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**A NEW METHOD  
OF DETERMINING THE NUTRITIONAL  
VALUE OF FOODSTUFFS AND THE  
PRACTICAL IMPORTANCE OF SUCH  
A METHOD**

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НОВАЯ МЕТОДИКА ОПРЕДЕЛЕНИЯ ПИЩЕВОЙ ЦЕННОСТИ ПРО-  
ДУКТОВ И ЕЕ ПРАКТИЧЕСКОЕ ЗНАЧЕНИЕ

На английском языке

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It is well known at present that adequate food must contain over 40 separate nutrients in definite quantities. The merits of various foodstuffs must be evaluated from the point of view of constituting fully adequate food.

Let us have a brief look at the historical development of methods of determining the nutritional value of foodstuffs and of food. For obvious reasons, in the past century there was established a view that, besides the protein content, the main criterion for determining the nutritional value of a foodstuff was its caloric value. A vestige of such an erroneous /from the contemporary point of view/ opinion even today not infrequently hinders correct orientation in choosing foodstuffs and products for fully adequate nutrition. In the light of contemporary knowledge concerning the physiological requirements of the organism and the chemical composition of foodstuffs, a more complex evaluation of foodstuffs suggests itself, taking into account also the minerals and the vitamins. The importance of an up-to-date complex and overall evaluation of the merits of foodstuffs has been stressed, for instance, by W.Ziegelmayr. A number of scientists, H.Sherman, W.Schuphan, J.Hruby, B.Cuvelier, E.Kohman, H.K.Gräfe, and others, have dealt with the working out of methods of determining the nutritional value

of foodstuffs, proceeding from the data of usual tables of the chemical composition of such substances. These tables are known to give the contents of each food component /protein and others/ in a portion of 100 g, expressed in g, mg, or other units. Such tables give no direct idea of the actual nutritional value of foodstuffs, and that for two main reasons. First, in equal quantities by weight /100 g/ foodstuffs contain widely varying quantities of water and non-digestible substances, which do not provide the organism with energy. The overall quantity of food required by the organism, however, is determined just by its energy requirements. Consequently, for comparing the nutritional merits of various foodstuffs it is inexpedient to proceed from equal quantities by weight. On the other hand, units of measuring quantities of nutritional components contained in the foodstuffs are not of equal measurability and do not directly reflect the requirements of the organism. Therefore it is impossible to add up the figures of these tables showing the contents of the various nutrients in a certain foodstuff. This would give, from the point of view of the organism, an idea of the saturation of the foodstuffs with all the components in general or in certain groups. The abovementioned authors show a tendency to evaluate foodstuffs from the point of view of the physiological requirements of the organism. Basically this tendency is expressed in the following. Instead of a 100 g portion of the foodstuff under evaluation, quantities are considered which give the organism an equal amount of energy, e.g. 1000,

2500 Kcal. Thus isocaloric quantities of foodstuffs are taken as the basis of evaluation. Other authors proceed from 100 g of the foodstuff, but express the nutrients contained in it not in weight units or in international units, but in the percentage of the daily requirements of the human organism.

On the foundation of I.P.Pavlov's doctrine of the unity of the organism and its environment, author have made an attempt to express the merits of various foodstuffs direct from the point of view of the physiological requirements of the organism. Besides, the contemporary situation in nutrition has been taken into account, which demands that particular value should be attributed to foodstuffs relatively rich in minerals and in vitamins. The essence of authors method /E.Rannak. "On the method of determining the nutritional value of foodstuffs", Publications of the Tallinn Polytechnical Institute, No.68, 1955/ consists in the following. As quantities of foodstuffs to be compared, their portions giving 3000 calories are taken, so that it is possible directly to compare the merits of various foodstuffs with the merits of the average daily ration of food corresponding to the physiological norm. As a measure of nutrients contained in the amounts of foodstuffs considered, their quantities have been taken corresponding to the physiological daily norm of respective components at easy work. These measures have been called the daily rations of nutrients /DRN/. For instance, 100 g of milk has the caloric value of 67 Kcal, consequently 3000 calories correspond to  $/3000:67/ \times 100 = 4500$  g of milk. Further, 100 g of milk contains 0.050 mg of thiamine, the average

physiological daily norm of which is 2 mg. Consequently, 100 g of milk contains  $0.050:2 = 0.025$  DRN of thiamine and 4500 g of milk contains 45 times more, i.e.  $0.025 \times 45 = 1.1$  DRN of thiamine. In the same way it is possible to express the quantity of any nutrient contained in any foodstuff or food. Owing to the equal measurability of the units of DRN it is possible to add up the quantities of various nutrients contained in the 3000 calorie amount of any foodstuff and to take the average value of all the nutrients or of a group of them under consideration. Taking into account the 12 best-known nutrients, the average overall nutritional value according to this method is: cabbage - no less 3.4 DRN /3000 Kcal; milk - about 1.7; brown bread /whole wheat or rye/ and potatoes - about 1.0, and white bread /wheat flour 70-75 %/ - no more than 0.5 DRN

/3000 Kcal. In this way it is possible to get an idea of the average saturation with nutrients of the digestible organic substance of any foodstuff. Figures above one DRN of various nutrients, and the average figures in particular, indicate high nutritional value

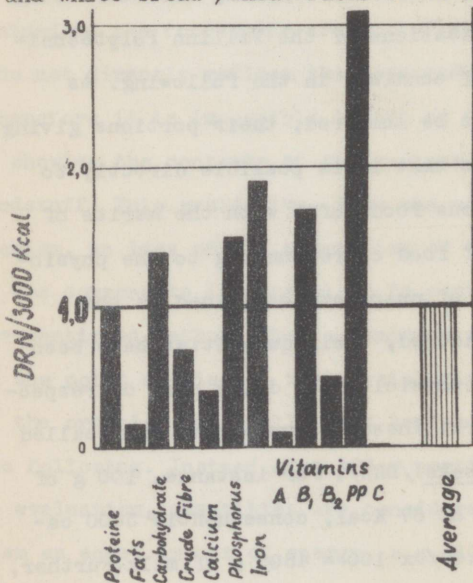


Fig.1. Flour, whole wheat.

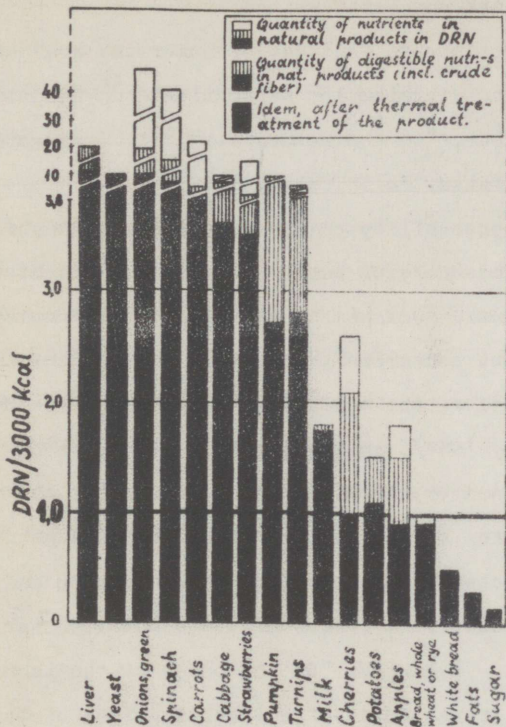


Fig.2. Nutrients in foodstuffs.

of the foodstuffs. Such foodstuffs improve the nutrient balance in the food by compensating for the lacking component nutrients. Figures below one DRN indicate a deficiency of nutrients in the foodstuff. Such graphic indicators make it easier for the broad masses of population and for those responsible for organizing communal dietary to find correct bearings in their evaluation of foodstuffs when compiling a food ration of full value.

Besides this, the suggested method:

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1/ Makes it possible to find way of numerical evaluation of the uniformity of distribution of nutrients in foodstuffs /E.Rannak and B.Kabur, "On the method ...", 11, Transactions of State Univ. of Tartu, No.68, p.19, 1959/.

2/ Opens up a possibility of a more complex evaluation of the physiological adequacy of human nutrition in its historical development /E.Rannak. "Changes in the chemical composition of food during the last centuries", Year-book of the Society of Naturalists attached to the Academy of Sciences of the Estonian SSR, vol.50, p.333, 1957/, and also of the structure of agriculture and food industry from the point of view of the most economical production of the highest nutritional value /E.Rannak. "On biochemical foundations of production and consumption of foodstuffs", Trans. of State Univ. of Tartu, No.97, p.90, 1960. - E.Rannak. "On the bases of the technology of the processing of raw foodstuffs", Publications of the Tallinn Polytechnical Inst., No.88, 1957/.

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