

CRC
HANDBOOK OF

Dietary Fiber in Human Nutrition

3rd Edition

Edited by
GENE A. SPILLER

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Dietary Fiber
in Human
Nutrition
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Dedication

To Hugh Trowell and Denis Burkitt, who pioneered a new understanding of the role of plant fibers in human health. They have been to me teachers of science, medicine, and humility. They should be remembered not only as pioneers in medicine, but also for their selfless and total dedication to the prevention of disease and human suffering.

Preface to the First Edition

The *CRC Handbook of Dietary Fiber in Human Nutrition* is proof of the amazing growth in the study of dietary fiber during the 1970s and 1980s. When I first edited a book on dietary fiber, *Fiber in Human Nutrition*, in the mid-1970s, I was happy to find at least a few good investigators who could contribute chapters to it. It would have been impossible to find a large number of scientists that could have made a major contribution to that early book.

However, as work was beginning on this Handbook in 1982 and I was presenting the design at the Symposium on Fiber in Human and Animal Nutrition in New Zealand that year, not only was I able to find all the 50-plus authors I needed, but I had the sad task of omitting some outstanding names.

Interest in what used to be the disregarded Cinderella nutrient of the early 20th century has grown at a rate greater than almost any other nutrient. The plant cell wall and the gums and mucilages had found their well-deserved niche in nutrition and medicine.

Even though few people still believe that dietary fiber has not found the ultimate proof that makes it a required nutrient, the momentum is with the ones who have found valid uses for it in high-fiber foods in treating diseases such as type-II diabetes. The momentum is also with the epidemiologists who have found correlations with lower incidence of colorectal cancer, the ones that have found in high-fiber foods one of the best ways to prevent excessive fat and food intake. It is a list that can go on and on.

Has the ultimate study on the long-range effects of dietary fiber been published? Of course not. It is probably impossible to carry out the ultimate study on the correlation of nutrition to chronic diseases under present conditions: we must accept the pieces of evidence derived from good epidemiology, from controlled human studies and, of course, animal studies. The lifetimes of many of us would be needed to satisfy the purists who hope for the ultimate study, in this or any other field in which we deal with the lifetime of a human being.

There is more to complicate things: dietary fiber polymers are quite elusive, unlike vitamins that can be isolated or synthesized readily. Some of these polymers may change when torn apart from their complex structure in the cell wall. Thus, when we attempt to extract them, too often we isolate something quite different from the original material, perhaps useful, but most certainly different. This bothers many scientists who would like to use the pure form of nutrients for their investigations. There is more: dietary fiber is so interactive that other components of the diet probably vary its effect on humans. All this makes dietary fiber research so challenging and so difficult!

This book is proof that there are many dedicated scientists and clinicians that have given their best efforts to dietary fiber. There are many who could not be included here, as there is a point in an effort of this kind at which the editor must sadly stop asking for contributions and recognize that the book must be a finite number of pages. I owe a very special thanks to all the authors in this book, for, after all, it is their book.

The book presents a large volume of data. The reader is directed to the Table of Contents which illustrates the design of the book, a design that was conceived to make it as easy as possible to find the needed data. Chemistry, analytical methodologies, physiological and biochemical aspects, clinical and epidemiological studies, and consumption patterns are covered extensively. Tables with the dietary fiber content of various foods analyzed by different methods are given at the end of the book.

Gene A. Spiller

Los Altos, California — February 1985

Preface to the Second Edition

Dietary fiber research has seen a great deal of progress since the first edition of this Handbook. This new edition is revised and updated by individual authors and, with the exception of a few chapters, such as the Southgate and the crude fiber analytical methods, that are unchanged, new material is added. Some new authors and chapters have been added, including the new method of analysis by Englyst and Hudson (Chapter 3.3) and Bosello, Armellini, and Zamboni's chapter on fiber consumption in Italy. Hugh Trowell passed away in 1989; his chapter has been left untouched. A major addition in the second edition is the inclusion of more extensive tables of data on dietary fiber in foods. They are prepared by various authors to give the reader a chance to compare data from different sources or methods.

This new edition should give researchers, physicians, nutritionists, and other health professionals a useful and ready source of information, as a handbook should. Again, as in the first edition, we could not ask all the experts in this field to contribute, so we decided to stay with the original authors as much as possible. We hope that our efforts will make this work valuable to everyone interested in this topic.

Gene A. Spiller

Health Research and Studies Center, Inc.

SPHERA Foundation, Los Altos, California — January 1992

Preface to the Third Edition

Dietary fiber research has seen a great deal of progress since the first and second editions of this Handbook. This new edition has been revised and updated by individual authors, with the exception of a few chapters that either have historical value or have data that should be available in a handbook of this nature, even though it may have been written a few years before the publication. I like to define the latter as “classic” chapters that have an essential, timeless nature. Some new authors and chapters have been added, including a new section on cereal fiber that emphasizes the crucial role of associated phytochemicals.

Hugh Trowell passed away in 1989; his chapter has been left untouched. Denis Burkitt passed away soon after the publication of the second edition, in which he had written the opening chapter with me. I have chosen to expand this first chapter without changing the part published in the second edition of the Handbook. I have added a second part to that chapter to bring it up to date.

This new edition should give researchers, physicians, nutritionists, and other health professionals a useful and ready source of information, as a handbook should. Again, as in the other editions, we could not ask all the experts in this field to contribute.

We hope that our efforts will make this work valuable to everyone interested in this topic. One new chapter (2.8) discusses a fiber from animal sources. This is an interesting topic in fiber definitions, as dietary fiber is considered to be from plant sources.

With all the great progress we have made in the past 10 years in nutrition research, it is unfortunate that the past 10 years have also seen conflicting studies on fiber, as on other topics in nutrition. In the late 1970s, Hugh Trowell, during one of our many meetings, expressed to me his concern that in the earnest desire to do more research, the picture of the benefits of fiber may become “muddled.” I would like to close this preface with an appeal to all fiber researchers to be careful in reaching sweeping conclusions before considering carefully the complexity and the interactivity of dietary fiber. Some major publications have reached conclusions on the effects of fiber after studying diets that were a long way from diets that could be called high-fiber diets.

Dietary fiber is a precious gift that plants bring to us. Let’s research it and teach about it with care.

Gene A. Spiller

Health Research and Studies Center, Inc.

SPHERA Foundation, Los Altos, California — December 2000

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For the third edition of this Handbook, the editor wishes to thank Rosemary Schmele, Connie Burton, and Len Marquart for their assistance.

The Editor

Gene A. Spiller is the director of the Health Research and Studies Center and of the SPHERA Foundation in Los Altos, California.

Dr. Spiller received a doctorate in chemistry from the University of Milan (Italy) and later a master's degree and a Ph.D. in nutrition from the University of California at Berkeley. He did additional studies at the Stanford University School of Medicine, Stanford, California. He is a Fellow of the American College of Nutrition, a Certified Nutrition Specialist, and a member of many professional nutrition societies.

In the 1970s, Dr. Spiller was head of Nutritional Physiology at Syntex Research in Palo Alto, California, where he did extensive research on dietary fiber and related topics. At the same time he edited many clinical nutrition books. He continued his work in clinical nutrition research and publishing in the 1980s and 1990s, as a consultant and as the director of the Health Research and Studies Center and of the SPHERA Foundation. Many human clinical studies, reviews, and other publications were the results of this work. Dr. Spiller has carried out clinical studies on the effect of dietary fiber and high-fiber foods including nuts, raisins, and whole grains. Other studies have focused on antioxidants and lipids. He is a lecturer in nutrition at Foothill College in the San Francisco Bay Area and earlier taught at Mills College in Oakland, California.

Dr. Spiller is the editor of many clinical nutrition books on fiber and other topics at the forefront of nutrition research, such as caffeine and lipids. Among his multi-author books on fiber are *Fiber in Human Nutrition* (Plenum, 1975), *Topics in Dietary Fiber Research* (Plenum, 1978), and *Medical Aspects of Dietary Fiber* (Plenum, 1980), followed by the *CRC Handbook of Fiber in Human Nutrition*, 1st and 2nd Editions (CRC Press, 1985 and 1992).

He has a special interest in lesser-known nutritional factors that may be beneficial to human health, though not essential to life, especially factors that are present in plant foods and that may work together with dietary fiber in the prevention of degenerative diseases.

Dr. Spiller has been responsible for organizing international workshops on dietary fiber, such as the International Nutrition Congress in Brazil in 1978 and in Brighton (U.K.) in 1985, and has chaired many symposia and sessions on this and related topics at national meetings of various scientific societies.

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