Human Nutrition

A COMPREHENSIVE TREATISE

General Editors: Roslyn B. Alfin-Slater and David Kritchevsky

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Nutrition and the Adult

Macronutrients

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Edited by

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Volume 1	*Nutrition: Pre- and Postnatal Development* *Edited by Myron Winick*
Volume 2	*Nutrition and Growth* *Edited by Derrick B. Jelliffe and E. F. Patrice Jelliffe*
Volume 3A	*Nutrition and the Adult: Macronutrients* *Edited by Roslyn B. Alfin-Slater and David Kritchevsky*
Volume 3B	*Nutrition and the Adult: Micronutrients* *Edited by Roslyn B. Alfin-Slater and David Kritchevsky*
Volume 4	*Nutrition: Metabolic and Clinical Applications* *Edited by Robert E. Hodges*

This volume is dedicated to all the scientists whose work has advanced our understanding of how to apply knowledge to benefit human nutrition.

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Foreword

The science of nutrition has advanced beyond expectation since Antoine Lavoisier as early as the 18th century showed that oxygen was necessary to change nutrients in foods to compounds which would become a part of the human body. He was also the first to measure metabolism and to show that oxidation within the body produces heat and energy. In the two hundred years that have elapsed, the essentiality of nitrogen-containing nutrients and of proteins for growth and maintenance of tissue has been established; the necessity for carbohydrates and certain types of fat for health has been documented; vitamins necessary to prevent deficiency diseases have been identified and isolated; and the requirement of many mineral elements for health has been demonstrated.

Further investigations have defined the role of these nutrients in metabolic processes and quantitated their requirements at various stages of development. Additional studies have involved their use in the possible prevention of, and therapy for, disease conditions.

This series of books was designed for the researcher or advanced student of nutritional science. The first volume is concerned with prenatal and postnatal nutrient requirements; the second volume with nutrient requirements for growth and development; the third with nutritional requirements of the adult; and the fourth with the role of nutrition in disease states. Our objectives were to review and evaluate that which is known and to point out those areas in which uncertainties and/or a lack of knowledge still exists with the hope of encouraging further research into the intricacies of human nutrition.

Roslyn B. Alfin-Slater
David Kritchevsky

Preface

Nutrition has been defined as the study of nutrients in foods from the time they are ingested to the time their metabolic end products are excreted. Included in the study of these processes are a host of catabolic and anabolic reactions following digestion and absorption, the manner in which these nutrients interact with each other, and the systems in which they participate. Furthermore, nutrition implies a study of nutrient requirements for all segments of a healthy population.

Whether the requirements for nutrients are met requires nutritional assessment. For infants, requirements are based on nutrients present in human milk. For children, anthropometric measures—height, weight, arm circumference—are compared with standards to see whether adequate weight gain and growth are maintained. For adults, there are no simple determinants to estimate adequate nutrition other than the maintenance of "normal" weight and "health."

These volumes, dealing with nutrition of the adult, were divided so that the macronutrients would be considered separately from the micronutrients. Volume 3A starts with a discussion of the recommended dietary allowances and how they are formulated. Thereafter, the digestion, metabolism, and functions of the various macronutrients are presented. Volume 3B is concerned with the micronutrients and also with the interactions of the various nutrients with common drugs. Volume 3B ends with a discussion of nutrition for the older adult and some of the problems which arise with aging. All of the authors in these volumes are experts in their respective areas.

It is hoped that calling attention to the known and unknown in nutrition will act as a stimulus for further research. It is only when we can relate functions and metabolic reactions of nutrients with external symptoms that we will be able to properly assess nutritional status and requirements and eventually arrive at an optimum rather than an adequate diet.

We wish to thank Miss Jane T. Kolimaga for her expert assistance in the preparation of the indices.

Roslyn B. Alfin-Slater
David Kritchevsky

Los Angeles and Philadelphia

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Nutrient Requirements: What They Are and Bases for Recommendations

Roslyn B. Alfin-Slater and Rose Mirenda

1. Introduction

Biblical references to the essential nature of food for the survival of mankind offer evidence of our persistent concern with nourishment and the quality of life which we enjoy. Food, as consumed by the average, healthy individual, satisfies not only hunger but also a number of other needs, i.e., physiological, psychological, and social. In addition, the specific requirements for nutrients depend on the individual biochemistry, on the ability to digest food properly, and on the efficiency of nutrient absorption and metabolism. It becomes evident that although food is essential to life, there are differences in the amount of nutrients individuals require for survival and well-being.

The present state of knowledge about nutrition is the result of an accumulation of information from a variety of records passed on from early Greek and Roman times to the latest research reports of the renowned nutrition scientists. Through trial and error and sometimes serendipity, the nutritional scientist has successfully supplemented the body of historical knowledge with the latest scientific observations to supply facts of such a high degree of certainty that recommendations can be made about the daily nutrient needs of man. It is within this frame of reference and through the utilization of the latest available scientific information that dietary standards and recommendations have been and are proposed in the United States and in other countries.

Unfortunately, in the field of nutrition as in other sciences, information is never complete. The unknown facts about nutrition provide the impetus for continued experimentation. Meanwhile, the accepted scientific data are

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