FOUR YEARS OF PLANNED FEEDING IN GREAT BRITAIN

By DR. MAGNUS PYKE
Ministry of Food

TWO fundamental difficulties beset the scientific distribution of nutrients among the population of a warring nation of forty-seven million people. Leaving aside for the moment the immense practical administrative problems involved, there is first the lack of precise scientific information on a number of nutritional matters, and secondly, when the best scientific judgment available has been adopted, there is the difficulty of finding out whether the distribution of nutrients has, in fact, been effective; and if it has, whether the health of the people is being maintained on a nutrient provision which is itself based on incomplete scientific data.

During the last thirty years or so, the science of nutrition has concerned itself almost exclusively with the study of substances present in the diet in minute amounts. A dozen or more vitamins have been discovered, their chemical nature investigated, their physiological significance studied, their distribution in foodstuffs surveyed and the amounts of them needed assessed. The blockade of Great Britain, which put in jeopardy the supply of food itself, at once threw back the emphasis on to the weightier constituents of food.

The fundamental principles governing calorie requirements were worked out in detail by Rubner and Atwater and their colleagues between 1850 and 1907. During the War of 1914-18 and between that and the present War, Cathcart and Orr, Moss and a few others carried on the work. They were, however, only a rearguard of the classical nutritionists: the big battalions studied vitamins and minerals. In first attempts in this War to solve the problem of what was the daily caloric requirement per head of the population, it was only possible to say that 'sedentary' men needed 2,500 calories, 'active' men 3,000 and so on. This, of course, merely changed one question to another: what was a 'sedentary', an 'active' or a 'very active' man? Any competent student, even with information mostly forty years old, could make an estimate of the national needs, but whereas in the university a margin of a hundred calories each way is unimportant, a hundred calories a day for forty-seven million people for a year represents half a million tons of wheat.

Knowledge with regard to protein requirements is even less complete than that of calorie requirements. The figure usually accepted of 70 gm. includes an elastic safety margin. Perhaps 50 gm. would suffice, and of this perhaps 25 gm. of animal protein would be enough for adults. Fortunately, the assessment of total protein requirement is only of academic interest, since the acquisition of calories in such foods as bread from high-extraction flour, and also potatoes, brings with it an intake of protein substantially higher than the minimum requirement.

The Ministry of Food has made the best assessment that scientific knowledge could suggest of the physiological requirement of each nutrient by every class of the population. Judgment was happily reinforced by almost complete agreement with similar estimates made by the National Research Council of America and published in 1941. Simultaneously with this work, at the request of the Ministry of Food, the Medical Research Council was preparing a table of

food compositions to be used as a standard for calculating the composition of the national diet.

Here then was the scientific basis upon which a logical food policy could be built. Nutrients could be translated into those foods which were available and, conversely, crops and shiploads could be assessed in calories, proteins or vitamins. This scientific attitude has in the main been successful and unquestionably must be followed in the future. Freedom from want implies the distribution of food according to physiological need.

The problem, however, is not only one of distributing nutrients systematically. In the spring of 1941, after a winter of bombardment and privation, the national diet of Great Britain, although physiologically sufficient, had reached its lowest ebb, and although bread and potatoes were unrationed there was evidence to suggest that caloric needs were not being filled. Nevertheless, the foodstuff in greatest demand, for which people were prepared to queue, was onions, which are of negligible nutritive value. Furthermore, it was found necessary to transfer acreage intended for vitamin C crops of greenstuff to the production of mustard for pickles. It is a matter of great difficulty and importance to judge at what stage a commodity not of itself of any value becomes of nutritive significance by rendering palatable nutritious food which otherwise would not be eaten.

The Ministry of Food took over the nation's feeding as a going concern. In order to plan improvements and to assess the results of its own actions, it was necessary to know and to be informed continuously about the state of the national nutrition. Two distinct methods are used to estimate the nutrients available per head. On one hand, the amounts of food imported, plus the amounts grown within the country, are known with some degree of precision. Allowances for waste during the various stages of distribution can be made, and thus the nutrients theoretically available per head can be calculated. The degree of reliability of the results of this method of assessment depends on the precision of the Ministry's knowledge of the amounts of food in the country at any time, which, with a commodity like potatoes, for example, can never be perfect, and upon the efficient functioning of rationing and other machinery of distribution.

The second means of gauging continuously the national nutrition is the method of the domestic budgetary survey of the type which has become well known through the work of Sir John Orr. Each week of the year, about 5,000 people from twenty towns throughout the country are under investigation. This war-time food survey is probably the most important single scientific work carried out by the Ministry of Food.

Neither method of investigating the national nutrition is, of course, complete. The figures for total supplies give an estimate of the food available per head of the nation. The budgetary assessment provides a measure of the food bought per head of the family. In neither case can we reach the individual. Both methods, however, are of cardinal value. Figures based on total supply estimates are available over a number of years and render it possible for comparison to be drawn between pre-war and war years, and for estimates to be made for contingencies after the War. The figures from the budgetary surveys show broadly the effectiveness of food distribution and any nutritional changes from month to month. In the surveys, however, a child

is merely a vulgar fraction of a man and we put together without distinction the heads of the coal-miner, the adolescent and the sedentary legislator.

A child's requirements for protein and calcium are proportionally higher than those of an adult. Its digestive machinery is less rugged and smaller and, since his body is growing, errors of diet in childhood may leave permanent effects. The child, then, has first call on milk. It is given supplies of vitamin D in cod-liver oil and vitamin C in concentrated fruit juice. This simple application of nutritional knowledge has not been carried out without administrative and technical difficulty. A reduction of income tax is accepted as some recompense for the expense of a child, but the provision of low-priced or free milk and orange juice to meet the special needs of the child was a new step in enlightened public administration. To provide fruit juice as a source of vitamin C it was necessary to enlist the help of analysts to insure that the stated concentration of vitamin was present in the preparation issued. This called for a certain change in outlook. The agricultural chemist is accustomed to analyse feed for its nutritive value. The analyst of human food, however, is usually engaged in a search for adulterants or preservatives.

Although the nutritive policy of the Ministry of Food is based on the distribution of equal shares to every individual, there is, in addition to the special individual provision of extra rations to children and expectant or nursing mothers and to certain invalids and other special categories, a group distribution to special classes. These classes are school children and industrial workers.

Hitherto it has been possible to obtain sufficient food to provide a nutritionally adequate diet for the population of Great Britain. First-class protein, fats and some other foods are rationed. By good fortune perhaps rather than by good management, of all nations in Europe only in Great Britain has it not yet been necessary to ration bread and potatoes. Nor are ration coupons demanded for communal meals. If bread, potatoes and communal meals were rationed in such a way as to make a material saving in food, it would probably be necessary to impose some measure of underfeeding.

To-day almost a quarter of the school-children in Great Britain receive their main meal of the day 'off the ration', and so do about an equal proportion of the industrial workers. The study of the nutritive value of these meals is an interesting matter. It has been investigated in a way similar in principle to the twofold scrutiny of the total national diet. First, the nutritive values of the catering allowances have been examined. An ordinary restaurant is allowed rations based on one pennyworth of meat per main meal. Industrial canteens receive a penny-halfpennyworth of meat and other additions. Canteens serving certain specified heavy industries are allowed two pennyworth of meat. School meals get the biggest allowances of all and two pennyworth of meat. The meat provided for the children is based on their high physiological needs of animal protein.

Rationed foods supply only a part of the total meal. Its full composition is based on custom, catering facilities and scientific advice. Those responsible for communal catering are eager for nutritional advice which is difficult to give. Daily requirements of nutrients are known with some degree of precision, but little well-grounded information is available about the desirable value for a single meal. In order to find out the nutritional value of

meals known to be satisfactory; to be able to suggest improvements; and to investigate the effects on food values of large-scale catering, the Ministry of Food enlisted the voluntary co-operation of biochemists in more than a dozen towns. These public-spirited workers have analysed the meals and investigated nutritional problems which arise in providing them. This work is continuing.

A number of important technical advances have been made in fulfilling the Ministry's policy of providing a diet which people will eat and which will supply their physiological requirements. Of foremost importance is the national loaf. Eighty-five per cent of the wheat grain is used. The part which is discarded is the least digestible fraction. The discovery that a minute morphological structure, the scutellum, which divides the germ from the endosperm, is by far the richest in vitamin B₁ of all parts of the grain, has enabled a flour to be prepared which is high in vitamin content and low in fibre. A chronic deficiency of vitamin B₁ in the national diet widespread in peace-time has thus been overcome. Other important advances have been the successful production of dried milk and dried egg. Dried meat, fish and vegetables are available for the Forces. The concentrated fruit juices as sources of vitamin C and perhaps other vitamins have already been mentioned.

The application of scientific planning to the nation's food calls for a better understanding by the public of the elementary principles of nutrition. The Ministry has in the past three years conducted an educational campaign stressing such points as the proper choice of foods for a balanced diet and the careful cooking of vegetables to preserve their vitamin C. How far the effects of this campaign are permanent cannot be judged until the relaxation of war-time restrictions once again gives the housewife some freedom of choice. The success of the predominantly scientific policy of the Ministry of Food can only be measured by the economies in shipping which it has rendered possible, and, most important of all, by the health of the nation. The national health has, so far, been well maintained. Clinical surveys for the assessment of nutritional well-being, which are carried out by the Ministry of Health and others, confirm what is suggested by the Ministry of Food's own surveys of food intake, that the rational distribution of the nation's food resources has caused, in general, an improvement rather than a deterioration in nutrition in Great Britain during these four years of war.

BIOGEOCHEMICAL RESEARCH IN THE U.S.S.R.

By A. P. VINOGRADOV

GEOLOGISTS have always taken an interest in the problem of the influence of life on the chemical processes going on within the earth's crust. In the early days of the Revolution, V. Vernadsky, first in the Ukrainian Academy of Sciences at Kiev and later in the Academy of Sciences of the U.S.S.R. in Leningrad, organized, on a very modest scale, experimental work in the study of the chemical composition of organisms. His friend and pupil, Prof. Y. Samoilov, of the University of Moscow, working independently, conducted research on the part played by organisms in the formation of soils. F. W. Clarke in his "Data of Geo-chemistry"