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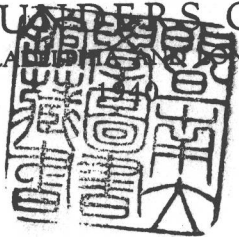
NUTRITION and DIET
in
HEALTH and DISEASE

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THIRD EDITION, ENTIRELY REWRITTEN

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To
N. S. McL.
A. B. McL.

PREFACE TO THE THIRD EDITION

THE older concepts of nutrition are undergoing profound changes. The physician no longer tells his patient what he must not eat; he tells him what he must eat. This and the great advances in the science of nutrition on which these concepts are based have made necessary the writing of this new edition.

The book has been entirely rewritten. Only a few paragraphs here and there from the earlier editions, such, for example, as those dealing with Sippy's method of treating peptic ulcer, have been retained. The newer discoveries have been so far reaching and the changes in point of view so extreme that little of the old remains.

The relatively large space given to a consideration of the nature and physiologic influences of the several nutritive substances and to the discussions of disordered physiology is, I believe, amply justified. Without this knowledge, intelligent dietary management is not possible.

The interest of the book has been greatly enhanced by the chapter on the feeding of infants written by Dr. P. C. Jeans, Professor of Pediatrics at the State University of Iowa, and by the chapter on feeding the surgical patient by Dr. Dean Lewis, Professor of Surgery at Johns Hopkins University. I wish to express my thanks to Dr. Jeans and Dr. Lewis for their contributions.

I wish also to acknowledge appreciation of the assistance given by Dr. James B. McLester in his helpful suggestions; Miss Blanche Frazier in the assembling of material; Mrs. Raymond Felix, Miss Janette Wilder and Mrs. Eugene Lott in the preparation of the manuscript, and Mrs. W. H. Collins in the construction of the menus.

JAMES S. McLESTER.

BIRMINGHAM, ALA.

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INTRODUCTION

NUTRITION is the sum total of those processes by which the living organism receives and utilizes the materials necessary for the maintenance of life. This includes growth, the repair of worn-out structures and the liberation of energy. The energy thus set free appears in the form of heat, mechanical work and electric currents and perhaps also in ways yet unknown.

Food has been defined as a palatable mixture of foodstuffs. A foodstuff is a material which is capable of being added to the body substance or which when absorbed into the blood stream will prevent or reduce the wasting of a necessary constituent of the organism.* For the animal organism, these nutritive substances are water, inorganic salts, the organic foodstuffs and certain other substances of various chemical structure which are grouped together under the term vitamins. The union of oxygen with the organic foodstuffs or their cleavage products maintains life and warmth in the cells.

Water is the most urgently needed of these substances, which need can be measured by the exceeding promptness with which symptoms of deprivation appear and their extreme gravity. The inorganic constituents of the food are also essential, though their need is not so immediately felt.

The well known organic foodstuffs, carbohydrates, proteins and fats, in their highly organized structures contain stored energy which in large part is liberated in the body. Here, as elsewhere, the law of the conservation of energy is applied; and when these substances are broken down through oxidation to simpler chemical bodies, they give to the animal organism the same amount of energy as would be liberated by similar conversion in the test tube. The energy contained in any foodstuff may be determined accurately by measurement of the heat which it yields on combustion in a calorimeter. It is expressed in units of heat known as calories, a calory being the amount of heat necessary to raise the temperature of 1 Kg. of pure water from 15 to 16° C.

The utilizable portion of this stored energy varies somewhat according to its source; for the average mixed diet, Rubner† adopted the following "standard values:" One gram of carbohydrate yields 4.1 calories; 1 Gm. of protein, 4.1 calories; 1 Gm. of fat, 9.3 calories. For

* Definition by Graham Lusk.

† Rubner, quoted by Lusk, G.: The Science of Nutrition, ed. 4, Philadelphia, W. B. Saunders Company, 1928, p. 43.

ordinary clinical purposes, however, the following values are accepted: One gram of carbohydrate yields 4 calories; 1 Gm. of protein, 4 calories; 1 Gm. of fat, 9 calories.

Each of these three foodstuffs plays its own part in the processes of nutrition. Carbohydrates form the most important source of energy, which they yield as heat and mechanical work; they are the chief as well as the most economical and readily available source of muscle energy. Fats on oxidation liberate heat and thus contribute to the maintenance of body warmth; they also furnish energy for muscular work. Proteins serve mainly to repair worn-out structures and to provide new tissues for the growing organism, but they may, by converting a certain portion of their structure into dextrose, accomplish the same purposes as carbohydrates and fats. The three may be substituted for one another to a certain extent. In the case of proteins, however, the limits of substitution are particularly well defined and indicate a point beyond which safe reduction or substitution is impossible; the presence in the diet of a small amount of nitrogenous food, "the wear and tear quota," is essential, and animal experiments have indicated that a minimum of fat also is necessary.

There is another group of food factors which, although required only in minute amounts, are absolutely essential. They are called vitamins. These substances are unrelated chemically but are alike in one respect—each exercises some form of regulatory control over physiologic processes.

In the following chapters the manner in which these several foodstuffs are utilized and the influences exerted by each will be discussed. Then will follow an analysis of man's nutritive needs in health and in sickness, with a final consideration of the practical arrangement of the diet in disease.