

ANNOTATIONS

CHEMISTRY OF FOOD AND NUTRITION¹

EVERYONE who has any interest in the subject of food chemistry is familiar with Dr. Sherman's books on the CHEMISTRY OF FOOD AND NUTRITION. Since the first edition was published in 1911, they have been universally accepted as a text by students of human nutrition. This is the sixth edition of the book. The same general plan for the presentation of subject matter is followed in this edition of CHEMISTRY OF FOOD AND NUTRITION as in preceding volumes. Familiar material comes first and is followed by that which is newer.

Chapter I, "General Introduction," gives a brief history of the research work since 1900 which has been responsible for the evolution of the "six pillar concepts" of our present-day study of nutrition. This historical outline indicates the pattern or chronological order in which material is presented throughout the book. Subject-matter of courses in General Organic Chemistry is not included.

Chapters II to VII inclusive, present the chemical nature, nutritive functions, digestion and metabolism of carbohydrates, fats, and proteins. Much of the material is necessarily a repetition of what appeared in earlier editions. It is familiar information, and there seems to be no need for further comment, except to mention Dr. Sherman's warning against allowing the newer findings of research to eclipse this longer-established knowledge.

The fuel-value of foods and human energy requirements under different conditions are the subjects of Chapters VIII-X. In Chapter VIII, practical working formulas are given for calculating the calorie-value of carbohydrates, fats, and proteins. Chapter IX shows how the basal energy requirements of the individual may be figured in terms of body surface

¹Sherman, Henry C.: CHEMISTRY OF FOOD AND NUTRITION. Sixth edition. New York, The Macmillan Company, 1941.

area; and Table 18 and Figure 21 give the surface area for individuals of stated height and weight according to Dr. E. F. Dubois' formula. The influence of carbohydrates, fats, and proteins on basal calorie requirements is discussed, and the actual specific-dynamic action of these food constituents is estimated numerically. Average energy losses in digestion are given. Chapter X takes up total energy requirements. Table 23 gives the energy expenditure per hour under different conditions of muscular activity as compiled by Dr. Rose. Energy requirements of pregnancy and lactation, and total energy requirements of children are discussed separately.

Protein requirements are discussed in Chapter XI. Maintenance levels of intake are compared with optimal amounts. Factors influencing the utilization of protein that are discussed in this chapter are: (a) the protein-sparing action of carbohydrates and fats; (b) nitrogen output on different levels of intake; (c) the nutritional efficiency of the protein mixtures contained in different foods; (d) the influence of muscular exercise; (e) protein requirement in relation to age and growth. Dr. Sherman suggests that more careful study should be made of protein in connection with pathological conditions, so that it will be possible to discriminate more exactly between normal and abnormal protein metabolism. Papers by Weech and by Weech and Goettsch have pointed out this need of further study.

Chapters XII through XVI are concerned with inorganic or mineral elements. The general functions of minerals in nutrition, sources of these elements, and requirements are discussed. Changes that appear in Chapter XIV of this sixth edition with reference to calcium and phosphorus requirements and content of typical foods are of especial interest. First among the changes is in minimum calcium requirement. Recent work by Leitch and Owen have raised the formerly accepted minimum calcium requirement of 0.45 grams per man per day, to 0.5 grams. Lusk, citing data of Hoffstrom and the work of Blunt and Cowan, indicated that one-third to one-half more calcium and phosphorus is required in pregnancy and lactation than for normal healthy adults. Revisions have been made in Table 42, "Calcium Content of Typical Foods," and in Table 43, "Phosphorus Content of Typical Foods," since the previous edition of *CHEMISTRY OF FOOD AND NUTRITION*. Some food items have been added; others have been dropped; and values for a given item are based on tests for larger numbers of food samples. New information

from experiments by a number of research workers refers to the utilization of calcium in various foods. It has been shown that the calcium of certain green vegetables is well utilized, while the calcium in others is almost useless. Need for further study is indicated.

Chapter XV, entitled: "Iron and Copper in Food and Nutrition," has been rather extensively rewritten. The several additions and changes are summarized at the end of the chapter. The main points of this summary are indicated by the following quotations: "The frequency of occurrence of anemia does *not* imply a corresponding frequency of iron deficiency in food supply. Even such anemias as are curable by iron are not to be assumed to have been due to iron-poor food." The amounts of iron necessary to effect a cure are so much larger than the amount in a normal diet, that an anemia cured by iron may involve something more than a deficiency in the diet. "Recent iron-balance studies show the normal nutritional requirement for iron to be somewhat less than previously estimated." It should be remembered that, "an average requirement of say 12 mg. means 12 mg. *as contained in ordinary foods.*" This is true whether or not only three-fourths of the iron in ordinary foods is "available." Iron requirements of normal women have been over-estimated because of misinterpretation of iron-balance experiments, and also because women whose iron losses should be counted as abnormal, have been included in obtaining averages for normal needs. It is better to recognize the idiopathic cases, says Dr. Sherman, and "see that they get medicinal iron under medical advice than to try to get idiopathically high amounts of iron into dietaries."

Beginning with Chapter XVII, Dr. Sherman has rearranged the order of the book; three chapters have been added, and the subject matter entirely rewritten.

Chapters XVII to XXIV discuss the vitamins. There is a constant flow of new knowledge in this field from research laboratories, and the up-to-date review of results of experimental work given by Dr. Sherman is extremely valuable. The extensive lists of references for the different vitamins will be very useful to students and other persons interested in this subject.

Vitamins in this sixth edition of CHEMISTRY OF FOOD AND NUTRITION are designated according to the actual chemical substance and its structural formula, in line with recommendations of many official agencies, such as the American Medical Association, the United States Pharma-

copeia, the American Institute of Nutrition, and the Nutrition Committee of the Health Organization of the League of Nations. The structural formula for each vitamin, where such has been established, is given, and a detailed discussion of the chemical properties and nutritional function of each is included. The findings of various investigators are listed separately. All conclusions and data are brought fully up to 1941. Food tables showing typical sources of each vitamin are given. Normally required amounts of each vitamin as determined by recent investigators are carefully outlined.

Chapter XXI deals with newly identified, water-soluble vitamins. These vitamins have been recognized as separate entities in the B group. In some cases a structural formula has already been determined. Knowledge of nutritional functioning of these vitamins has not yet been established. The water-soluble vitamins mentioned in this chapter are: Vitamins B₃, B₄, B₅ and B₆ (Pyridoxine); and Vitamin H, Vitamin M, Vitamin P (Citrin), Pantothenic Acid, Factor W, the Grass-juice factor, and Choline.

In Chapter XXII, Vitamin A is shown to be really two substances: Vitamin A₁ found in salt-water fish, and Vitamin A₂ found in fresh-water fish. The discovery of A₂ has thrown some of the details of the molecular structure of Vitamin A as accepted to date into debate. In addition, there are the formerly identified substances (four of them) known to be precursors of Vitamin A, which are readily hydrolyzed in the body to yield Vitamin A.

Chapter XXIII is called "The Vitamins D," because by 1940 it was realized that there are probably at least ten such substances, members of the sterol-group, five of which have been fairly well defined chemically. Only two are of outstanding importance: D₂ (activated ergosterol) and D₃ (activated 7-dehydrocholesterol). These two forms are the ones that were identified several years ago and are known on the market as: calciferol and viosterol (forms of D₂), while D₃ has been identified with the principal natural vitamin D of fish oils, and is presumably the same as is found in milk and eggs.

Chapter XXIV takes up "Other Fat-Soluble Vitamins." The nutritional functions of all but one of these factors seem to be fairly well defined, but required amounts and units of measure are still not quite clear. The "other fat-soluble vitamins" discussed are: (1) Vitamin E, now known as "alpha" and "beta" tocopherols, is designated by the term

Vitamin E, because the tocopherols are clearly closely related. Vitamin E is known to be necessary to successful reproduction, and is also tied up with the proper functioning of the nervous system. (2) Vitamin F, about which little is said; and (3) Vitamins K₁ and K₂ which are known to have antihemorrhagic properties.

Chapter XXV, entitled: "The Nutritional Chemistry of Reproduction and Lactation," not only takes up the interrelationship between energy, protein, minerals, and vitamins under the special conditions created by reproduction and lactation, but also states the required amounts of these dietary essentials during periods of reproductive activity.

The wider, more far-reaching effect of the practical application of the newer knowledge of nutrition through successive generations is the subject of Chapters XXVII to XXX. These chapters will be very useful to those who are interested in the social significance of nutrition. Dietary standards in terms of types of foods provide the needed interpretation of food chemistry for its practical application. Optimal levels of food intake are defined for each nutritional factor. Several tables on food allowances and distribution of calories in diets to obtain well-balanced diets are included in Chapter XXVII. Simple food budgets are outlined for urban families, and it is shown that the amount of money required to maintain good nutrition depends largely on a knowledge of food values and willingness to put such knowledge into practice.

Chapter XXX is a discussion of "Nutritional Chemistry and Human Progress" as viewed by persons directing public welfare, health, and research organizations. Data are presented to illustrate that death rates can be decreased and better health attained by all age groups when modern knowledge of nutrition is put into practice.

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DIFFERENTIAL FERTILITY IN BUTLER COUNTY, OHIO

AN INTENSIVE study of differential fertility, "Average Number of Children Per Woman in Butler County, Ohio: 1930," has recently appeared in the form of a Census monograph prepared in cooperation with