. McGuigan, PhD, is currently a Senior Lecturer in Exercise Physiology in the School of Exercise, Biomedical and Health Sciences at Edith Cowan University, Australia. He completed his PhD at Southern Cross University and a postdoctoral research fellowship at Ball State University. His research interests include strength and power development, monitoring training, and the use of resistance training as a health intervention of different populations. Contact: m.mcguigan@ecu.edu.au.

Ronald W. Mendel, PhD, holds a doctorate in Exercise Physiology from Kent State University. Dr. Mendel is cofounder of the Ohio Research Group and is the Laboratory Director for the Ohio Institute of Health & Human Performance. He is an active member in the International Society of Sports Nutrition, the American College of Sports Medicine, the National Strength and Conditioning Association, and the American Society of Exercise Physiologists (ASEP) and is the former president of the Ohio Association of Exercise Physiologists. He also maintains adjunct status at several universities. Contact: ron@ohioresearchgroup.com.

Christopher R. Mohr, PhD, RD, LDN, is a consultant, author, and freelance writer. He completed his dietetic internship at the University of Delaware, allowing him to sit for the national registration exam to become a Registered Dietitian. From there, Chris attended the University of Massachusetts to pursue a Master of Science in Nutrition Science. While at UMASS, Chris was a Sports Dietitian who worked with most of the 23 Division I teams at the University. He earned a PhD in Exercise Physiology at the University of Pittsburgh. Contact: chris@MohrResults.com.

Christopher J. Rasmussen, MS, CSCS, is the Research Coordinator of the Exercise and Sport Nutrition Laboratory within the Center for Exercise, Nutrition and Preventive Health Research at Baylor University. He is also a part-time Lecturer within the Department of Health, Human Performance and Recreation teaching both Human Performance and Health Education courses. Contact: Chris_Rasmussen@baylor.edu.

Nicholas A. Ratamess, PhD, CSCS, is currently an Assistant Professor in the Department of Health and Exercise Science at The College of New Jersey. His

major research interest is examining how the human body physiologically adapts to resistance training and has authored and coauthored more than 40 scientific and educational publications in the strength and conditioning field. Contact: ratamess@tcnj.edu.

Timothy P. Scheett, PhD, is currently an Assistant Professor in the Department of Physical Education and Health at the College of Charleston, South Carolina. Dr. Scheett earned his doctorate at the University of Connecticut. Contact: ScheettT@cofc.edu.

Christopher B. Scott, PhD, worked for 5 years at the Cooper Institute for Aerobic Research in Dallas, Texas, and another 5 years in clinical cardiology and pulmonary practice. He is now Assistant Professor in Sports Medicine at the University of Southern Maine. His research focus is on exercise metabolism. Dr. Scott earned his PhD at the University of Wyoming, Laramie. Contact: cscott@usm.maine.edu.

Rick Seip, PhD, FACSM, is Senior Scientist in Preventive Cardiology at Hartford Hospital in Hartford, Connecticut. He received the PhD from University of Virginia and completed postdoctoral training in Atherosclerosis, Nutrition, and Lipid Research at Washington University School of Medicine, St. Louis. He has coauthored more than 40 peer-reviewed publications. Contact: rlseip@aol.com.

Alan E. Shugarman, MS, RD, has worked in the nutrition, dietary supplement, and health and fitness industry for more than 15 years. He holds a Bachelor of Science in Chemistry & Biology with a minor in Nutrition, a Master of Science in Food & Nutrition Science, and is a Registered Dietitian. Currently Dr. Shugarman works as a consultant, researcher, product developer, and writer for the nutrition and dietary supplement industry through Discovery Nutrition, Inc. (www.DiscoveryNutrition.com).

Marie Spano, MS, RD, is a registered dietitian and holds a BS in Exercise and Sport Science from the University of North Carolina Greensboro and an MS in Foods and Nutrition from the University of Georgia, where she helped run the UGA Sports Nutrition program for the athletic department. Ms. Spano is a Health Scientist working in nutrition and physical activity for the federal government and also works as a freelance writer, consultant, and speaker. Contact: mariespano@comcast.net.

Jim Stoppani, PhD, received his doctorate in exercise physiology from the University of Connecticut in 2000 and completed a postdoctoral research fellowship in the prestigious John B. Pierce Laboratory and Department of Cellular and Molecular Physiology at Yale University School of Medicine, where he investigated the effects of exercise and diet on gene regulation in skeletal muscle. He was awarded the Gatorade Beginning Investigator in Exercise Science Award in 2002. Currently, he serves as science editor for *Muscle & Fitness*, *Muscle & Fitness Hers*, and *Flex* magazines at Weider Publications in Woodland Hills, California, and is a science consultant for numerous companies, including Physical magazine, Power Plate, ProSource, StrengthPro, Scivation, and PrimaForce. Contact: jstoppani@amilink.com.

Jeffrey R. Stout, PhD, holds a BS degree in Exercise Science from Concordia University, a Masters in Exercise Science, and a PhD in Exercise Physiology from the University of Nebraska in Lincoln. He is a Fellow of the American College of Sports Medicine (FACSM), and Certified Strength and Conditioning Specialist (CSCS). In 2001, Dr. Stout was awarded the leading young scientist of the year by the National Strength and Conditioning Association. Dr. Stout currently teaches and conducts research at the University of Oklahoma. Contact: jeffstoutscs@aol.com.

Darin Van Gammeren, MAEd, CSCS, earned his BS in Exercise Science at the University of Sioux Falls and his master's degree at the University of Nebraska

at Kearney (UNK). While at UNK, Mr. Van Gammeren conducted research on various sports supplements and their effects on body composition and athletic performance. Currently, Mr. Van Gammeren is a doctoral candidate in the Exercise Biochemistry Laboratory at the University of Florida studying skeletal muscle plasticity. Specifically, the laboratory is attempting to determine the specific pathways involved in free radical-mediated damage to skeletal muscle. Contact: dgrizz@yahoo.com.

Jakob L. Vingren, MS, earned his baccalaureate and master's degrees in the Department of Kinesiology at the University of North Texas. His research interests include resistance exercise as it relates to muscle physiology and endocrinology. Contact: jakob.vingren@uconn.edu.

Jeff S. Volek, PhD, RD, received his doctorate from the Pennsylvania State University and is now an assistant professor in the Department of Kinesiology at the University of Connecticut. He has produced more than 100 scientific publications in the area of nutrition and exercise science. His current research focus is on how very-low-carbohydrate diets affect a variety of clinical and performance outcomes including fasting and postprandial lipoproteins, weight loss, body composition, hormonal responses, and adaptations to exercise training. Contact: jvolek@uconnvm.uconn.edu.

Joe Weir, PhD, earned his doctorate in exercise physiology from the University of Nebraska and is currently a Professor in the Division of Physical Therapy at Des Moines University–Osteopathic Medical Center. His research interests focus on neuromuscular and autonomic responses to exercise and digital signal processing. Contact: Joseph.Weir@dmu.edu.

Darryn S. Willoughby, PhD, holds BS and MEd degrees in Exercise Science from Tarleton State University and a PhD in Neuromuscular Physiology and Biochemistry with a sub-emphasis in Nutritional Biochemistry from Texas A&M University. He is a Fellow of the American College of Sports Medicine and International Society of Sport Nutrition. He is a Certified Strength and Conditioning Specialist through the National Strength and Conditioning Association, and a Certified Nutritional Consultant through the American Fitness Professionals and Associates. Dr. Willoughby is currently an Associate Professor of Exercise and Nutritional Biochemistry and Molecular Physiology at Baylor University in Waco, Texas. Contact: Darryn_Willoughby@baylor.edu.

Tim N. Ziegenfuss, PhD, CSCS, is the Chief Executive Officer of The Ohio Research Group of Exercise Science and Sports Nutrition. "Dr. Z" is a well-known author, speaker, and researcher with expertise in exercise training, nutrition, dietary supplements, and sports performance. He is a Fellow of the International Society of Sports Nutrition, a Certified Strength and Conditioning Specialist, and Chair of the exercise physiology and sports nutrition program at Huntington University. Contact: zsciences@yahoo.com.

Companion CD

This CD-ROM contains a study guide in Adobe PDF format. Adobe Reader® is required to view this document. We have included installers for this free software on this disc for both Mac and PC computers. The application is compatible with most Mac and PC computers.

PC USERS:

The application “HP_ESN_StudyGuide.exe” should launch automatically on most Windows computers when the disc is inserted into your computer. If the application does not start after a few moments, simply double click the application “HP_ESN_StudyGuide.exe” located on the root of this CD-ROM.

MAC OSX USERS:

Double click the application “HP_ESN_StudyGuide” after inserting the CD-ROM. The Mac OSX operating system does not support an auto-start feature.

The following hardware and software are the minimum required to use this CD-ROM:

- For Microsoft Windows: An Intel Pentium II with 64 MB of available RAM running Windows 98, or an Intel Pentium III with 128 MB of available RAM running Windows 2000 or Windows XP. A monitor set to 1024 × 768 or higher resolution.
- **For Macintosh OS X:** A Power Macintosh G3 with 128 MB of available RAM running Mac OS X 10.1.5, 10.2.6 or higher. A monitor set to **1024 × 768** or higher resolution.



<http://www.springer.com/978-1-58829-611-5>

Essentials of Sports Nutrition and Supplements

Antonio, J.; Kalman, D.; Stout, J.R.; Greenwood, M.;

Willoughby, D.S.; Haff, G.G. (Eds.)

2008, XVII, 691 p., Hardcover

ISBN: 978-1-58829-611-5

A product of Humana Press