FOOD VALUES: WHAT THEY ARE, AND HOW TO CALCULATE THEM

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By

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CHAPTER I

INTRODUCTION

Now that Economy has become a national watchword, and is likely to remain so for many years to come, there is no subject on which people more ardently desire information than on our actual needs in food. For a multitude of reasons we are all about to reduce our expenditure on food. This will be done in many cases by reducing the actual quantity, a step which may be entirely judicious; but it will be done much more usually by important changes in the diet. How can we be sure that we are not running the risk of being underfed or wrongly fed? How are we to choose among the many suggestions made, the many contradictory statements as to the food actually necessary to us, its nature and its quantity? Any housekeeper at this moment can obtain innumerable recipes, of which the chief object is to exhibit a great decrease in the cost of each new dish, compared with the cost of the old dishes in the old recipes. She can obtain an equally large number of "hints," which indicate how materials formerly thrown away can be used to contribute to the family sustenance. Occasionally estimates are given of the amount "saved" by the use of these materials, or the quantity of nutriment available in each new dish, but these numerical estimates are compiled for the purpose of recommending the hint or the recipe; they do not form part of any scheme of adequate diet per person per day; they do little to answer the question—How can I be sure that the food I am offering daily to the people for whom I am responsible is right, in nature and in quantity, to keep up their health and strength—those national assets which have to be conserved and increased as fully as possible?

This handbook has been compiled to answer that question; not so much directly by giving model diets, as by putting readers in possession of the chief facts known at present about food and diet, in a condensed accessible form, and, as far as possible, by means of arithmetical data. It will be shown how these data can be used in working out problems for the diet of individuals and of small communities. Readers will be able by use of the Tables to answer their own questions. In particular they will be able to discover whether a given plan of feeding certain people, reviewed weekly or daily, will be approximately a sound one.

It will always be necessary, however, for them to use their own judgment finally in adopting a standard of sufficiency in diet, for as yet there is no such standard to which unanimous adherence is given. This book will aim, further, at indicating clearly what statements or figures are generally accepted, what other statements and figures are still under discussion, and will aim also at guiding readers to avail themselves of any new information that may be published.

Information of the kind is spoken of commonly as the knowledge of food values—a rather vague term. Long before the war there was a pious aspiration that housekeepers (and above all housekeepers in the making—girls still at school) should know about food values.

The idea in the minds of people, who often used this expression rather loosely, seemed to be something of this kind :—It is obvious that a pound of beefsteak contains more nourishment than a pound of strawberries. Therefore all foods can be arranged in order of merit according to the amount of nourishment they contain.

But the inquirer, looking for such a list of food values, finds the quest full of difficulties. A human being requires different kinds of nourishment. The physiologist tabulates his requirements under the three main headings of proteins, fats and carbohydrates, and states these requirements in grams. We have to convert these figures into ounces or pints of ordinary food ; and only in the case of the fats is the arithmetical process at all simple. Then we find it necessary to follow the points of a scientific discussion as to how far these three forms of food can "replace" or "spare" one another, just as we have taken the trouble to keep them carefully apart. It seems that their relation to each other must be settled before we can arrive at the knowledge of how much of each kind an ordinary person needs.

Postponing the consideration of this relation to the next chapter, we will describe here briefly the three kinds of food distinguished by the physiologist.

Fats. Fats are certainly more familiar to us than the other two. We think first of the fat from beef, mutton, pork or bacon ; then of butter and margarine ; next perhaps of olive oil, the only vegetable fat we take separately as an article of diet, and lastly of the various nut butters and vegetable margarines now to be obtained. These last forms of fat have until recently been used chiefly by vegetarians, but now the fact that they cost less than the others is recommending them to every one's notice. We do not find it difficult to believe that fats form a separate category in food-stuffs. This is partly because we are accustomed to buy and to use them separately. Fats and oils are found naturally, however, distributed in minute quantities through many animal and vegetable foods; as for instance in milk, cheese, nuts, yolk of egg, and even in lean meat. We look for fat in animal rather than in vegetable food, in which it occurs to a less extent.

Carbohydrates The name carbohydrate signifies to the chemist a compound of carbon, hydrogen and oxygen, with the two last elements in the same proportion as that in which they occur in water. Fats contain the same three elements, but less oxygen in proportion than the carbohydrates. The name carbohydrates is still used in treatises on diet, but it is in one way unfortunate, because certain compounds which come under the chemist's definition of carbohydrate (notably cellulose) are very little use to us as food. The food-stuffs classified as carbohydrates are chiefly the sugars, and starch, which is closely connected with sugar. They are now often termed the saccharoses or saccharides.

There is more than one kind of sugar. Beet and cane sugar show no appreciable difference in composition at all; but the sugar in fresh fruit (found also in small lumps in dried fruit such as raisins) is different from cane sugar; so is the sugar occurring in milk. There are yet other kinds. Our chief source of all sugars is from plants, which are continually manufacturing it from their mineral food, gaseous and liquid. But they primarily manufacture starch, and store this in seeds, roots, stems or tubers, because it is insoluble in water. It is converted into sugar when it must travel to various parts of the plant, and must be soluble in water to be carried from one place to another. This process of converting starch into sugar is also effected when the animal or human being digests starch; but the converse process of changing sugar into starch, necessary to the plant, is not a part of our digestive[1] activity, which must always aim at making matters soluble.

Briefly, we may take our carbohydrate food as starch or as sugar, only in the former condition it gives more work to the digestive organs. But it is more palatable to most people, especially to take in quantity, probably because of the absence of very definite taste. It is the chief constituent, by weight, of the solid portion of bread, potatoes, oatmeal, rice and peas. Practically all our starch comes from vegetables, also all our sugar, except that in milk, and in honey—if we count honey as an animal product. Vegetable foods bring, in addition, some quantity of cellulose, varying according to the special preparation given to the food, and also with the part of the plant selected. Green vegetables, and most fruits, especially those with small seeds, contain a good deal; whereas a substance like white flour contains very little. Cellulose is the substance of which the plant cell-wall is made; one sees it in almost pure form in white paper or in cork. Although it is a carbohydrate from the chemist's point of view (and also formally included under the term saccharide because it is related to starch), it is usually indigestible, and is finally expelled from the system. The cells of animal tissues have no cell-wall, and therefore animal food contains no cellulose. It also contains as a rule no starch.

See note 2, p. 57.

Starch, when strongly heated, is converted into dextrin, another carbohydrate, which is digestible, being soluble in water, whereas cellulose is completely insoluble. We are familiar with dextrin as it gives the brown colour to the crust of a loaf. In the pure state its solution in water forms gum or mucilage.

Proteins. It is more difficult to realize the nature of a protein than that of any other constituent of food. The nearest substance to pure protein that we are likely to see among ordinary foods is the coagulated curd of milk, out of which cheese is made. This consists chiefly of the protein called casein. Purified from other material, and then quite tasteless, it forms the basis of medicine foods such as Plasmon and Protose. But we need not think of protein in these rather remote and expensive forms. The chief part of muscle, which we know as lean meat, is a protein called *myosin*. The part of flour which is not starch, known as gluten, consists of at least two proteins—*glutenin* and *gliadin*. White of egg, often known as albumin, is almost pure protein. Peas and beans contain *legumin*, which is very like myosin.

It is for the chemist to tell us how these proteins actually differ from one another, and their composition is still under investigation. Each protein may be said to be a complex combination of several chemical compounds allied to each other. All of these are composed of carbon, hydrogen, oxygen, nitrogen, usually sulphur, and occasionally phosphorus as well. Professor Lusk has suggested, in a very interesting lecture,[1] that a single protein consists of a group of these compounds, somewhat as a word consists of letters; and,

[1] Lusk. *The Fundamental Basis of Nutrition.*