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Basic Tasks of Hygiene in the Field of the Study of Nutrition of the Population

Z. M. Agranouskiy

For the first time in the history of mankind the problem has been put in the Soviet Union on a public, government-wide scale of attaining a level of food product consumption which is based on scientifically grounded nutritional norms required for the complete and *harmonious* development of a healthy person. The accomplishment of this task is based on the acts of the Nineteenth Congress of the CPSU [Communist Party of the Soviet Union] and of the September plenum of the TsK KPSS [Central Committee of the Communist Party of the Soviet Union] and the subsequent resolutions of the party and the government providing for an *sharp* increase in production of articles of public consumption in the country and the creation of an abundance of food products.

The increase in the production of nutritional products in the USSR is contributing to a considerable improvement in the nutrition of the population both in a quantitative and qualitative sense. In the light of the historic resolutions of the party and the government broad perspectives are being opened up in the field of the study of the nutrition of the population, and the most favorable conditions are being created for the successful accomplishment of one of the main tasks of workers in nutritional hygiene--the organization of proper nutrition for the population.

According to current concepts, proper nutrition should be designed in consideration of the physiological requirements associated with various working and living conditions of man and the age characteristics of the organism.

Food, I. P. Pavlov pointed out, is the main connection of the living organism with the environment. After the investigations by the great physiologist and his students, *who* created the physiology of digestion, the science of nutrition was given a solid basis for its further progressive development. The investigations of recent times have made it possible to establish the tremendous importance of nutrition for the correct development of the growing population of the rising generation, for increasing the vital functions of the organism and its resistance to disease, strengthening the creative efforts and working capacity of people, increasing health and prolonging life. Therefore, nutrition is *an* environmental factor which has a varied influence on the increase in the sanitation indices of health of the population.

The investigations of Soviet scientists (Budagyan, Yefremov, Krotkov, Lavrov, Makarychev, Molchanova, Razenkov, Sharpenak, Shaternikov and others)

have solved the problem of the quantitative and, to a considerable degree, of the qualitative aspect of nutrition, although in this area there still remain many unclarified problems which are the subject of ^{the} further many-sided investigations which are being carried out on the basis of the physiological teaching of I. P. Pavlov. However, even at the present time the workers in the field of nutrition are adequately equipped so that, based on modern scientific data and the achievements of hygienic practice, they can work out and recommend measures for making the nutrition of the population effective.

The development of these measures should be based on ^a systematic and planned study of nutrition, primarily of the organized population groups. A necessary premise for the successful resolution of this task is the study of nutrition in its interrelationship with the indices of public health.

Among the organized groups of the adult and child population groups which are on rationed nutrition as well as certain occupational groups of workers in various branches of industry and hard workers in the fields are acquiring essential importance. The nutrition of adolescents studying in the FZO [Industrial Training] and RU [Trade Schools] schools, the nutrition of children in nurseries, kindergartens, children's homes, the nutrition of various occupational groups of workers whose work is connected with industrial hazards in various branches of industry, construction and transportation, workers on night shifts, agricultural workers in the sovkhozes, MTS [Machine and Tractor Stations] and kolkhozniks during the period of field work require a more accurate hygienic standardization.

The current importance of the problems listed and the great possibilities which the ^{medical} hygienist has at his disposal in this field can be illustrated by the articles of Z. P. Koshina and Ye. A. Lebedeva, who made a study of the nutrition of the pupils in children's homes, which are published in the present collection. A study of the organization of nutrition, the structure of the types of food products at different periods of the year, the diet, the quantitative and qualitative composition of the diet with checking of the adequacy of the most important qualitative elements of the food--protein and calcium--by means of investigations of the nitrogen and calcium balance supplemented by a checking of the physical development of children made it possible for the authors to obtain objective data which characterize in detail the nutrition of the pupils in children's homes.

In the investigation of the nutrition of children the authors obtained valuable material with respect to the ^{assimilability} of protein, determined the factors which have an influence on retaining nitrogen and calcium in the body, studied the calcium balance and the nitrogen balance in children of different

ages, as well as the interrelationships of calcium excreted by the intestine and kidneys, and they established other facts which are of independent scientific interest. These investigations served as the basis for the development of measures for increasing the efficiency of nutrition of children, which are at present being incorporated into practice.

Along this line a study was made of hospital nutrition (general diet) at the chair of the hygiene of nutrition of the ~~Leningrad~~ Leningrad Sanitation Hygiene Medical Institute⁷, the nutrition of students in trade schools, and a study was completed concerning nutrition in pioneer *campes*.

Interesting data were obtained in the study of nutrition in the *dietetic* dining rooms of the *public* type and the dietary sections in industrial enterprises.

The special attention of medical hygienists should be attracted by problems of nutritional organization at industrial enterprises: the condition and adequacy of the public nutrition system in the factories and plants; the assortment of food, its variety and the structure of food types in accordance with the requirements of those being fed and the nature of work in various industries; the presence of vegetables, dairy products, dietary courses for persons needing diets; the nutritional routine; the circumstances present during eating, etc.

Study of the nature of nutrition and/diet at industrial enterprises can be carried out, as has been recommended by Gordin and Startsev, according to the following exemplary plan:

- a) a general characterization of the group;
- b) the nature of the nutrition according to the menus and the actual outlay of food products;
- c) ~~the~~ a characterization of the existing diet;
- d) hygienic evaluation of the nutrition according to the data of the organoleptic and chemical examination of the daily rations;
- e) hygienic evaluation of the existing diet by comparison with the standards established by the decision of the administration, and with the physiological norms;
- f) a characterization of the conditions under which food is eaten and the sanitary-technical condition of the food section;
- g) the working out of practical recommendations directed at improving nutrition, with the aim of ^{bringing} the level of consumption to the level of the norms of the physiological requirement.

This system, which is completely acceptable in studying nutrition in groups receiving nutrition according to definite rations, can be utilized

also in the study of nutrition in dining rooms of the *public* type at industrial enterprises. However, the problem of the physiological value of nutrition with free selection of the courses should be decided in a somewhat different way. In this case, a study is needed of the nature of the assortment of food products and of the food consumed according to the data of the average 24-hour outlay of courses for a definite period of time (at different periods of the year) by means of questioning the consumers, laboratory tests of the food and biological value of the most common dishes, or by means of a theoretical calculation of the chemical composition and calorie count of the food on the basis of menu data.

With free selection of the courses and an inadequate acquaintance with the chemical composition of the food and the physiological requirements for it the consumer can make out a diet which suffers from incompleteness with respect to certain food substances or to the calorie count. Under these conditions, various forms of propaganda concerning a proper diet assume essential importance.

An expedient measure was proposed by Salganik, who studied the nutrition of workers in the Automatic Machine-Tool Plant imeni Gor'kiy. For the purpose of incorporating physiologically sound nutrition at the plant the author worked out the so-called "menu of proper nutrition". In this menu several variants of breakfasts, dinners and suppers are recommended for those dining at the public nutrition enterprises. The recipes of the courses in the menu are made out so that any recommended breakfast in combination with any recommended dinner and supper provides the physiological norm for nutrition and a proper diet for the given population group. The system being proposed makes it possible to select courses freely in accordance with taste, habit and the material capacities of the consumers. From this example it is seen that the medical hygienist has at his disposal extensive possibilities for making nutrition more efficient also in unorganized population groups.

In the study of nutrition of workers at industrial enterprises the attention of the medical hygienist should be directed at the incorporation into practice of the so-called "prophylactic nutrition", which is not only has the usual recommended physiological value but also is directed at the prophylaxis of disease connected with the working conditions in the given branches of industry.

It is known, for example, that vitamins have exceptional significance as an active factor affecting the metabolism and the reactivity of the organism. In working in hot shops considerable losses in the water-soluble C and B group vitamins may occur in connection with the increased perspiration and an

activation of the oxidative processes. In this case, the medical hygienist can and should secure an increase in the vitamin content of the food by means of including menus and assortments of food products in the rations which possess a high vitamin rating, and supervise the accomplishment of measures providing for the preservation of the vitamins during the preparation process and the process of storing the food, and, if it is necessary, he should organize special supplementary vitaminization of the food with vitamin preparations. With respect to vitamins B₂ and PP this problem has been discussed in the article of O. P. Maykova, which has been included in the present collection.

Problems of the proper prophylactic nutrition at industrial enterprises as a whole have been inadequately worked out ^{as far}; in studying the nutrition and the recommendations of measures for making it more efficient the medical hygienist can make use of consultations with the occupational-disease pathologist and physicians in the health stations. A careful analysis of the etiology and pathogenesis of disease makes it possible to approach the proper solution of this problem. In this connection data of the periodic medical examinations of workers are of great interest; the study and analysis of these data can serve as the starting material, in a number of cases, for the development of intensified measures for making nutrition more efficient.

In the study of nutrition of industrial enterprises the special attention of the medical hygienist should be attracted by the nutritional conditions of the young workers, who in large measure consist of persons who have been graduated from trade schools of different types; while during their training period they received food in an organized manner and in accordance with definite rations; subsequently, with a transition to industry, the nutrition was accomplished according to free selection of courses in the general plant dining room. ^{The} study and increase in the efficiency of nutrition of young workers are acquiring particularly great current importance. The nutrition of young workers 17-19 years of age should ^{not} be organized in consideration only of the nature and intensity of the work but also of the physiological characteristics of the metabolic processes in the body during this transitional age period.

An important place in the work of the medical hygienist should be occupied by the study and increasing the efficiency of the ^{nutrition of the} population ~~nutrition~~ which lives under conditions of rural localities. In the sovkhoses, MTS [Machine and Tractor Stations], in schools for mechanizers of agriculture the study of nutrition is accomplished chiefly according to ^{principles} ~~principles~~ presented above, with consideration of the local conditions. Nutritional conditions during the period of field operations requires special

attention -- the organization of nutrition, the remoteness of the food stations from the places of work, the possibility of obtaining hot food, variety of food, the structure of the food assortment, the system of supply of food products with consideration of the season of the year and the requirements of the consumers, the preservation of the biological integrity of the food and an observance of the sanitation requirements in its processing, a sanitary routine at places of processing and eating the food. The medical hygienist should give active consultation aid in the proper organization of nutrition at public nutrition installations in rural localities, keeping in constant touch with the directorate of the kolkhoz.

The study of the nutrition of unorganized population groups under conditions of rural localities is important. In/^{making} such investigations considerable organizational difficulties arise as well as the need for careful selection of the working methods. On the basis of the experience of the chair of hygiene of nutrition of the LSGMI the study of nutrition as a complex component part of the dispensary examination of the population is the most expedient. In this case, it seems ~~not~~ possible not only to characterize the actual condition of nutrition but also to tie in the data obtained with the indices of health, because in a dispensary examination, along with the study of the health of the population, the condition of other factors of the environment, working and living conditions, etc. is also demonstrated.

The study of nutrition of unorganized groups of the rural population is possible also with the application of other methods. At the chair of the hygiene of nutrition of the LSGMI K. D. Kharakhorkina used two methods in the study of nutrition in a number of kolkhozes of Krymskaya and Leningradskaya Oblasts: 1) a questionnaire which dealt chiefly with the diet and the structure of the food assortment (the nutrition of 754 persons was studied by this method) and 2) a daily determination of the total quantity of food products used by various families with a subsequent recalculation per person (25 families were examined by this method). The data obtained in this work revealed that defects in nutrition are most often the results of an inadequate acquaintance of the kolkhoz ^{workers} with the problems of proper nutrition. The unsatisfactory structure of the food assortment may be associated also with defects in the work of planning and mercantile organizations.

Medical hygienists still are not giving enough attention to the regular study of nutrition of unorganized population groups; nevertheless, this is extremely important not only for the accumulation dynamically of data concerning the condition and the changes in the population nutrition and the prevention of diseases associated with the quantitative and qualitative inadequacy of

nutrition but also for the purpose of prepaganda concerning proper nutrition, the role of which will increase with the creation of an abundance of food products in the Soviet Union.

For the purpose of characterizing the condition of the population nutrition certain data of the morbidity rate, which the hospital-polyclinic system has at its disposal, can be utilized: material concerning the gastro-intestinal morbidity rate, cases of hypo- and avitaminoses, data of examination of the blood, particularly of the concentration of hemoglobin and the erythrocyte count (which in a number of cases can speak for ^{the} condition of protein nutrition), etc. The presence of a connection of the medical hygienist with physicians in the hospital-polyclinic system and mutual information between them can prove to be very useful in the study and development of measures for increasing the efficiency of the population nutrition.

Increasing the efficiency of the population nutrition is associated with the structure of the food product consumption. In speaking about the problems of the Communist Party of the Soviet Union in the field of public nutrition, N. S. Khrushchev noted that the most important of them is an improvement in the structure of consumption, chiefly from livestock products and vegetables ~~xxx~~ ^{are} which/characterized by a high degree of food and biological value.

In the study of the public nutrition and the development of measures for increasing its efficiency the medical hygienists can not circumvent the problem of the structure of the food products consumed. Attentive study and profound analysis of the appropriate data, particularly if these data will be combined with the indices of the physical development of the population in childhood and at mature ages, can give adequate material for characterizing the condition of the public nutrition.

The work of medical hygienists in this direction, as has been noted by the Ministry of Health, "should have as its task the demonstration of defects and their causes in the food-product supply of the population and the development of effective measures for eliminating these defects". In accordance with this the participation of medical hygienists in the work of planning the provision and production of food products and giving sound hygienic requirements for increasing the efficiency of this planning is entirely expedient. In this connection, it is extremely important to direct the attention of planning organizations to the condition of the milk, dairy-product, ^{and} vegetable supply of the population, the production of which is seasonal, and the consumption is constant, to assure the regular supply of these products in all ^{seasons} of the year as well as to recommend the most perfect conditions of storage and transportation of the food products from a hygienic point of view.

The work of the medical hygienist on the study and increasing of the efficiency of population nutrition should be based on the work of a well-equipped laboratory with the application of modern standardized methods of investigation. Only in this case will the medical hygienist have at his disposal the objective scientific data which can be analyzed and generalized. The analytical network of laboratory investigations should be expanded by means of the determination not only of the organic but also of the vitamin *and* mineral composition of food, a problem which can be accomplished even at the present time in the case of many laboratories of the sanitary-epidemiological stations.

An important place in the matter of increasing the efficiency of population nutrition should be occupied by extensive propaganda *on* the scientific basis of nutrition with the utilization of modern methods of sanitation-education activity and active *cooperation* of broad groups of medical workers in this work.

In the present article one of the most important problems in the field of the hygiene of nutrition has been touched on, which has tremendous importance for increasing the health indices of the population. Increasing the efficiency of nutrition of the population is a component part of the general problem of the Communist Party of the Soviet Union directed at maximum satisfaction of the constantly growing material and cultural needs of ^{*the*} Soviet people.

Hygienic Characteristics of the Organic Composition of the
Food Ration of Pupils in Children's Homes

Z. P. Koshina

Nutrition is one of the most important and active factors in the environment, exerting a varied influence on the human body. ^{The} Soviet physiologist, Sechenov, and particularly Pavlov have repeatedly indicated the importance of nutrition for bodily activity. Through the works of Soviet scientists it has been established that by changing the nature of nutrition it is possible to influence different functions and the metabolism in the body in the necessary direction.

Complete nutrition is determined by the content of necessary food substances in the rations -- proteins, fats, carbohydrates, minerals, vitamins, both with respect to their qualitative and quantitative relationships.

The nature of nutrition is of particular importance for the growing body, because an increased growth of all tissues and the formation of the body in childhood and youth require the optimum content and a proper interrelationship of all the food constituents. An infant's future growth and development depend on the correctness of his nutritional structure beginning with his first few days of life.

In designing the proper nutrition for children it is essential to begin with differentiated physiological norms for each age period. However, at the present time existing norms of the food product assortment for pupils in children's homes are designed without consideration of this important principle and provide the same rations for all age groups of pupils.

In connection with this, we considered it necessary to study the actual condition of nutrition in the children's homes, namely: the content of proteins, fats, carbohydrates, and the caloric count of the food rations for pre-school and school children's homes in the rations. (A simultaneous study was also made of the salt composition of the rations; see Ye. A. Lebedeva's article (page 25)). In view of the special importance of protein for the growing organism we posed the problem of investigating the condition of the nitrogen balance in children of different age groups simultaneously with the study of nutrition, because nitrogen balance can be an indicator of the adequacy of protein coming in with the food against the background of a content of other components in the rations and of the general condition of metabolism.

One of the most important requirements of proper nutrition is a correctly organized diet, in connection with which we made a study also of the diet in

children's homes, namely: the hours of eating, the number of times of eating, and the distribution of the calorie count and food substances for various meals throughout the day.

For the purpose of *determining the* interrelationship of nutrition with the health indices we studied the physical development of the pupils of three children's homes with consideration of other environmental factors (work and life).

In all, 123 24-hour rations were studied, whereby 33 of them were studied during periods of experiments on the investigation of the nitrogen balance.

For the purpose of determining the quantity of proteins in the food rations we made use of the Kjeldahl semimicro-method according to a system recommended by Petrun'kina. Fats in the rations were determined according to the Soxhlet method. The concentration of carbohydrates was calculated by the difference in the dry residue.

For the pre-school children's home 41 complete 24-hour rations were examined.

Data concerning the concentration of the main food substances and the calorie count of the rations of the pre-school pupils at various months of the year are presented in Table 1.

[Please see end of this chapter for all 5 Tables mentioned herein.]

From Table 1 it is seen that the protein concentration in the rations according to individual months was found to be non-uniform: the greatest quantity of protein occurred during the spring months, and the least, in the autumn. This principle becomes clear through a comparison of the food-product assortment rations used for analysis according to the seasons of the year; during the autumn a larger quantity of vegetables is contained in the food-product assortment, characterized by a low concentration of protein, and the quantity of products of animal origin rich in protein decreased correspondingly; a similar situation occurred also with respect to meal-^{groat} products.

The protein requirement is determined not only by its absolute content in the rations but also by its biological value, that is, the capacity of satisfying the requirements of the body for all the essential amino acids and, by the same token, of maintaining the necessary level of the nitrogen balance. This may be achieved by including a certain quantity of complete proteins in the rations, chiefly from products of animal origin.

According to the old investigations of a number of authors (Danilevskiy,

Shaternikov, Palladin, Molchanova), the concentration of proteins of animal origin in the food rations should comprise no less than one-third of the total quantity of protein. According to the new standards, recommended by the Institute of Nutrition of the Academy of Medical Sciences USSR, the content of proteins of animal origin in the food should amount to about 60 percent of the total quantity of protein per day.

The content of animal proteins in the rations which we studied *at* the pre-school children's home amounted, on the average (for the year), to 45.43 percent with variations in different months within limits of from 39.5 to 49.96 percent. The lowest percentage of proteins of animal origin occurred during the autumn, amounting, on the average, to 42.32 percent.

The content of fats in various rations of pre-school pupils also showed considerable variations--within limits of from 45 to 65 grams. The lowest concentration of fat in the rations occurred during the autumn months.

The quantity of carbohydrates in various food rations was *mainly* within limits of from 280 to 360 grams; on the average, 315.64 grams (Table 1). As seen from Table 1, it was quite constant, on the average, for the various months, and in almost all cases the 24-hour quantity of carbohydrates exceeded 300 grams.

In comparing the data obtained concerning the concentration of the principal food substances in the rations of pre-school students with the physiological norms recommended for children of the same age certain discrepancies may be noted (Table 2).

From Table 2 it is seen that the actual content of proteins, on the average, ^{lagged} somewhat behind the physiological norm. The quantity of fats was less than the recommended norm. The quantity of carbohydrates exceeded the physiological requirements. The latter is explained by the nature of the food-product assortment, that is, by the inclusion of food products rich in carbohydrates in the rations.

The correct interrelationship of the various food substances is of great importance for good assimilation of the food as a whole and particularly of its protein component. According to data in the literature, it is well known that the highest percentage of assimilability of the food substances in children is achieved when the ^{proportion} between the quantity of protein, fat and carbohydrates is that of 1:1:4 (Molchanova, Frumin).

In the study of the food rations of pre-school *pupils we* established the fact that the optimum relationship indicated actually was *not*

achieved and amounted to 1:0.82:5.05.

The total calorie count of the food rations of pre-school pupils amounted to 2,035 calories with variations on various days of from 2,000 to 2,300 calories.

The calorie count of nutrition of various months is presented in Table 1, from which it is seen that in the majority of cases it was more than 2,000 calories and that it drops to 1,800-1,900 calories only in the autumn months. Such a situation was the result of a decrease in the concentration of proteins, fats and carbohydrates in the rations, which was indicated above. However, the increased calorie count of the food rations with an inadequate concentration of proteins and particularly of fats was explained chiefly by the considerable concentration of carbohydrates. On the average, 12.6 percent of the total calorie count was provided for by proteins; 23.75 percent, by fats; and 63.65 percent, by carbohydrates.

On the average, the calorie count of the rations of pre-school pupils amounted to 2,035 calories and exceeded the recommended physiological norm for the given age.

A study of the nutrition of children of school age was made in two school children's homes--Nos. 43 and 65. In these homes 49 24-hour rations were examined.

In the school children's homes there were children from seven to 15 years of age, that is, two age groups of children were combined: 1) from seven to 11 and 2) from 12 to 15 years.

In the analysis of the food-product assortment of the rations the presence of seasonal variations in the content of food products of animal origin may be noted. During the winter period the greatest content of meat-fish products and eggs occurred; during the autumn, the concentration of these products was notably reduced. The reverse relationships applied to the milk and dairy product concentration, that is, a smaller quantity of these products came about in the winter period, and they were of considerable specific proportion in the autumn. There was no noticeable difference in the content of vegetables for the different seasons.

The data obtained are shown in Table 3 with respect to the content of the main food substances in the rations of school students and the calorie count of the rations for various months.

As is seen from Table 3, the average 24-hour content of proteins by months was not constant and amounted to from 72 to 87 grams.

The quantity of proteins of animal origin, on the average, amounted to 35.6 percent of the total quantity of protein in the food rations with variations in different months from 31 to 41 percent. Here, it should be noted that the quantity of animal protein from milk and dairy products was insignificant: on the average, the quantity of milk per day during the year amounted to a total of 157.0 cubic centimeters, while in various months it was even lower, or there were no dairy products used at all.

The quantity of fat, on the average, according to months is presented in Table 3; the lowest quantity of it was noted during the winter; on the average, the fat content amounted to about 50 grams.

Complete animal fats amounted to 82 percent of the total quantity of fat in the rations.

The concentration of carbohydrates, as is seen from Table 3, was subject to variations in different months within limits of from 394 to 462 grams, amounting, on the average, to 434.8 grams a day.

In comparing the data obtained concerning the actual content of food substances in the rations of school students with the physiological norms for children of the same age differences were found (Table 4).

From Table 4 it is seen that the actual content of protein in the rations corresponded to the physiological norm for children of younger school age and

was 19.0 grams behind the normal ^{established} ~~part~~ ^{norm} for ^{older} children. The quantity of fats for both age groups was considerably less than the normal. The content of carbohydrates corresponded to the physiological norm for ^{older} children, considerably exceeding that for the younger school children.

The relationship between the food substances in the rations of school students amounted to 1:0.63:5.55, that is, by comparison with the recommended rations it contained an increased quantity of carbohydrates with a low content of fat.

The caloric count of the rations of the school students amounted, on the average, to 2,541 calories with variations ~~in~~ for individual months within limits of 2,408-2,722 calories.

The calorie count of the rations of the school students came, on the average, from proteins to the extent of 12.54 percent; from fats, 18.12 percent; from carbohydrates, 69.34 percent.

Therefore, the calorie count of the rations of school students was somewhat too high for children of the younger school age (recommended norm for them is 2,291 calories) and insufficient for the older school students (2,541 as against 2,940 calories).

The caloric count as supplied by various food substances also showed differences from the recommended optimum interrelationship: the calorie count which came from fats lagged considerably behind the recommended norm, while that obtained from carbohydrates exceeded it. The calorie count from the protein component was slightly less than the recommended one.

Investigations of the state of the nitrogen balance were made in children of three age groups: age six, 10-11, 14-16 years.

For the purpose of carrying out the investigation a selection of practically healthy children was first made in conjunction with the physician of the children's home.

In the pre-school children's home the balance was studied in six children--three boys and three girls. Of the younger school students five children--two boys and three girls--were selected; of the older school students, three boys and three girls. The children who were under observation led the form of life which was usual for them: they visited school, carried out their work at home, occupied themselves with lessons, etc.

For purposes of providing a complete and accurate collection of material we organized a constant tour of duty in the children's home as well as in the school, places where the children took walks, etc. Observations were made for the first four three-day periods, one following the other.

Before making the examination a study was made in every children's home of the structure of the food-product assortment for the previous year, and the average annual outlay of food products per ^{child} infant per day was calculated. On the basis of the food product assortment calculated in this way we subsequently (during the observation period) made out the rations for the determination of the nitrogen balance.

The performance of the investigation was always proceeded by a preliminary preparatory three-day period during which nutrition was the same as during the preceding experimental period. This preliminary period was necessary, on the one hand, in order to accustom the children to ^{the} strict routine of the observation period, and, on the other hand, in order to stabilize the nitrogen balance in the body for a given ration, although the ration devised (on the

basis of the average annual food product assortment) was practically the same in its character as the ordinary diet of the children.

The ration was issued to the children by weight according to the results of the courses: the uneaten food residues were gathered up and were taken into account in computing the balance.

The collection of urine was made for each day separately; for the purpose of the analysis a five-percent 24-hour quantity of urine was used which was preserved with concentrated sulfuric acid. The stool of various experimental periods was divided up with bilberries, which were issued in quantities of 30 grams.

Through an investigation of the nitrogen content in the average sample of urine and stool (for the entire three-day period) the total quantity of nitrogen excreted from the body was established.

In comparing the data of the intake of nitrogen into the body and its excretion in the urine and stool, we established the state of the nitrogen balance.

During the period of the investigations ^{on the nitrogen balance} the food rations contained, on the average, 66.1 grams of protein, 54.26 grams of fat, 340.0 grams of carbohydrates; the total calorie count amounted to 2,171 calories.

On the basis of our investigations it was established that the quantity of protein intake in children of pre-school age (age six) varied within limits of from 3.1 to 3.55 grams per kilogram of weight and corresponded to the recommended norm.

In all children who were under our observation a persistently positive nitrogen balance was present. The nitrogen balance, on the average, for 12 days of observation varied for individual children within limits of from \wedge 2.023 to \wedge 2.839 grams per day. The percentage of nitrogen retention was within limits of from 20.54 to 27.8 percent of the total quantity of nitrogen administered.

It should be noted that in comparing the average figures of the nitrogen balance for the entire 12 days we did not find any differences in nitrogen retention in boys and girls of this age.

The intake of nitrogen in milligrams per kilogram of weight of the child during the observation period amounted to from 400 to 600; the intake within limits of from 400 to 550 milligrams per kilogram of weight produced an increasing retention of nitrogen from 85.3 to 134.8 milligrams per kilogram of weight. With an intake of nitrogen of more than 550 milligrams per kilogram of

weight a reduction in its retention was observed. This corresponded to a quantity of protein higher than 3.5 grams per kilogram of weight. A reduction in nitrogen retention with an intake of more than 3.5 grams of protein per kilogram of weight was evidence, apparently, that this quantity was excessive. Similar cases have been noted by a number of authors in the investigation of nitrogen balance in children (Frumin and others).

The assimilability of protein on a mixed diet containing 47 percent animal protein and 53 percent vegetable protein amounted to 82-85 percent in the majority of children; in two children it was within limits of 76-78 percent.

The condition of the nitrogen balance in children 10-11 years was determined for nine days. The ration during the period of carrying out the examination contained, on the average, 84.51 grams of protein, 49.23 grams of fat, and 492 grams of carbohydrates. Its calorie count amounted to 2,824 calories. In general, the rations of this period were not much different from the ordinary rations throughout the year.

An intake of protein for children of this age is recommended of 2.5-3.0 grams per kilogram of weight per day. In our investigations the quantity of protein ingested per kilogram of weight was, on the average, within limits of from 2.42 to 2.98 grams.

The nitrogen balance in children 10-11 years of age was persistently positive. On the average for the nine days for different children it was within limits of from 4 2.279 to 4 5.148 grams a day. Two children had the highest nitrogen retention, which may be related to a certain lag in their physical development (in weight and height) by comparison with the average standart (Molchanova).

The percentage of nitrogen retention during all the observation periods in various children was, on the average, within limits of from 16.96 to 38.6 with respect to the total quantity of nitrogen. The nitrogen intake per kilogram of weight per day amounted to from 350 to 500 milligrams. It was established that along with an increase in the nitrogen intake its retention in the body increased correspondingly -- from 77.5 to 129.9 milligrams per kilogram of weight.

The assimilability of protein in children aged 10-11 on a mixed diet containing 33 percent animal protein and 67 percent vegetable protein varied within limits of from 80 to 82 percent; in one case it amounted to 77.8 percent. A lower percentage of protein assimilation in certain children with the

same composition of the rations may be explained, apparently, by their individual characteristics.

A study of the nitrogen balance of older school children was made for 12 days. During the period of investigation the rations were similar, in their chemical composition, to the ordinary rations throughout the year and contained

81.26 grams of protein, 46.94 grams of fat, 94.45 grams of carbohydrates; the total calorie count amounted to 2,789 calories.

The protein intake per kilogram of weight with the rations of this composition was different in boys and in girls and amounted, on the average, to 2.03 to 2.18 grams for boys and 1.25 to 1.6 grams per kilogram of weight per day for girls.

The recommended protein norms for children from 12 to 16 years of age are 2.0-2.5 grams per kilogram of weight. Based on these norms, the quantity of protein ingested by boys was at the lower limit of the recommended norm, and in girls was lower than the recommended norms.

The condition of the nitrogen balance in boys and in girls was different. The nitrogen balance in boys was from \pm 3.288 to \pm 3.940 grams of nitrogen per day in boys, on the average, for the 12 days of observation, whereas in girls it varied within limits of from \pm 1.308 to \pm 2.379 grams a day.

The boys who were under observation were 14 years of age, that is, during the period of active growth and the formation of the body, when an increased requirement of protein is usually observed. In connection with this, a higher nitrogen retention was observed in them even from a comparatively inadequate quantity of it which was contained in the rations. The girls were 15-16 years of age, that is, in a period when growth and formation of the organism has, by and large, been completed. They did not show such a high degree of protein retention.

The quantity of protein in the rations of girls, however, was also inadequate: at various periods a very low nitrogen balance was shown in them (\pm 0.48 grams).

The percentage of protein retention in boys amounted to an average of from 25.13 to 30.31 during the 12 days of observation; in girls, it ranged of from 10.23 to 18.83 percent of the total quantity of protein administered per day.

The nitrogen intake per day per kilogram of weight in children of this age varied from 200 to 400 milligrams, producing, respectively, an increase in retention of from 32.6 to 104.4 milligrams of nitrogen per kilogram of weight.

The assimilability of protein on a mixed diet containing 31 percent animal protein in the majority of cases amounted to from 80 to 82 percent, and in two cases it was equal to 84-85 percent.

A properly organized diet is of great importance in designing proper nutrition. Lavrov, Molchanova, Vasil'yeva and others consider a four-meal diet to be most efficient, with distribution of the food in accordance with working and living conditions throughout the day. With respect to the nutrition of children Ignatov also considers a four-meal diet most expedient; Molchanova adheres to the same opinion. The distribution of food recommended by these authors ^{for} the day almost coincides (Table 5).

In the pre-school children's home there was a four-meal diet and strictly established hours for eating, namely: breakfast at 9:00 a.m.; lunch, at 1:00 p.m.,
afternoon meal, at 4:00 p.m.; and supper, at 7:00 p.m. The distribution of the calorie count, on the average for the day, was the following: for breakfast, 28 percent; for lunch, 32 percent; for the afternoon meal, 15 percent; and for supper, 25 percent.

In comparing the data which we obtained concerning the distribution of food with respect to the different meals in pre-school students on diets recommended by Ignatov and Molchanova, the presence should be noted of a certain discrepancy in the distribution of the calorie count with respect to breakfast and lunch, namely: the calorie count of the breakfast of the pre-school students somewhat exceeded the recommended norm, while the calorie count for lunch was less. The calorie count of the afternoon meal and supper corresponded to the recommended norms.

Insignificant discrepancies in the calorie count of breakfast and of lunch can not be considered of essential importance if we take into consideration the fact that the full activity of the child begins in the morning, and in connection with this the food requirement can be increased. As far as the distribution of proteins, fats and carbohydrates throughout the day is concerned, it is recommended by certain authors (Bremner) that it be the same as the

distribution of the calorie count.

In the study of the distribution of the various food substances throughout the day it was established that the quantity of proteins used for supper was somewhat excessive, whereas there was an inadequate quantity taken at lunch; the quantity of fats, as a rule, was increased for breakfast and inadequate at lunch. Only the content of carbohydrates was distributed most efficiently in the rations throughout the day.

In the school children's homes a three-meal diet was used with meals as follows: breakfast at 8-8:30 a.m.; lunch at 3-3:30 p.m.; and supper at 7-7:30 p.m.

The majority of authors (Lavrov, Molchanova, Reysler) considers the three-meal-a-day system to be inefficient even for adults, in view of the fact that the prolonged interruptions between the various meals cause disturbances in the body's condition.

With the three-meal-a-day system in the school children's home the gap between breakfast and lunch amounted to 6½ to seven hours. For a small number of children occupied in school during the second shift lunch was given at 1 p.m., which correspondingly increased the gap between lunch and supper to six to 6½ hours. This type of diet in school children's homes must be considered as not satisfying the hygienic requirements. The actual distribution of the calorie count was the following: for breakfast, 31 percent; for lunch, 38 percent; and for supper 31 percent.

The calorie count for lunch (38 percent of the 24-hour rations) should be considered inadequate, because even those authors (Molchanova) who consider it possible to recommend a three-meal diet as a minimum for adults set apart 45-50 percent of the 24-hour calorie count for lunch. Lunch is the main meal during the day, and when there is an inadequate calorie count it can not cover the energy losses which have occurred during the first half of the day, particularly after such a prolonged interruption in meals (6½-seven hours). The calorie count of supper, which amounts, on the average, to 31 percent, should be considered too high and as not satisfying the requirements of the efficient distribution of food, in view of the fact that overloading the stomach before sleep has an unfavorable influence both on the assimilation of food and on the normal course of sleep.

Therefore, both the number of times meals are taken a day as well as the distribution of food with respect to the calorie count throughout the day should be considered unsatisfactory in the school children's homes studied.

In the study of the distribution of the various food substances according to meals throughout the day it was established that the quantity of fat taken

for supper was too high (32 percent) and was inadequate at lunch time. The distribution of carbohydrates throughout the day was also inefficient. Only the distribution of protein can be considered satisfactory: the main quantity of it was taken during the afternoon meals.

On the basis of the data presented the conclusion may be drawn that the existing diet in the children's homes examined can not provide the proper intake of food substances during the day in accordance with the energy expenditure and the requirements of the child organism.

We compared
/the data obtained on the physical development of 225 children with the standards for the physical development of pre-War children (1938/39, Wasserman, Gutkin), and thereby a rating was made of the standard deviation of the physical development of the children investigated. As a result of the comparison it was shown that the great majority of children showed deviations from the mean figures of physical development within limits permitted by the normal variation. In individual cases both/ ^{at} preschool age and older school age groups a lag was established behind the mean indices within limits of from - 1 to -2 sigmas. These individual cases may be connected with the presence of residual signs of rickets in pre-school pupils, and with nutritional deficiency and unfavorable war-time living conditions in children of school age; during the war time, these children were of pre-school or younger than pre-school age. In our investigation defects were shown in the children's rations which naturally could not contribute to eliminating the abnormalities in physical development detected.

Conclusions

1. In the study of food rations of pupils in children's homes it was established that the concentration of proteins in the rations of ^a pre-school children's home approaches the optimum physiological norms for the given age; the content of proteins in the rations of school children's homes corresponds to the physiological norm for children of seven to 11 years of age and is inadequate for children of older ages.
2. The quantity of fats in the rations of both pre-school and school children's homes lags somewhat behind the physiological norms for all age groups.
3. The content of carbohydrates in the rations corresponds to the physiological norm for older school students and considerably exceeds the physiological norm for children of pre-school and younger school age.
4. Seasonal variations are noted in the content of food substances in the rations, which is associated with the nature of the food-product assortment during various periods of the year.
5. The calorie count of the rations in children of pre-school and

younger school age proved to be higher than the norms recommended for these age groups and lagged somewhat in children of older school age.

6. The investigation of the condition of the nitrogen balance in children six years of age and 10-11 years of age showed that the protein intake per kilogram of weight corresponds to the recommended norms and provides a stable positive nitrogen balance.

^{No} differences in the ^{condition of} nitrogen balance in boys and girls were found in these age groups.

The intake of protein per kilogram of weight in girls aged 15-16 was less than the recommended norms; the nitrogen balance in them proved to be positive and ⁱⁿ only individual cases was at the lower limit, approaching a nitrogen equilibrium.

The nitrogen balance in boys aged 14 was comparatively high, which was associated with ^a high protein requirement at this age.

7. The percentage of nitrogen retention with respect to the total quantity of that administered amounted to the following: in pre-school students, from 20 to 27; in young school students, from 16 to 38; in older school students, from 25 to 37.

8. The assimilability of protein in children of all ages ranged from 80 to 85 percent, and only in solitary cases did it decrease to 76 percent.

9. The diet of children of pre-school age, by and large, satisfies the requirements for a proper diet, showing only minor deviations in the distribution of proteins and fats throughout the day. This can not be said with respect to school children's homes, in which the number of meals a day as well as the distribution of the calorie count and principal food substances does not satisfy the requirements of the correct organization of the diet.

10. Through an investigation of the physical development of pupils it was established that the great majority of children show deviations from the mean age indices within limits of permissible variations (± 1 sigma).

11. The nutrition in children's homes should correspond to the differentiated physiological requirements of various age groups, and from this point of view, requires a scientifically grounded reorganization.

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Table 1

The Concentration of the Main Food Substances and the Calorie Count of Rations in a Children's Home According to Months (On the Average in Grams)

Organic composition and calorie count	1951		1952							Average
	XI	XII	I	II	III	IV	V	IX	X	
Proteins .	60,25	61,57	63,64	63,74	64,30	64,46	66,80	61,90	55,70	62,46
Fats .	42,80	54,18	54,60	64,78	59,78	57,77	55,97	38,77	37,50	52,38
Carbohydrates	299,30	304,38	329,50	331,93	323,97	319,70	333,51	296,0	302,46	315,64
The calorie count	1922	2004	2126	2225	2146	2114	2137	1826	1817	2035

Table 2

Recommended Physiological Norms of Food Substances for Children of Pre-School Age and Their Actual Content in the Rations (On the Average in Grams)

Indices	Proteins	Fats	Carbohydrates
Physiological norms	65,0	65,0	241,0
Actual content.	62,46	52,38	315,64

Table 3

The Concentration of the Basic Food Substances and The Calorie count of the Rations in a School Children's Home According to Months (On the Average, in Grams)

Organic composition and calorie count	1952										Average
	XII	I	II	III	IV	V	IX	X	XI		
Proteins . .	87.04	77.20	76.81	75.14	74.01	79.8	82.45	83.62	72.99	78.79	
Fats	53.29	45.33	38.95	52.0	52.55	55.5	46.34	54.92	50.45	49.93	
Carbo-hydrates . .	442.50	440.50	428.20	394.20	435.60	436.80	462.90	440.60	432.70	434.80	
Calorie count . . .	27220	25430	24260	24080	25780	26340	26660	26480	25420	25410	

Table 4

e Recommended Physiological Norms of Food Substances for Children of School Age and Their Actual Content in the Rations (Average in Grams)

Indices	Proteins	Fats	Carbohydrates
Physiological norm for children 7-11 years	78,0	81,0	297,0
Same for children 12-15 yrs	98,0	86,0	424,0
Actual content	79,0	50,0	434,0

Table 5

The Distribution of the Food Rations

Meals	Calorie count (in%)	
	According to Ignatov	According to Molchanova
Breakfast	20	25
Lunch	40	35-40
Afternoon meal	15	10-15
Supper	25	20-25

Hygienic Characteristics of the Salt Content of the Food

Ration of Pupils in Children's Homes

Ye. A. Lebedeva .

The body's requirement for various food substances has been studied by many Soviet research workers (Budagyan, Bukin, Yefremov, Ignatov, Krotkov, Lavrov, Molchanova, Nebytova-Luk'yanchikova, Petrun'kina, Reysler, Shaternikov and others). The data obtained were the starting data in establishing the nutritional norms for various occupational and age groups of the population; here, it was shown that by means of properly organized nutrition it is possible to create the basis for improvement of health, lengthening of the prime of life, increase in the work capacity, resistance of the body to diseases, and increase in the average length of life.

Nutrition also has an important part in the change in the hereditary properties of the body. Lysenko points out that "...the entire process of development, including the development of the properties of heredity and variability, depends on the source of life--nutrition".

Proper nutrition requires a correlation of the quantitative and qualitative composition of the food/ ^{with} the physiological requirement of the body. Through the investigations of Pavlov and his pupils (Bykov, Krasnogorskiy, Leporskiy, Razenkov and others) it was shown that food, depending on its properties, has an influence on the motor and secretory activity of various organs, their blood supply and their trophism through the nervous system, that is, on all the complex processes occurring in the tissues during metabolism. The mineral composition of the food ration is of exceptional importance in this connection. Erisman pointed out that without mineral substances the construction and activity of the organs of our body would be impossible and for that reason the presence of them in the food is no less important than their content of other nutrient principles!

The research of Bunge, A. Ya and V. Ya. Danilevskiy, Lunin, and recently Kaplanskiy, Krotkov, London, Molchanova and other scientists has been devoted to the elucidation of the part played by the inorganic composition of the food and the significance of various mineral elements.

At the present time it has been established that a number of mineral elements are constituents of proteins and exert an influence on their colloidal and other physico-chemical properties. The mineral substances are included in large quantities in the composition of bone and dental tissues, giving them strength and hardness. Mineral substances are included in enzymes, hormones, vitamins, thereby taking part in all the processes of metabolism. Certain of the mineral elements possess the capacity of changing the activity

of hormones and enzymes. Mineral substances which are present in the intercellular fluids are responsible for maintaining the osmotic pressure at a definite level and play an important part in assuring the acid-base equilibrium in the body. The part played by mineral substances in the processes of digestion and assimilation of food is great, as it is also in providing for the normal functions of the muscular and nervous systems. In connection with the exceptionally ^{great} importance of mineral substances for the body the study of the mineral composition of the food rations of the population and the taking of measures for increasing its efficiency is one of the main tasks of hygienists (Krotkov).

In the organization of nutrition for the population it is necessary to take into consideration the quantity of mineral salts in the ration, the form of their compounds, the relationships between them and other food components. The requirement for mineral substances should be taken into consideration also depending on the age, occupational, climatic factors and on the general condition of the body.

The work which we have undertaken is devoted to an investigation of the content of the principal mineral elements (calcium, phosphorus and iron) in the food rations of pupils in the preschool and school children's homes of the general type, to a study of the condition of the calcium balance in them in various age groups and to an X-ray investigation of the structure of bone tissue. The aim of the investigations was a determination of the actual content and adequacy of mineral substances in the body, the establishment of a relationship between the composition of the food rations, the calcium balance and the structure of bone tissue as well as a development of measures for increasing the biological value of rations of pupils in children's homes.

The investigations were carried out during the autumn, spring and winter periods of 1951/52 in ^{one} pre-school and two school children's homes of the general type.

One hundred and twenty-three 24-hour rations were investigated for their content of calcium salts, phosphorus and iron; of these, 53 were in ^{the} pre-school children's home and 70, in the children's homes for children of school age. Keeping in mind the need for establishing the quantities of mineral substances actually obtained by the children we took samples of the rations for the purpose of determining the content of calcium, phosphorus and iron in them from the tables of the dining pupils.

Simultaneously with the laboratory investigation of the rations a theoretical computation of calcium, phosphorus, iron and magnesium was made according to tables of the chemical composition of food products as well as a study of the

structure of the food-product assortment.

Determination of the level of the calcium balance was accomplished for children of three age groups. In children six years and 14-15½ years of age the calcium balance was determined for four three-day periods. In each of these age groups there were three boys and three girls included. The calcium balance in children aged 10-11 was determined for the three periods of observation (each lasting five days). Two boys and three girls were included in this group.

The selection of children for study of the calcium balance was made in cooperation with the physician of the children's home. For the purpose of the observation practically healthy children were used who had been in the children's home for a long time (no less than two years).

During the period of study of the calcium balance the children were kept under the usual living and working conditions: they came to school, did their domestic tasks, accomplished assignments in the children's home, visited the Pioneer Palace, etc. All this provided the possibility of obtaining the most reliable data concerning the condition of the calcium balance in children under an ordinary school and non-school load, since the determination of the human requirement for various food substances, as Molchanova points out, is possible only under those conditions in which a person's life and activity are occurring.

The menus which were used as a basis of the study of the calcium balance were made out according to the calculation of the actual average 24-hour consumption of food products by a single pupil. The average 24-hour assortment of food products was calculated on the basis of the accounts of the children's homes concerning the number of pupils and the actual outlay of food products for the children during the preceding year, excluding the summer vacation period. On the basis of the data obtained the menus were computed for three days. These menus were repeated in the subsequent three-day periods of the observation.

The level of the calcium balance was determined by a means of a comparison of the data of calcium intake and its excretion through the kidneys and intestines. For this purpose a determination was made of the calcium in the ration, the residuals of the food uneaten by the children, as well as that in the urine and stool.

During the period of study of the calcium balance the children were weighed daily at the same time of day. For subsequent calculations we used the average weight of the child during the observation period as a basis.

The calcium salts were determined by the volumetric permanganate method

after calcination of the sample in platinum crucibles. For the purpose of determining the phosphorus the sample was changed into a salt by a mixture of nitric and sulfuric acids. The phosphorus was precipitated in the form of a complex compound with molybdenum which was dissolved in a titrated solution of alkali. The excess of the latter was titrated with hydrochloric acid. The iron was determined colorimetrically by means of an electrophotocolorimeter of the "Stankin" brand.

It was established by investigation that the content of iron in the ration of the pre-school and school children's homes was adequate for the purpose of satisfying the physiological needs of the children for this element; in the ration of the pre-school children's home the quantity of iron amounted, on the average, to 24.1 milligrams; in the school children's home, to 34.3 milligrams a day (Table 1).

The quantity of phosphorus in the ration of the pre-school children's home in various seasons ranged from 1067 to 1168 milligrams a day, averaging 1090 milligrams, which is less than the physiological norm for children of pre-school age. The content of phosphorus in the ration of school children's homes showed considerable seasonal variations and made it possible to evaluate it as an average during the entire period of study.

As seen from Table 2 the quantity of phosphorus in the autumn-winter period was greater than in the spring, during these seasons satisfied the requirements of the physiological norms for children and adolescents older than 11 years of age and exceeded the recommended norms for children of under 11 years of age. The content of phosphorus during the spring was less than the recommended norms for children of school age, amounting, on the average, to 1402.2 milligrams a day (Table 2).

An inadequate concentration of phosphorus in the rations of the pre-school children's home and, during the spring period also in the rations of the school children's home, was the result of the low milk and dairy product content in the rations as well as of the inefficient collection of vegetables and meal-groat products.

It should be noted that the quantity of phosphorus capable of being absorbed in the food ration was less than we determined on chemical examination, because the phosphorus compounds which were contained in various food products possess different degrees of assimilability. Thus, cereal phosphorus is not used completely by the body, which is explained by the presence in the cereals of phytin, along with the readily assimilable nuclein, lecithin and inorganic

phosphorus, which is characterized by a very low degree of assimilability particularly if there is little phytase contained in the food product; this is an enzyme which splits phosphoric acid from phytin (Vasil'yev, Korobkova).

In the ration of the pre-school children's home studied about 2.5 percent of the ^{total} quantity of phosphorus and in the rations of the school children's homes, 55.3 percent of the total quantity of phosphorus was represented by the cereal products. Thereby, the *importance* of phosphorus in the cereal products in the rations of the school children's homes was particularly great during the spring period, at which time the absolute quantity of phosphorus was the least.

An inadequate content of phosphorus in the rations of the pre-school children's homes, and during the spring period also in the rations of the school children's homes, as well as the presence of a considerable quantity of phytin, and poorly assimilable phosphorus permits us to draw the conclusion that the content of phosphorus compounds in these rations lagged behind the physiological norms recommended for children.

The absolute quantity of phosphorus in the rations of school children's homes, as has been mentioned, exceeded the physiological norms for children under 11 years of age and were within the limits of the norms recommended for the older age groups during the autumn and winter seasons. Therefore, even in

[Please see end of this chapter for all seven pertinent Tables.]

the presence of a certain portion of poorly assimilable phosphorus in the ration it may be considered that the content of it during these periods was adequate to satisfy the requirements of children and adolescence.

The calcium content in the food ration of the pre-school and school children's homes investigated was less than the physiological norms, amounting, on the average, to 486 milligrams per day in pre-school and 505 milligrams per day in the school children's homes.

With a low level of the average values of calcium during the entire investigation period its actual content in a number of rations studied was even less; as seen from Table 3, the root-mean-square deviation, which is an index of the variability of the calcium content on various days, amounted to 95-106 milligrams per day in the pre-school children's home and 143-185 milligrams per day in the school children's homes. The inadequacy of calcium salt was the result of the inefficient structure of the food-product assortment of the rations studied (Table 3).

Through the investigations of Molchanova, Petrun'kina, and Povorinskaya it has been established that the calcium requirement of people is hard to satisfy if less than 500 grams of milk are contained in the ration; this is one of the richest food products in calcium.

In the rations studied the content of milk and/^{dairy} products was inadequate and was one of the main causes of the low content of calcium in the ration (Table 4).

inefficient selection of vegetables and meal-groat products. Thus, in the pre-school children's home about 66 percent and in the school children's homes, more than 80 percent of all the vegetables consisted of potatoes, which, according to the data of a number of authors, are a poor source of calcium.

The proportion of vegetables characterized by a high content and good assimilation of calcium (cabbage, carrots, etc.) was low in the ration. Krotkov emphasizes the value of cabbage as a source of calcium. The assimilability of calcium in the cabbage, according to the research of Gnoyeva, Kalinina, Rabinovich and Vekua, and the assimilability of carrot calcium, according to the data of Nebytova-Luk'yanchikova and Orlova are equivalent to the assimilability of milk calcium.

In the rations studied the content of cabbage, carrot and a number of other vegetables was not the optimum one. Thus, in the rations of school children's homes the content of cabbage during the winter period amounted to a total of only 11.0 grams a day or two percent of the total quantity of vegetables. The proportion of carrots, beets, and onions amounted to a total of one to two percent. What has been noted is evidence to the effect that a low content of calcium in the rations was brought about not only by a deficiency in dairy products but also by the inefficient structure of the vegetable assortment.

As far as the meal-groat and bean products are concerned, about 45 percent of their total quantity in the rations studied consisted of flour and macaroni products, the calcium content in which, according to the data of Polyachek, does not exceed 22-23 milligrams percent.

In the rations of the pre-school children's homes there was a high ~~pr~~ proportion of semolina (16 percent), millet (13 percent), and rice (12 percent) which are also poor sources of calcium. These types of foods were contained also in large quantities in the rations of the school children's homes. At the same time, the content of calcium-rich cereal products (oatmeal and buckwheat meal, beans) was small and did not exert any essential influence on the total content of this element in the ration.

From what has been stated it is seen that the low content of calcium in the rations studied was the result of the inefficient structure of the food assortment; with a better selection of food products the calcium content in the rations could have been much higher.

In evaluating the rations from the viewpoint of the content of calcium in them, we can not, however, be guided by the absolute numerical figures of its concentration in the food.

Consideration should also be given to the quantity of calcium which can be assimilated. The latter, to a considerable degree, depends on the nature of the calcium compounds, the

relationship of calcium and phosphorus in the rations, as well as the inter-relationship of it with other food substances.

In the rations studied the interrelationship of calcium and phosphorus was not favorable, amounting, in various seasons, to 1:2.05-2.48 in the rations of the pre-school children's home and 1:2.76-3.19 in the rations of the school children's homes, which is evidence of a relative excess of phosphorus existing in the rations (compared with calcium) and of the possibility of formation of the unabsorbable tricalcium phosphate in the intestine.

The utilization of food calcium by the body depends also on its interrelationship with magnesium salts. When there is an excess of magnesium unfavorable conditions are created for calcium assimilation, and the excretion of the latter from the body is also increased. In the rations of the pre-school children's home the interrelationship of calcium and magnesium in various seasons amounted to 1:0.68-0.74, while in the rations of the school children's home, to 1:0.8-1.05. A relative excess of magnesium salts compared with the quantity of calcium in the rations of school children's homes is explained by the deficiency of calcium salt and, apparently, does not exert any harmful effect on the assimilation of these elements, particularly since the quantity of fats in the rations of the pre-school children's home ~~is~~ equal to 52 grams and in the school children's homes, to 50 grams (according to the data of Koshina), which was adequate for assuring the formation of calcium-magnesium compounds with the fatty acids and their subsequent absorption.

The quantity of proteins in the rations of the pre-school children's home amounted to about 62 grams and in the rations of the school children's homes, to about 79 grams a day and exceeded the calcium content by 129-156 times, which could not have exerted any harmful effect on the ^{food} calcium assimilation either.

In order to give the most complete characterization of the rations with respect to the calcium content we studied the calcium balance in pupils of various age groups, because the latter is one of the indices of the course of the metabolic processes in the body and depends also on the qualitative composition of the food.

Through numerous investigations of Soviet scientists (Malchanova, Petrun'kina, Dmitriyeva) as well as through the investigations of Sherman and Herbst, it has been shown that for the purpose of assuring normal growth and development children of pre-school and younger school age should obtain no less than 30-40 milligrams of calcium per day per kilogram of weight in the food. Under these conditions a high positive calcium balance and a retention of it of ^{about} 11 milligrams per day per kilogram of weight of the child are observed; this is adequate. If, as the result of a calcium deficiency in the food or poor assimilability of it as well as a number of other causes, the magnitude of calcium retention is less than 11 milligrams per kilogram of the child's weight, the calcium balance, even if it is positive, is considered unsatisfactory, because under these conditions it does not provide for an adequate accumulation of it in the body.

The high level of calcium balance and an adequate retention of it in the body, according to the research of the authors mentioned, can be achieved by an appropriate *combination* of the rations and selection of food products with consideration not only of the quantity of calcium and forms of its compounds contained in them but also of its relationship with proteins, fats, vitamins and other mineral salts. Here, special importance is ascribed to the inclusion of an adequate quantity of milk and dairy products in the food rations, which contributes to an improvement in the assimilation of the entire rations and a better utilization of the mineral substances of the food, including calcium, by the organism.

In the evaluation of the data obtained we considered the calcium balance satisfied in the event the retention per kilogram of weight of the child amounted to about 11 milligrams a day. In order to exclude the possibility of an influence of a temporarily increased excretion or calcium retention on various days which might be associated with the participation of calcium in metabolism we made the average data for the entire nine-12-day period of observation the basis of our conclusion concerning the condition of the calcium balance.

It was established through our investigations that the calcium balance in the absolute majority of children investigated six and 10-11 years of age was low (Tables 5 and 6); the calcium retention did not assure an adequate accumulation of it in the body. At the age of six and at the age of 10-11 there were no distinct differences found in the level of the calcium balance between girls and boys.

The calcium balance in 14-year-old boys was positive (Table 7); from 31 to 62 percent of the entire food calcium was retained in the body; however, in the recalculation per kilogram of weight of the child the retention amounted, on the average, to 6.18 milligrams (variations of from 4.22 to 9.0 milligrams in various cases), which did not give us the grounds for considering the calcium balance adequate.

The calcium balance in girls 15-15½ years of age was also positive in all cases; however, the calcium retention was inadequate: in recalculating for one kilogram of weight it amounted, on the average, to 1.7 milligrams per day (variations from 0.24 to 3.62 milligrams).

The low level of the calcium balance and the inadequate accumulation of it in the body of the majority of children examined can be related to the small quantity of calcium in the rations, the low proportion of readily-assimilable calcium lactate, the inefficient structure of vegetables and meal-groat food products and a number of other factors which we revealed in the study of the mineral composition of the food rations of pupils in children's homes.

We also made an X-ray investigation of the condition of the bone tissue of pupils of children's homes, since the osseous system is the principal calcium-phosphorus depot in the body and is closely connected with all the links of mineral metabolism.

The chemical composition and structure of bone tissue depend on a whole series of environmental conditions, among which the working and particularly occupational factors and nutritional conditions are of the greatest importance. Here, great importance is ascribed to the quantity and quality of protein in the rations, the vitamin content, the relationship of food substances in the rations, as well as to the content of mineral substances in the rations, primarily of calcium and phosphorus salts (Yeremin, Yefremov, Kasperskaya, Nemenova, Reynberg).

Even at the end of the past century a number of Soviet scientists (Lebedev, Tvirbut) showed that with an inadequate concentration of minerals in

the food the structure of bone tissue is disturbed first. Keeping animals on rations poor in calcium salts, even if complete with respect to all other food substances, also leads to profound disturbances in the bone structure.

Sharabrin, in analyzing the causes of "osseous dystrophy" of animals, points out that in the majority of cases they are of an exogenous nature and amount to an inadequacy of mineral substances in the fodder and water. Among other, rarer causes of "osseous dystrophy" the author makes mention of poor absorption of minerals in the intestine and a disturbance of the function of the parathyroid glands.

A change in the structure of the bone tissue with an inadequate intake of mineral substances into the body (primarily, calcium and phosphorus) or in connection with other factors is manifested in the form of osteoporosis.

In osteoporosis the trabeculae thin out in the spongiosa of the bone tissue, and the connection between them is lost in places. The expanded spaces and gaps between various trabeculae and lamellae are filled in with connective tissue, chiefly fatty. Because of the thinning out of the intracortical layer of the long bones an increase occurs in the diameter of the medullary canal (Reynberg, Rokhlin).

These changes, which occur in the bones in osteoporosis, account for the "transparency" of the image on bone roentgenography, which is the principal diagnostic feature of osteoporosis.

A study of the condition of the bone tissue was made at the chair of roentgenology of the LSGMI under the direction of B. M. Shtern. We made a selective examination of pupils of children's homes. For the purpose of the examination healthy boys and girls were taken who had been in the children's home more than two years or who had been transferred from the Infants' Home. In all, 50 children were examined; of these, 37 were of school age and 13 were three to seven years of age.

A study of the structure of the bone tissue was made by means of roentgenographic investigations of the knee joints including the adjacent epi- and metaphyseal areas of three bones.

As the result of the X-ray examination of the majority of children no changes were found in the bone tissue structure; in three boys, six, 10 and 11 years of age slight changes were found of osteoporotic nature, which were shown chiefly in the structure of the epiphyses of the long bones.

On clinical examination of the children in the orthopedic clinic of the LSGMI no changes were found in these boys with respect to the bone-joint apparatus.

The structural changes found in the bones in the form of roentgenologically demonstrable osteoporosis do not give us the grounds for considering them a consequence of the inadequacy ~~in~~ the mineral composition of the food rations, since they were shown in individual cases and in a slight form.

In our opinion, the fact that the periods of intrauterine development and infancy of the children examined occurred under war-time conditions was of greater importance for the occurrence of these bone changes.

It is known that during the intrauterine period of life the development of the fetus is indisruptibly associated with the maternal organism, and all the factors influencing the mother are reflected to varying degrees on the development of the child. During the period of early childhood/^{the} children experience deprivations and difficulties because of the/^{changed} living and nutritional conditions during the war time.

In the Soviet Union, where the Party and Government ~~has~~ always *shown* great concern for the maintenance of health of the population and particularly of children, all the necessary conditions have been created for the organization of nutrition for the population on scientific-hygienic principles. This has been reflected in the historic resolutions of the Nineteenth Congress of the Communist Party of the Soviet Union, the Fifth Session of the Supreme Soviet USSR and in the Acts of the Plena of the Communist Party of the Soviet Union, in which an extensive program of future increase in the material welfare of the working class has been planned. The development of agriculture, and, along with this, of the food industry in the Soviet Union will lead to a marked increase in the production of food products; the structure of consumption will be improved because of an increase in production chiefly of livestock products and of vegetables; measures have been provided also for expanding the assortment of the food and improving the quality of food products. Special attention has been directed to increasing the production of food products for the child group of the population. The production of milk, sugar, vegetables, fruits and other nutritional products is increasing considerably. Measures have also been planned which assure the uninterrupted supply of the population with all types of food products in all seasons of the year, which is of tremendous importance for the proper organization of nutrition of the working class. Improvement of the nutrition of the population, along with other measures for improving the

material and cultural level of the working class, will contribute to an increase in the welfare of the Soviet people, and an improvement in the health and physical development of children.

Conclusions

1. It has been established by investigations that the content of iron in the rations studied exceeded the recommended physiological norms.
2. The calcium content in the rations studied and the relationship of element *in* phosphorus did not/ correspond with the optimum physiological norms.
3. The phosphorus content proved to be less than the optimum physiological norms in the rations of children of pre-school age and were satisfactory in the rations of school childrens homes during the autumn and winter seasons, but were inadequate during the spring.
4. Seasonal variations were established in the content of mineral substances in the rations of pre-school and school childrens homes, which is related to the nature of the food-product assortment in different seasons.
5. The inefficient structure of the food-product assortment established as the result of investigation (inadequate content of calcium-rich products, particularly of milk products and certain vegetables) was one of the principal causes of the low calcium balance in children six, 10 and 11 years of age.
6. No distinct difference was found in the level of the calcium balance between boys and girls six, 10 and 11 years of age.
7. The calcium balance in girls 15-15½ years of age was close to a condition of calcium equilibrium.
8. The calcium balance in boys 14 years of age was low. Despite the good utilization of calcium by them (from 31 to 62 percent of the calcium taken in with the food was retained at this age) the accumulation of it in the body was inadequate.
9. In the majority of children examined there were no roentgenologically detectable changes in the bone tissue structure; in solitary cases osteoporosis was found the occurrence of which can be explained by the fact that the periods of intrauterine development and infancy of the children examined took place during the war years, which might subsequently have been reflected in the condition of their health.

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Table 1

Iron Content in 24-Hour Rations of Children's Homes
in Milligrams (According to Seasons of the
Year)

Indices	Pre-school children's home No. 29			School children's homes Nos. 43 and 65		
	Autumn	Winter	Spring	Autumn	Winter	Spring
Average concentra- tion per day	22,91	24,02	26,86	37,52	32,28	32,67
Average root mean square deviation . . .	2,50	3,23	2,41	6,26	3,47	4,5
Coefficient of variation in % of the mean 24- hour value	39,73	13,4	8,9	16,7	10,7	13,8
Average error in arithmetic mean	± 0,69	± 0,83	± 0,67	± 1,52	± 0,94	± 1,09

Table
Table 2

Phosphorus Content in 24-Hour Ration of Children's
Homes in Milligrams (According to Seasons of
the Year)

Indices	Pre-school children's home No. 29			School children's homes Nos. 43 and 65		
	Autumn	Winter	Spring	Autumn	Winter	Spring
Average concentra- tion per day	1067,15	1043,68	1168,0	1557,3	1516,61	1402,2
Average root mean square deviation	122,15	176,43	152,95	287,04	288,51	300,98
Coefficient of variation in % of the mean 24- hour value	11,44	16,9	13,09	16,4	19,0	21,6
Average error of arithmetic mean	± 33,9	± 44,8	± 42,5	± 69,5	± 80,1	± 91,3

Table 3

Content of Calcium in 24-Ration of Children's Homes in Milligrams (According to Seasons of the Year).

Indices	Pre-school children's home No. 29			School children's homes Nos. 43 and 65		
	Autumn	Winter	Spring	Autumn	Winter	Spring
Average concentration per day	530,85	461,45	470,7	595,0	495,15	438,1
Average root mean square deviation	94,9	101,52	106,04	181,1	184,61	143,34
Coefficient of variation in % of the mean 24-hour value	17,86	21,1	22,56	30,4	37,28	32,7
Average error of arithmetic mean	± 26,3	± 26,7	± 29,4	± 43,19	± 51,8	± 32,6

Table 4

Average Quantity of Milk and Dairy Products in the Rations of Children's Homes (in Grams)

Name	Pre-school children's home No. 29	School children's homes Nos. 43 and 65
Milk	347,0	157,0
Curds	3,6	3,8
Cheese	3,3	9,7
Sour cream	5,6	9,9

Table 5

Calcium Balance in Children Six Years of Age (in
Milligrams)

Last name	Date of exam.	Ca taken a day	Ca excreted			Balance	Ca retention per kg. of weight
			in the urine	in the stool	Total		
Ustinovich . . .	14-16/XII	523	108	300	408	+1155	+5.40
	17-19/XII	514	107	340	447	+ 67	+3.10
	20-22/XII	590	94	376	470	+120	+5.50
	23-25/XII	477	91	322	413	+ 64	+2.95
Kondareva . . .	14-16/XII	570	61	324	385	+181	+ 9.1
	17-19/XII	543	67	378	445	+ 98	+ 4.8
	20-22/XII	593	63	324	387	+206	+10.0
	23-25/XII	503	37	341	378	+125	+ 6.1
Zvereva . . .	14-16/XII	552	110	350	460	+ 92	+ 5.0
	17-19/XII	511	118	205	323	+188	+10.0
	20-22/XII	512	111	261	372	+140	+ 7.5
	23-25/XII	482	115	171	286	+196	+10.4
Zheludev . . .	14-16/XII	553	238	230	468	+ 85	+ 4.5
	17-19/XII	536	192	145	337	+199	+10.3
	20-22/XII	591	207	288	495	+ 96	+ 5.0
	23-25/XII	490	112	153	265	+225	+11.4
Ivanov . . .	14-16/XII	560	122	179	301	+259	+12.7
	17-19/XII	531	109	289	398	+133	+ 6.7
	20-22/XII	593	148	245	393	+200	+10.0
	23-25/XII	503	119	333	452	+ 51	+ 2.5
Vronskiy . .	14-16/XII	569	165	425	590	- 21	-1.15
	20-22/XII	593	150	349	499	+ 94	+5.0
	23-25/XII	503	156	230	386	+117	+6.20

Table 6

Calcium Balance in Children 10-11 Years of Age
(In Milligrams)

Last name	date of exam.	Ca taken a day	Ca excreted			Balance	Ca retention per kg. of weight
			in the urine	in the stool	Total		
Kondrat'yev . .	20-22 IV	554	28	322	350	+204	+5.92
	23-25 IV	406	11	379	390	+ 16	+0.46
	26-28 IV	419	30	299	329	+ 90	+2.65
Dokuchayev . .	20-22 IV	548	64	339	403	+145	+5.24
	23-25 IV	409	47	256	303	+105	+3.74
	26-28 IV	433	7	164	171	+262	+9.3
Bulatova . .	20-22 IV	545	69	329	398	+148	+5.25
	23-25 IV	403	46	218	264	+139	+4.87
	26-28 IV	426	63	478	541	-115	-4.07
Vishnyakova . .	20-22 IV	451	22	223	245	+206	+8.6
	23-25 IV	345	41	290	331	+ 14	+0.58
	26-28 IV	316	44	322	365	- 50	-2.07
Zotova . .	20-22 IV	514	27	347	374	+140	+4.52
	23-25 IV	376	25	267	292	+ 84	+2.65
	26-28 IV	406	6	254	260	+146	+4.58

Table 7

Calcium Balance in Children 14-15 $\frac{1}{2}$ Years of Age
(In Milligrams)

Last name	Date of exam.	Ca taken a day	Ca excreted			Balance	Ca retention per kg. of weight
			in the urine	in the stool	Total		
Yerofeyev	22-24/II	509	35	266	301	+ 208	+ 5,53
.	25-27/II	572	13	218	231	+ 341	+ 9,0
.	2-4/IV	416	18	163	181	+ 235	+ 6,1
.	5-7/IV	390	14	157	171	+ 219	+ 5,79
Astaf'yev	22-24/II	509	52	139	191	+ 318	+ 8,37
.	25-27/II	565	26	337	363	+ 202	+ 5,46
.	2-4/IV	416	59	141	200	+ 216	+ 5,81
.	5-7/IV	390	22	147	169	+ 221	+ 5,91
Sundukov	22-24/II	498	18	169	187	+ 311	+ 8,24
.	25-27/II	497	157	185	342	+ 155	+ 4,22
.	2-4/IV	416	81	152	233	+ 183	+ 4,94
.	5-7/IV	390	92	130	222	+ 168	+ 4,53
Devyatkova	22-24/II	496	151	268	419	+ 77	+ 1,31
.	25-27/II	561	125	287	412	+ 149	+ 2,55
.	2-4/IV	416	107	253	360	+ 56	+ 0,82
.	5-7/IV	390	85	198	283	+ 107	+ 1,82
Vishnyakova	22-24/II	483	79	323	402	+ 81	+ 1,64
.	25-27/II	555	86	289	375	+ 180	+ 3,62
.	2-4/IV	416	66	338	404	+ 12	+ 0,24
.	5-7/IV	390	62	292	354	+ 36	+ 0,72
Kranent	22-24/II	417	16	300	316	+ 101	+ 1,8
.	25-27/II	471	67	290	357	+ 114	+ 2,0
Smidova	2-4/IV	409	108	196	304	+ 105	+ 2,07

**An Experiment in Making Out Rations for Nutrition
in Private Children's Institutions**

Ye. A. Lebedeva and Z. P. Koshina

Food is one of the principal vital needs of man. Correctly organized nutrition should be adequate both with respect to calorie count as well as to its qualitative composition, with a consideration of the requirements of the body depending on the climatic conditions, the nature of occupational activity and the anatomic-physiological characteristics of the body. The latter is particularly important in the organization of nutrition of children's groups, since the physiological characteristics of children of different age groups and their requirement for food substances ^{are} different; one of the principal requirements for proper nutrition of children is a differentiated organization of it.

This situation, however, is not always taken into consideration to the proper degree in organizing the nutrition of children in children's homes. The existing norms of nutrition provide for a single 24-hour assortment of food products for a single pupil in the children's home; nevertheless, in children's homes of the general type there are children of different age groups, from three to 16.

Taking into consideration this situation the directors of the children's homes are striving, as our investigations have shown, to provide differentiated nutrition, in a certain way; however, in this process attention is being directed primarily to the degree of satiation and the volume of food, and problems of food and biological value of nutrition are not always taken into account.

In connection with this, in the analysis of the structure of the food-product assortment of school and pre-school children's homes it was established that the consumption of a number of biological^{ly} valuable food products by the children was less than had been provided by the existing food product assortment (Table 1).

Thus, for example, we can not consider the reduction of meat and fish -- products rich in complete protein and possessing protein of a high degree of assimilability and *of* other important food substances expedient; the quantity of dairy products, and , in the rations of school children's homes, the consumption of milk has also been reduced.

The consumption of vegetables by the children of pre-school and particularly

school children's homes was also considerably limited, which is not expedient either, if we take into consideration the fact that vegetables exert a beneficial influence on the digestive and assimilation processes of food and are carriers of various mineral substances and a number of vitamins.

On the other hand, the consumption of cereal products (bread-pastry and meat products) exceeded the approved norms, particularly in the rations of children of school age, which did not contribute to increasing the biological value of the rations *either*.

Therefore, the changes in the structure of the established food product assortment for children's homes demonstrated on examination were made without taking into consideration the biological value of various food products. The latter also had an influence on the quantitative indices of nutrition. In a number of cases, the content of food substances in the rations of the children's homes examined was *less than* the physiological requirement of children for these substances (see article by Koshina and Lebedeva in the present collection).

The results of ~~the~~ study of nutrition in children's homes emphasized the necessity and the possibility of introducing nutrition for the children which was differentiated according to age groups. With this aim in view we made out assortments of food products and worked out exemplary menus for children of pre-school and school children's homes; in the latter, there were *different* rations for children seven to 11 years of age and for children over 11 years of age.

The rations were made out with consideration of the quantitative and qualitative completeness of them in accordance with recommended physiological norms for nutrition of children in various age groups; thereby, consideration was given to the requirements of the proper combination of courses, the volume of the food, as well as the physiological/^{ly}recommended interrelationships of various meals with respect to their caloric count and qualitative composition. The recommended rations provide four meals for all the age groups.

The suggested rations are, in their cost, in accordance with the assignments expended for nutrition in children's homes.

In Table 2, the 10-day food product assortment per child aged three to seven which we recommended is shown; in Tables 3 and 4 the menus and the chemical composition of two suggested rations are given.

In calculating the chemical composition of the rations we made use of the basic textbook by Polyachek.

As seen from Table 11, the suggested rations are in accordance with the physiological norms for children from three to seven years of age with respect to the calorie count and the content of the principal food substances.

In the suggested rations about 14 percent of the 24-hour calorie count is provided by proteins with a predominance of proteins of animal origin.

The calorie count of the fatty part of the rations amounts to about 18-30 percent of the 24-hour calorie count, whereby about 92 percent of all the fats are of animal origin.

In the content and interrelationship of the principal mineral salts the suggested rations are similar to the optimum physiological norms. In the nature of the compounds a considerable portion of the mineral salts are readily assimilable because of the high content of milk, dairy products and vegetables in the rations. The ration is complete also with respect to the vitamin concentration

For the school children's homes, as has been mentioned above, we recommended the introduction of a differentiated diet for children seven to 11 years of age and over 11 years of age; the 10-day assortments of food products for children seven to 11 years of age and, separately, for children over 11 years of age are presented in Tables 7 and 8. In Tables 6, 7, 9 and 10 two rations each (out of 10 which we worked out) are presented as examples for the children of the appropriate ages.

The composition of the rations recommended for pupils in school childrens homes is similar to the corresponding optimum physiological norms (Table 13).

In the rations suggested for children under 11 years of age 12.9 percent of the entire calorie count is provided for by proteins, among which more than 55 percent is constituted by proteins of animal origin in the rations of younger children; in the rations of older children 13.7 percent of the entire calorie count is provided for by the proteins. About a half of the total quantity of proteins of the rations of children over 11 years of age is also represented by animal products. More than 25 percent of the total calorie count of the rations come from the fatty portions and 83 percent of all the fats are fats of animal origin.

As far as the content of the principal mineral substances and the ratios between them are concerned, the recommended rations are in accordance with the

accepted norms for various age groups of children.

In the rations there is a predominance of mineral/salts which are characterized by their high degree of assimilability as in the rations recommended for children from three to seven years of age, which is explained by the inclusion of considerable quantities of milk and dairy products in the rations, as well as by an increase in the quantity of vegetables.

Thus, in the rations recommended for children from seven to 11 years of age the calcium lactate amounts to about 77 percent; and in the rations of children over 11 years of age, 74 percent of the total quantity of calcium.

From the products of animal origin the phosphorus amounts to about 63 percent in the rations of children aged seven to 11 and about 58 percent of its total quantity in the rations of children and adolescents over 11 years of age.

The ratio of calcium to phosphorus(1:1.6 and 1:1.73) is also optimal for the assimilation of these substances.

According to the content of vitamins the rations suggested for children of school age are within limits of the recommended norms (Table 14).

The organization of nutrition in childrens homes according to the rations which we have suggested should lead to the differentiation of nutrition according to age groups in accordance with the physiological norms.

The incorporation of differentiated nutrition into practice requires a partial change in the organization as well as a supply of food products for the children's institutions, which is perfectly accomplishable in the Soviet Union, where the Communist Party, showing its everyday concern for children, has made it its task to attain "...a level of food-product consumption which is based on scientifically grounded nutritional standards required for the complete harmonious development of a healthy person". (N. S. Khrushchev).

Table 1

Consumption of the Principal Food Products in the Children's Homes Examined (in Grams)

1 Наименование продуктов	2 Утвержденная норма	3 Фактическое потребление в 1951-1952 гг.	
		4 Общешкольный детский дом	5 Школьные детские дома
6 Хлеб ржаной	175	123	262
7 Хлеб пшеничный	175	178	208
8 Мука пшеничная	20	19	10
9 Крупа	35	62	54,5
10 Макароны	35	23	40,3
11 Картофель	300	295	425
12 Овощи	260	158	103
13 Фрукты сухие	15	12	13
14 Печенье	16	8	5
15 Мясо	80	70	74
16 Рыба	75	25	27
17 Молоко	250	357	157
18 Творог	33	3,6	3,8
19 Сметана	17	5,1	9,9
20 Сыр	10	3,3	9,7
21 Масло сливочное	45	42,7	41,6
22 Масло растительное	17	5,0	5,0
23 Яйца (шт.)	0,3	0,25	0,17

1) Name of food products; 2) Approved norm; 3) Actual consumption in 1951-52; 4) pre-school children's homes; 5) school children's homes; 6) rye bread; 7) whole-wheat bread; 8) whole-wheat flour; 9) groats; 10) macaroni; 11) potatoes; 12) vegetables; 13) dry fruits; 14) pastry; 15) meat; 16) fish; 17) milk; 18) curds; 19) sour cream; 20) cheese; 21) butter; 22) oleomargarine; 23) eggs (units).

Table 2

Ten-Day Assortment of Food Products per Children's
Homes Pupil at the Age of From 3 to 7

Name of food products	Gross wt.	Proteins		Fats		Carbo- hydrates
		animal	veg.	animal	veg.	
		in grams				
1	2	3	4	5	6	7
Rye bread	1 060.0	—	62.54	—	6.36	437.91
Whole-wheat bread	1 885.0	—	129.62	—	7.26	851.13
Macaroni	80.0	—	7.40	—	0.42	58.62
Vermicelli	20.0	—	1.85	—	0.11	14.62
Noodles	40.0	—	3.70	—	0.21	29.31
Flour	137.0	—	12.13	—	1.59	93.96
Dry biscuits	5.0	—	0.40	—	0.06	2.90
Millet	30.0	—	2.21	—	0.56	18.71
Buckwheat	100.0	—	8.0	—	1.57	64.44
Oatmeal	30.0	—	2.73	—	1.47	18.33
Pearl-barley	10.0	—	0.66	—	0.08	6.73
Hercules (meal)	30.0	—	2.73	—	1.47	18.33
Rice	80.0	—	5.20	—	0.93	57.33
Semolina	30.0	—	2.40	—	0.24	22.00
Potato flour	10.0	—	0.07	—	—	7.27
Beans	20.0	—	3.32	—	0.34	10.00
Peas	30.0	—	5.80	—	0.96	15.10
Milk	5 260.0	164.11	—	183.57	—	259.84
Acidophilus milk	200.0	6.24	—	5.24	—	5.94
Thin curds	290.0	53.94	—	1.74	—	3.43
Sour cream	180.0	4.85	—	42.84	—	6.33
Butter	395.0	3.87	—	331.68	—	2.53
Dutch cheese	40.0	10.0	—	11.98	—	0.53
Eggs (units)	2.5	13.63	—	12.88	—	0.62
Meat	684.0	99.52	—	9.75	—	2.77
Liver	150.0	25.74	—	6.17	—	3.11
Codfish	125.0	13.47	—	0.18	—	—
Oleomargarine	23.0	—	—	—	21.41	—
Sugar	315.0	—	—	—	—	269.53
Potatoes	2 115.0	—	21.96	—	2.96	294.44
Carrots	1 215.0	—	7.33	—	2.57	76.62
Onions	175.0	—	1.62	—	0.12	15.22
Cabbage	965.0	—	7.81	—	2.99	27.44
Beets	120.0	—	1.54	—	0.08	9.22
Pickles	90.0	—	0.64	—	0.08	1.62
Tomatoes	30.0	—	0.63	—	—	2.11
Cranberries	120.0	—	0.28	—	—	8.11
Dried fruits	20.0	—	0.24	—	0.18	10.22
Apples	700.0	—	1.76	—	—	68.22
Candy	20.0	—	—	—	—	18.53
Coffee	66.0	—	—	—	—	—
Tomato juice	500.0	—	—	—	—	25.00
Salt	150.0	—	—	—	—	—
Total		395.37	294.57	606.03	54.02	2 839.77

Table 2
(cont'd)

Calorie count	Cs	P	Fe	A	B ₁	B ₂	PP	C
	in milligrams							
	8	9	10	11	12	13	14	15
109.4	275.60	2236.6	60.42	—	1.59	0.74	0.95	—
091.74	508.95	1752.95	17.0	—	1.32	0.94	2.27	—
274.64	17.60	115.2	0.96	—	0.06	0.04	1.0	—
68.66	4.40	28.8	0.24	—	0.02	0.01	0.24	—
137.32	8.80	57.6	0.48	—	0.04	0.02	0.48	—
449.98	30.14	197.28	1.65	—	0.15	0.09	2.36	—
14.10	1.40	4.70	0.05	—	—	—	0.06	—
90.97	3.20	98.10	—	—	—	—	—	—
311.60	39.0	226.0	1.20	—	0.5	—	—	—
100.0	20.70	117.60	1.14	—	0.09	0.02	0.30	—
31.08	2.0	18.10	0.20	—	—	—	—	—
100.0	20.70	117.60	1.14	—	0.5	—	—	—
265.19	7.20	76.80	0.72	—	—	—	—	—
102.65	6.0	27.90	0.30	—	—	—	—	—
30.12	2.10	12.50	0.08	0.01	0.02	0.01	0.30	2.25
57.80	26.40	95.0	1.58	—	0.03	0.01	—	—
94.65	25.20	120.0	1.71	—	—	0.03	0.30	—
445.30	6312.0	4891.80	10.52	6.12	2.63	8.94	26.30	52.60
94.98	240.0	186.0	0.40	0.24	0.1	0.34	1.0	2.0
252.30	261.0	522.0	0.58	—	—	—	—	—
442.80	154.80	120.60	0.36	1.08	0.09	—	—	—
110.23	59.25	67.15	0.79	4.74	—	—	—	—
156.28	354.0	260.0	0.48	0.36	0.01	0.14	—	—
78.19	82.50	225.0	3.75	3.25	0.18	0.40	7.80	—
113.0	46.17	831.06	11.27	0.15	0.78	0.87	18.96	6.16
176.12	58.80	834.40	39.20	39.80	0.52	2.25	21.42	44.24
56.96	31.59	178.20	0.16	—	0.05	0.07	0.96	—
99.14	—	—	—	—	—	—	—	—
220.59	—	—	—	—	—	—	—	—
25.67	158.50	680.95	11.12	0.32	1.1	0.63	15.86	119.0
68.79	495.84	1280.92	5.17	25.81	1.03	0.72	4.13	42.39
61.95	43.21	183.27	0.60	0.03	0.11	0.01	—	12.67
72.25	434.25	308.90	10.62	0.19	0.19	0.68	2.90	193.0
46.80	25.25	33.33	0.71	0.01	0.12	0.08	—	8.67
10.05	11.70	23.40	0.27	0.05	0.05	—	—	3.6
11.10	1.80	4.50	0.09	0.30	0.02	0.01	0.12	9.0
35.08	40.80	19.20	0.60	—	—	—	—	11.8
44.60	10.0	21.0	1.0	1.0	0.01	0.01	—	—
9.30	37.80	69.30	2.52	0.57	0.25	0.25	3.15	37.50
77.50	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
92.50	45.0	110.0	2.0	8.50	0.35	2.20	2.0	170.0
—	750.0	—	6.30	—	—	—	—	—
21.09	10656.35	16153.81	203.2	92.53	11.91	17.61	112.86	714.88

Table 3

Menu for Children's Home Pupils from Three to
Seven Years of Age

Menu	Apportionment	Gross weight	Proteins
		in grams	
1	2	3	4
Breakfast			
"Hercules" gruel in milk	"Hercules" meal	30.0	2.73
	Milk	100.0	3.12
	Butter*	5.0	0.05
	Sugar	5.0	—
Coffee and milk	Milk	100.0	3.12
	Sugar	15.0	—
	Coffee	6.0	—
Roll with butter	Roll	100.0	6.88
	Butter	15.0	0.15
For breakfast:			16.05
Lunch			
Milk soup with rice	Milk	200.0	6.24
	Rice	15.0	0.95
	Butter	5.0	0.05
	Sugar	5.0	—
	Beef	80.0	11.64
Meat with stewed cabbage and creamed sauce	Cabbage	200.0	1.62
	Tomatoes	5.0	0.10
	Sour cream	10.0	0.27
	Onions	10.0	0.05
	Butter	5.0	0.05
	Carrots	15.0	0.05
	Tomato juice	100.0	—
	Apple	100.0	0.25
Tomato juice	Tomato juice	100.0	—
	Apple	100.0	0.25
Bread	Bread	75.0	4.45
	For lunch:		25.75
Afternoon meal			
Milk with roll	Milk	200.0	6.24
	Roll	50.0	3.44
For the afternoon meal:			9.68
Supper			
Curds with sugar	Curds, thin	70.0	13.00
	Sugar	10.0	—
Sweet tea	Sugar	15.0	—
	Butter	15.0	0.15
Roll with butter	Roll	50.0	3.44
	Butter	50.0	2.90
Bread	Bread	50.0	2.90
	For supper:		19.50
Total for the day:			71.00

*In this and other cases marked with the * sign,
the apportionment of butter is determined at the time of issuance.

Table 3
(cont'd)

Fats	Carbo- hydrates	Calorie count	Ca	P	Fe
			in milligrams		
5	6	7	8	9	10
1.47	18.33	120.0	20.19	117.60	1.14
3.49	4.94	65.50	120.0	93.0	0.20
4.20	0.03	39.37	0.75	0.85	0.01
—	4.72	19.37	—	—	—
3.49	4.94	65.50	120.0	93.0	0.20
—	14.17	58.12	—	—	—
—	—	—	—	—	—
0.39	45.18	217.07	27.0	93.0	0.90
12.59	0.09	118.11	2.25	2.55	0.03
25.63	92.40	703.04	290.19	400.00	2.48
6.98	9.88	131.0	240.0	186.0	0.40
0.18	10.76	49.72	1.05	14.40	0.10
4.20	0.03	39.37	0.75	0.85	0.01
—	4.72	19.37	—	—	—
1.14	0.32	60.0	5.40	107.20	1.32
0.62	5.68	40.16	90.0	58.0	2.20
—	0.35	1.85	0.30	0.75	0.02
2.38	0.33	24.60	8.60	6.70	0.02
0.01	0.71	3.33	2.32	9.78	0.03
4.20	0.06	39.37	0.75	0.85	0.01
0.03	0.97	4.64	6.24	16.20	0.06
—	5.0	20.50	9.0	22.0	0.40
—	9.83	41.33	5.40	9.90	0.36
0.45	30.97	149.25	19.50	158.30	4.28
20.19	79.61	623.49	389.21	590.93	9.21
6.98	9.88	131.0	240.0	186.90	0.40
0.20	22.60	108.53	13.50	47.50	0.45
7.18	32.48	239.53	253.50	234.40	0.85
0.42	0.84	60.90	63.0	126.0	0.14
—	9.45	38.75	—	—	—
—	14.17	58.12	—	—	—
2.59	0.09	118.11	2.25	2.55	0.03
0.20	23.59	103.53	14.0	47.50	0.45
0.30	20.65	99.50	13.0	105.50	2.85
3.51	68.79	483.91	92.25	281.55	3.47
3.51	673.28	2 036.23	1 025.50	1 506.88	16.01

Table 4

Menu for Children's Home Pupils Three to Seven
Years of Age

Menu	Apportionment	Gross weight	Proteins
		in grams	
1	2	3	4
Breakfast			
Buckwheat gruel with butter	Buckwheat meal	50,0	4,0
	Butter*	10,0	0,10
Milk	Milk	200,0	6,2
Roll with butter	Roll	100,0	6,8
	Butter	10,0	0,10
	For breakfast:		17,3
Lunch			
Sour cabbage soup with meat	Cabbage	100,0	0,68
	Onions	10,0	0,08
	Tomatoes	5,0	0,12
	Tomatoes	100,0	1,04
	Carrots	10,0	0,06
	Meat	40,0	5,43
	Sour cream	15,0	0,46
Pie with meat and eggs	Flour	50,0	4,43
	Meat	45,0	6,60
	Butter	10,0	0,10
	Milk	40,0	1,28
	Eggs (units)	0,25	1,28
Cranberries with sugar	Cranberries	100,0	0,24
	Sugar	20,0	—
Bread	Bread	75,0	4,4
	For lunch:		27,11
Afternoon meal			
Milk with roll	Milk	200,0	6,2
	Roll	50,0	3,4
	For afternoon meal:		9,6
Supper			
Stewed carrots with butter	Carrots	200,0	1,2
	Milk	50,0	1,5
	Butter	10,0	0,0
Tomato juice	Tomato juice	100,0	—
Coffee with milk	Milk	100,0	3,1
	Sugar	15,0	—
	Coffee	6,0	—
Roll	Roll	50,0	3,4
	For supper:		9,6
	Total for day:		63,6

Table 4
(cont'd)

Fats	Carbo- hydrates	Calorie count	Ca	P	Fe
			in milligrams		
5	6	7	8	9	10
0,78	32,22	155,80	19,50	113,0	0,60
8,40	0,06	78,74	1,50	1,70	0,02
6,98	9,88	131,0	240,0	185,0	0,40
0,39	45,18	217,07	27,0	93,0	0,90
8,40	0,06	78,74	1,50	1,70	0,02
24,95	87,40	661,35	289,50	395,40	1,94
0,26	2,40	15,0	38,10	24,36	0,88
0,01	0,71	3,33	2,40	12,0	0,03
—	0,35	1,85	0,30	0,75	0,02
0,14	13,93	62,73	0,75	32,20	0,53
0,02	0,59	2,86	4,80	12,40	0,05
0,53	0,15	28,0	2,52	45,36	0,63
3,57	0,49	36,90	12,90	10,05	0,02
0,58	34,31	164,23	11,0	72,0	0,60
0,65	0,18	34,0	3,06	55,08	0,68
8,40	0,06	78,74	1,50	1,70	0,02
1,40	1,98	26,20	48,0	36,90	0,08
4,15	0,05	15,91	8,0	11,0	0,40
—	6,89	29,23	20,0	8,0	0,90
—	18,90	77,50	—	—	—
0,45	30,97	149,25	19,50	158,30	4,28
17,16	111,96	725,73	162,83	470,10	9,12
6,98	9,88	131,0	240,0	185,0	0,40
0,20	23,59	108,53	14,0	47,50	0,45
7,18	33,47	239,53	254,0	233,50	0,85
0,43	12,63	60,69	81,60	210,80	0,85
1,74	2,47	32,75	60,0	47,0	0,10
8,40	0,06	78,74	1,50	1,70	0,02
—	5,0	20,50	9,0	22,0	0,40
3,49	4,94	65,50	120,0	93,0	0,20
—	14,18	58,12	—	—	—
—	—	—	—	—	—
0,20	23,59	108,53	14,0	47,50	0,45
14,26	62,97	404,33	286,10	422,00	2,02
63,55	295,70	2 030,94	993,20	1 848,30	14,15

Table 5

10-Day Assortment of Food Products Per Children's
Home Pupil from Seven to Eleven Years of
Age

Name of food products	Gross wt.	Proteins		Fats		Carbo- hydrates
		ani- mal	veg.	ani- mal	veg.	
		in grams				
1	2	3	4	5	6	7
Rye bread	1 650.0	—	97.30	—	9.90	681.4
Whole-wheat bread	2 025.0	—	117.25	—	9.31	1 135.4
Macaroni	190.0	—	17.58	—	1.01	139.2
Noodles	70.0	—	6.47	—	0.37	51.5
Vermicelli	35.0	—	3.23	—	0.19	25.6
Whole-wheat flour	123.0	—	11.05	—	1.36	84.7
Dried biscuits	18.0	—	1.46	—	0.22	10.4
Millet	40.0	—	2.95	—	0.74	24.9
Buckwheat meal	185.0	—	14.80	—	2.91	119.2
Pearl-barley meal	40.0	—	2.66	—	0.32	26.4
"Hercules" meal	50.0	—	4.55	—	2.45	30.7
Oatmeal	40.0	—	3.64	—	1.96	24.4
Rice	30.0	—	1.95	—	0.35	21.5
Semolina	40.0	—	3.20	—	0.32	29.4
Potato flour	10.0	—	0.07	—	—	7.2
Peas	40.0	—	7.73	—	1.28	20.4
Beans	20.0	—	3.32	—	0.34	10.0
Milk	4 650.0	145.10	—	162.20	—	230.0
Acidophilus milk	200.0	6.24	—	5.24	—	5.0
Thin curds	440.0	81.84	—	2.64	—	5.2
Sour cream	165.0	4.45	—	39.27	—	5.4
Butter	437.0	4.28	—	366.95	—	2.2
Dutch cheese	180.0	44.98	—	53.61	—	4.2
Eggs (units)	2.25	13.63	—	12.88	—	0.5
Meat, beef	614.0	89.24	—	8.74	—	2.4
Liver	100.0	17.10	—	4.10	—	2.1
Codfish	240.0	25.94	—	0.35	—	—
Oleomargarine	60.0	—	—	—	55.86	—
Sugar	335.0	—	—	—	—	316.6
Potatoes	2 700.0	—	28.14	—	3.84	376.1
Carrots	540.0	—	3.25	—	1.14	34.2
Onions	227.0	—	2.10	—	0.15	17.2
Sauerkraut	600.0	—	4.86	—	1.86	17.4
Beets	110.0	—	1.42	—	0.07	8.4
Dried mushrooms	15.0	—	3.30	—	0.34	4.6
Pickles	135.0	—	0.96	—	0.12	2.4
Tomatoes	41.0	—	0.86	—	—	2.8
Tomato juice	500.0	—	—	—	—	20.0
Cranberries	125.0	—	0.3	—	—	8.4
Apples	900.0	—	2.23	—	—	88.4
Coffee	42.0	—	—	—	—	—
Salt	150.0	—	—	—	—	—
Total	—	432.80	346.63	655.98	96.41	3 597.8

Table 5
(cont'd)

Calorie count	Ca	P	Fe	A	B ₁	B ₂	PP	C
	in milligrams							
	9	10	11	12	13	14	15	16
83.50	429.0	3 481.5	94.05	—	2.48	1.16	14.85	—
82.47	546.75	1 883.25	18.23	—	1.42	1.01	24.30	—
82.27	41.80	273.60	2.28	—	0.21	0.14	3.23	—
80.31	15.40	100.80	0.84	—	0.08	0.05	1.19	—
80.15	7.70	50.40	0.42	—	0.04	0.03	0.50	—
79.67	26.80	177.80	1.48	—	0.13	0.08	1.90	—
70.76	4.86	16.73	0.17	—	0.01	0.01	0.23	—
71.29	5.60	130.89	—	—	—	—	—	—
79.58	72.15	418.10	2.22	—	0.93	—	—	—
74.34	8.0	72.40	0.80	—	—	—	—	—
77.0	34.50	196.0	1.90	—	0.15	0.03	0.5	—
73.16	27.60	156.80	1.52	—	0.12	0.03	0.4	—
79.45	2.70	28.80	0.27	—	—	—	—	—
75.83	8.0	37.20	0.40	—	—	—	—	—
70.12	2.10	12.50	0.08	—	—	—	—	—
76.20	33.69	160.0	2.28	—	—	0.04	0.4	—
77.80	26.40	95.0	1.58	—	0.03	0.01	—	—
75.70	5 580.0	4 324.50	9.30	5.58	2.33	7.90	23.25	46.50
74.98	240.0	386.0	0.40	0.24	0.1	0.34	1.0	2.0
72.80	395.0	792.0	0.88	—	—	—	—	—
75.90	141.90	110.55	0.33	0.99	0.08	—	—	—
70.94	65.55	74.39	0.88	5.26	—	—	—	—
73.27	1 598.0	1 170.0	2.16	1.62	0.05	0.71	—	—
78.19	74.25	202.50	3.38	2.93	0.16	0.35	6.95	—
78.0	41.40	745.20	10.12	0.14	0.68	0.77	17.02	5.52
77.99	39.03	554.28	26.04	26.04	0.35	1.50	14.24	29.38
77.70	60.84	343.20	0.32	—	0.10	0.14	—	1.65
78.50	—	—	—	—	—	—	—	—
78.09	—	—	—	—	—	—	—	—
75.71	202.50	870.75	14.17	0.38	1.32	2.64	18.75	140.25
73.86	220.32	569.16	2.30	11.49	0.46	0.32	1.84	19.32
72.25	55.97	237.39	0.77	0.04	0.14	0.02	—	16.30
77.10	270.0	174.0	6.69	0.12	0.12	0.42	1.80	120.0
73.12	23.50	31.02	0.67	0.01	0.11	0.08	—	8.05
73.83	1.95	12.15	0.09	—	0.03	—	—	1.80
73.08	17.55	35.1	0.40	0.81	0.81	—	—	5.40
73.17	2.40	6.0	0.12	0.41	0.02	0.02	0.02	12.30
75.50	45.0	110.0	2.0	8.5	0.35	0.20	2.0	170.0
73.66	24.40	9.78	1.10	—	—	—	—	12.2
73.99	48.60	89.10	4.24	0.73	0.32	0.32	40.50	51.03
—	—	—	—	—	—	—	—	—
—	750.0	—	6.30	—	—	—	—	—
98	11 187.10	17 933.8	217.50	65.20	13.13	18.33	174.95	641.79

Table 6
(cont'd)

Fats	Carbo- hydrates	Calorie count	Ca	P	Fe
			in milligrams		
5	6	7	8	9	10
0.32	29.46	136.88	8.0	37.20	0.40
3.49	4.94	65.50	120.0	93.0	0.20
—	4.72	19.37	—	—	—
4.20	0.03	39.37	0.75	0.85	0.01
3.49	4.94	65.50	120.0	93.0	0.20
—	14.18	58.12	—	—	—
0.39	45.18	217.07	27.0	93.0	0.90
2.59	0.09	118.11	2.25	2.55	0.03
34.48	103.54	719.92	398.00	319.60	1.74
0.30	33.89	162.77	20.25	69.75	0.68
5.39	0.47	78.14	177.0	130.0	0.24
6.29	34.36	240.91	197.25	199.75	0.92
0.11	14.66	68.66	4.40	28.80	0.25
0.01	0.71	3.33	2.40	12.0	0.03
0.02	0.59	2.86	4.80	12.40	0.05
0.14	13.93	62.73	0.75	32.20	0.53
4.20	0.03	39.37	0.75	0.85	0.01
1.22	0.34	64.0	5.76	103.68	1.42
0.40	39.70	175.64	20.0	86.0	1.40
0.01	1.06	4.94	3.48	14.76	0.05
0.03	0.89	4.28	5.60	12.70	0.06
4.20	0.03	39.37	0.75	0.85	0.01
4.20	0.03	39.37	0.75	0.85	0.01
—	9.83	41.33	5.40	9.90	0.36
—	5.0	20.50	9.0	22.0	0.40
0.60	41.30	199.0	26.0	211.50	5.70
5.14	128.10	765.38	89.83	547.99	10.28
0.48	0.96	69.60	72.0	144.0	1.60
7.14	0.99	75.80	25.80	20.10	0.06
3.98	9.88	131.0	240.0	186.0	0.40
1.30	33.89	162.77	20.25	69.75	0.68
2.59	0.09	118.11	2.25	2.55	0.03
0.30	20.65	99.50	13.0	105.50	2.85
7.79	66.46	656.78	373.30	527.90	5.62
1.70	332.46	2382.99	1058.38	1595.24	18.56

Table 6

Menu for Children from Seven to Eleven

Menu	Apportionment	Gross weight	Protein
		in grams	
1	2	3	4
First breakfast			
Semolina in milk	Semolina	40,0	3,20
	Milk	100,0	3,12
	Sugar	5,0	—
	Butter	5,0	0,06
Coffee with milk	Milk	100,0	3,12
	Sugar	15,0	—
	Coffee	6,0	—
Roll with butter	Roll	100,0	6,80
	Butter	15,0	0,15
For first breakfast:			16,28
Second breakfast			
Roll with cheese	Roll	75,0	5,16
	Cheese	20,0	5,0
For second breakfast:			10,16
Lunch			
Noodle soup and bone decoction	Noodles	20,0	1,87
	Onions	10,0	0,06
	Carrots	10,0	0,06
	Potatoes	100,0	1,00
	Butter	5,0	0,06
	Meat	85,0	12,10
Stewed meat with potatoes	Potatoes	250,0	2,50
	Onions	15,0	0,15
	Carrots	15,0	0,09
	Butter*	5,0	0,06
	Butter	5,0	0,06
	Apple	100,0	0,20
Apple	100,0	—	
Tomato juice	100,0	—	
Bread	100,0	5,90	
For lunch:			24,50
Supper			
Curds with sour cream	Thin curds	80,0	14,80
	Sour cream	30,0	0,30
Milk	200,0	6,20	
Roll and butter	Roll	75,0	5,16
	Butter	15,0	0,15
Bread	50,0	2,90	
For supper:			30,36
Total for day:			81,20

Table 7

Menu for Children from Seven to Eleven

Menu	Apportionment	Gross weight	Proteins
		in grams	
1	2	3	4
First breakfast			
Macaroni with cheese	Macaroni	50,0	4,6
	Dutch cheese	20,0	5,0
	Butter	7,0	0,0
Milk	Milk	200,0	6,2
Roll with butter	Roll	50,0	3,4
	Butter	15,0	0,1
For first breakfast:			19,5
Second breakfast			
Roll and butter	Roll	75,0	5,1
	Butter	10,0	0,1
For second breakfast:			5,2
Lunch			
Milk soup with rice	Milk	250,0	7,8
	Rice	30,0	1,9
	Butter	5,0	0,0
	Sugar	5,0	—
Stewed liver with potatoes and sauce	Liver	100,0	17,1
	Potatoes	200,0	2,4
	Onions	10,0	0,0
	Flour	3,0	0,0
	Butter	5,0	0,0
	Sour cream	10,0	0,2
Cranberry jelly	Cranberries	25,0	0,0
	Sugar	15,0	—
	Potato flour	10,0	0,0
Bread	Potato flour	10,0	0,0
	Bread	100,0	5,9
For lunch:			35,7
Supper			
Salad with fish	Carrots	45,0	0,2
	Beets	50,0	0,0
	Potatoes	100,0	1,0
	Pickles	25,0	0,1
	Onions	12,0	0,1
	Oleomargarine	10,0	—
	Codfish	50,0	5,1
	Milk	100,0	3,1
	Coffee	6,0	—
	Sugar	15,0	—
Coffee with milk	Bread	100,0	5,9
	Roll	50,0	3,4
	Apple	100,0	0,2
For supper:			20,7
Total for day:			80,1

Table 7
(cont'd)

Fats	Carbo- hydrates	Calorie count	Ca	P	Fe
			in milligrams		
5	6	7	8	9	10
0.26	36.64	171.65	11.0	72.0	0.60
5.99	0.47	78.14	177.0	130.0	0.24
5.88	0.04	55.12	1.05	1.19	0.01
6.98	9.88	131.0	240.0	185.0	0.40
0.20	22.59	108.50	13.50	46.50	0.45
12.59	0.09	118.11	2.25	2.55	0.03
32.00	69.71	662.52	444.80	438.24	1.73
0.3	33.89	162.77	20.25	69.75	0.68
8.4	0.06	78.74	1.50	1.70	0.02
8.70	33.95	241.51	21.75	71.45	0.70
8.72	12.34	163.75	300.0	233.0	0.50
0.35	21.52	99.45	2.10	28.80	0.21
4.20	0.03	39.37	0.75	0.85	0.01
—	4.72	19.37	—	—	—
4.10	2.10	116.99	39.03	554.28	26.04
0.33	32.51	146.37	17.50	75.0	1.22
0.01	0.71	3.33	2.40	12.0	0.03
—	2.18	9.04	0.70	5.0	0.04
4.20	0.03	39.37	0.75	0.85	0.01
2.38	0.33	24.60	8.60	6.70	0.01
—	1.72	7.31	5.0	2.0	0.20
—	14.18	58.12	—	—	—
—	7.27	30.12	2.10	12.50	0.08
0.60	41.30	199.0	26.0	211.0	5.70
24.89	141.14	956.19	404.93	1 141.98	33.05
0.10	2.82	13.57	18.24	47.12	0.18
0.03	3.99	19.27	10.0	13.20	0.29
0.14	13.93	62.73	7.50	32.25	0.53
0.02	0.86	2.38	2.50	5.20	0.06
0.01	0.89	4.16	2.90	12.30	0.04
9.31	—	86.58	—	—	—
0.68	—	23.21	12.48	70.40	0.07
3.49	4.94	65.50	120.0	93.0	0.20
—	—	—	—	—	—
—	14.18	58.12	—	—	—
0.60	41.30	199.0	26.0	211.0	5.70
0.20	42.59	108.53	13.50	46.50	0.45
—	9.83	41.33	5.40	9.90	0.36
13.98	155.33	684.28	218.62	545.87	7.70
79.57	350.13	2 544.60	1 090.13	2 192.54	44.18

Table 8

10-Day Food Product Assortment Per Children's Home
Child from 11 to 16 Years of Age

Name of food products	Gross wt.	Proteins		Fats		Carbo- hydrates
		animal	veg.	animal	veg.	
		in grams				
1	2	3	4	5	6	7
Rye bread	2 450,0	—	144,55	—	14,70	1 011,85
Whole-wheat bread	2 520,0	—	173,38	—	9,78	1 138,90
Pastry	40,0	—	2,68	—	2,68	29,40
Macaroni	240,0	—	22,20	—	1,27	175,87
Noodles	80,0	—	7,40	—	0,42	58,62
Vermicelli	35,0	—	3,23	—	0,19	25,64
Whole-wheat flour	128,0	—	11,43	—	1,39	88,07
Dried biscuits	21,0	—	1,70	—	0,25	12,20
Millet	50,0	—	3,68	—	0,93	31,18
Buckwheat meal	240,0	—	19,20	—	3,76	154,66
Oatmeal	60,0	—	5,46	—	2,94	36,66
Pearl-barley	50,0	—	3,32	—	0,40	33,67
"Hercules" meal	60,0	—	5,46	—	2,94	36,66
Rice	30,0	—	0,95	—	0,35	21,52
Semolina	40,0	—	3,20	—	0,32	29,46
Potato flour	30,0	—	0,22	—	—	21,82
Peas	80,0	—	15,46	—	2,57	40,27
Beans	20,0	—	3,32	—	0,34	10,0
Milk	4 320,0	134,78	—	150,74	—	213,36
Kefir	400,0	17,16	—	14,41	—	13,86
Acidophilus milk	200,0	6,24	—	6,98	—	9,88
Thin curds	715,0	132,99	—	4,29	—	8,58
Sour cream	155,0	4,18	—	36,89	—	5,11
Butter	489,0	4,79	—	410,61	—	2,93
Melted cheese	150,0	42,30	—	34,78	—	3,09
Eggs (units)	2,25	12,17	—	11,50	—	6,55
Meat, beef	682,0	99,33	—	9,73	—	2,76
Liver	100,0	17,10	—	4,10	—	2,10
Fresh codfish	260,0	11,69	—	0,21	—	—
Oliomargarine	98,0	—	—	—	91,24	—
Sugar	480,0	—	—	—	—	430,02
Poratoes	3 435,0	—	45,95	—	0,26	481,21
Carrots	342,0	—	2,06	—	0,73	21,55
Onions	164,0	—	1,52	—	0,11	14,41
Cabbage	450,0	—	1,19	—	—	9,38
Beets	160,0	—	2,06	—	0,11	12,91
Dried mushrooms	15,0	—	3,30	—	0,34	4,66
Cucumbers	135,0	—	0,77	—	0,10	0,95
Tomatoes	44,0	—	0,76	—	—	2,52
Cranberries	45,0	—	0,11	—	—	3,10
Dried fruits	40,0	—	0,48	—	0,36	20,48
Apples	200,0	—	0,50	—	—	19,66
Tomato juice	500,0	—	—	—	—	20,0
Coffee	42,0	—	—	—	—	—
Salt	150,0	—	—	—	—	—
Total		482,74	488,68	684,24	139,28	4 275,85

Table 8
(cont'd)

Calorie count	Ca	P	Fe	A	B ₁	B ₂	PP	C
	in milligrams							
	8	9	10	11	12	13	14	15
875.50	636.0	5 169.50	137.35	—	3.68	1.72	22.05	—
470.11	680.40	1 925.10	22.68	—	1.76	1.26	30.24	—
156.40	14.0	47.0	0.45	—	0.03	0.02	0.48	—
823.92	52.80	345.60	2.88	—	0.26	0.17	3.12	—
274.64	17.60	115.20	0.96	—	0.08	0.06	1.04	—
120.15	7.70	43.20	0.42	—	0.04	0.03	0.59	—
421.45	27.90	185.0	1.54	—	0.13	0.03	2.04	—
59.22	5.40	18.60	0.18	—	0.02	0.01	0.24	—
151.51	7.0	163.50	—	—	—	—	—	—
747.84	83.50	542.40	2.88	—	1.20	—	—	—
200.40	41.40	225.20	2.28	—	0.18	0.04	0.60	—
155.42	10.0	90.50	1.0	—	—	—	—	—
200.40	41.40	225.20	2.28	—	0.18	0.04	0.60	—
99.45	2.70	28.88	0.27	—	—	—	—	—
136.88	8.0	37.20	0.40	—	—	—	—	—
90.37	7.0	41.0	0.24	0.02	0.07	0.04	1.0	—
252.40	67.20	320.0	4.56	—	—	0.07	0.80	—
57.80	26.40	95.0	1.58	—	0.03	0.01	—	—
529.55	5 184.0	4 017.60	8.64	5.18	2.16	7.34	21.60	43.20
161.19	480.0	372.0	0.80	0.48	0.20	0.63	2.0	4.0
131.0	240.0	186.0	0.40	0.24	0.10	0.34	1.0	2.0
322.05	643.50	1 287.0	1.43	—	—	—	—	—
581.30	133.35	103.90	0.31	0.93	0.08	—	—	—
50.39	73.35	81.13	0.98	5.87	—	—	—	—
109.58	1 327.50	975.0	1.80	1.35	0.05	0.54	—	—
159.10	74.50	225.0	3.75	2.93	0.16	0.36	6.97	—
112.0	46.08	829.44	11.23	0.15	0.77	0.87	18.90	6.13
116.99	39.03	554.28	26.04	26.04	0.34	1.45	14.23	37.92
49.88	65.91	371.80	0.33	—	0.10	0.15	1.86	—
48.51	—	—	—	—	—	—	—	—
63.09	—	—	—	—	—	—	—	—
66.28	259.0	1113.70	18.13	0.48	1.67	0.96	23.89	187.25
93.53	239.20	359.60	1.45	7.19	0.29	0.20	1.16	12.22
58.21	40.60	173.20	0.56	0.03	0.98	0.14	—	11.90
41.12	171.90	110.78	4.20	0.09	0.09	0.32	1.35	90.0
62.40	34.0	45.88	0.95	0.14	0.16	10.90	—	11.10
35.83	0.97	6.07	—	—	0.03	—	—	1.80
12.06	14.04	28.08	0.33	0.08	0.08	—	—	0.95
13.32	2.70	6.75	0.13	0.44	0.03	0.02	0.2	13.20
13.16	9.0	3.60	0.40	—	—	—	—	4.40
89.20	19.60	38.0	1.0	0.63	—	—	—	2.40
82.66	10.80	19.80	0.72	0.16	0.07	0.07	0.90	11.35
82.50	45.0	110.0	2.0	8.50	0.65	0.20	2.0	170.0
—	750.0	—	6.10	—	—	—	—	—
5.06	11 633.50	20 637.70	273.63	60.98	15.37	30.09	153.86	608.93

Table 9

Menu for Children From 11 to 16 Years of Age

Menu	Apportionment	Gross weight	Proteins
		in grams	
1	2	3	4
First breakfast			
Oatmeal in milk	Oatmeal	60,0	5,46
	Butter	5,0	0,05
	Milk	150,0	4,68
	Sugar	5,0	—
Coffee and milk	Coffee	6,0	—
	Milk	100,0	3,12
	Sugar	15,0	—
Roll with butter	Roll	100,0	6,88
	Butter	10,0	0,10
	For first breakfast:		20,29
Second breakfast			
Roll with butter	Roll	100,0	6,88
	Butter	10,0	0,10
	For second breakfast:		6,98
Lunch			
Soup puree, pea in bone decoction	Peas	80,0	15,46
	Potatoes	100,0	1,04
	Onions	10,0	0,09
	Butter	5,0	0,05
Goulash with mashed potatoes and sauce	Meat	85,0	12,42
	Potatoes	200,0	2,43
	Onions	10,0	0,09
	Tomatoes	10,0	0,24
	Butter	10,0	0,10
	Whole wheat flour	5,0	0,44
Kefir with sugar	Kefir	200,0	6,24
	Sugar	15,0	—
Bread	Bread	150,0	8,85
	For lunch:		47,45
Supper			
Potato cutlets with onion sauce	Potatoes	300,0	3,13
	Oleomargarine	20,0	—
	Flour	10,0	0,88
	Onions	10,0	0,09
	Eggs(units)	0,25	1,46
Tomato juice	Tomato juice	100,0	—
Sweet tea	Sugar	20,0	—
Bread	Bread	100,0	5,90
Roll with cheese	Roll	50,0	3,44
	Cheese	20,0	5,64
	For supper:		20,54
	Total for day:		95,2

Table 9
(cont'd)

Fats	Carbo- hydrates	Calorie count	Ca	P	Fe
in milligrams					
5	6	7	8	9	10
2.94	36.66	240.0	41.90	235.20	2.28
4.20	0.03	39.37	0.75	0.85	0.01
5.23	7.41	98.25	180.0	140.0	0.30
—	4.72	19.37	—	—	—
3.49	4.94	65.50	120.0	93.0	0.20
—	14.18	58.12	—	—	—
0.39	45.18	217.07	27.0	93.0	0.90
8.40	0.06	78.74	1.50	1.70	0.02
24.65	113.18	816.42	371.15	563.75	3.71
0.39	45.18	217.07	27.0	93.0	0.90
8.40	0.06	78.74	1.50	1.70	0.02
8.79	45.24	295.81	28.50	94.70	0.92
2.57	40.27	252.40	67.20	320.0	4.56
0.14	13.93	62.37	7.50	32.0	0.56
0.01	0.71	3.33	2.40	12.0	0.03
4.20	0.03	39.37	0.75	0.85	0.01
1.22	0.34	64.0	5.70	93.68	1.41
0.33	32.51	146.37	17.50	75.0	1.22
0.01	0.71	3.33	2.40	12.0	0.03
—	0.73	3.70	0.60	1.50	0.03
8.40	0.06	78.74	1.50	1.70	0.02
0.06	3.43	16.42	1.10	7.20	0.06
5.24	5.04	94.98	240.0	186.0	0.40
—	14.18	58.12	—	—	—
0.90	61.95	298.50	39.0	316.5	8.55
23.08	173.89	1 121.63	385.65	1 058.43	16.88
0.13	41.80	188.19	22.50	97.0	1.60
18.62	—	173.17	—	—	—
0.12	6.86	32.84	2.20	14.40	0.12
0.01	0.71	3.33	2.40	12.0	0.03
1.38	0.07	19.09	8.0	23.0	0.38
—	5.0	20.50	9.0	22.0	0.40
—	18.90	77.30	—	—	—
0.60	41.30	193.0	26.0	211.0	5.70
0.20	22.59	108.51	13.50	45.50	0.45
4.64	0.41	67.95	177.0	130.0	0.24
26.00	137.64	869.88	250.60	555.90	8.92
82.52	469.94	3 120.74	1 045.90	2 272.78	30.43

Table 10

Menu for Children from Eleven to Sixteen Years of
Age

Menu	Apportionment	Gross weight	Proteins
		in grams	
1	2	3	4
First breakfast			
Noodle pudding with curds	Noodles	60,0	5,55
	Curds	50,0	9,30
	Milk	80,0	2,50
	Butter	5,0	0,05
	Sugar	5,0	—
	Eggs	0,25	1,22
Tomato juice	Tomato juice	100,0	—
Coffee with milk	Milk	100,0	3,12
	Sugar	20,0	—
	Coffee	6,0	—
Roll with butter	Roll	100,0	6,88
	Butter	10,0	0,10
	For first breakfast:		28,72
Second breakfast			
Roll with butter	Roll	100,0	6,88
	Butter	10,0	0,10
	For second breakfast:		6,98
Lunch			
Potato soup with meat and beans	Meat	42,0	6,21
	Potatoes	130,0	1,39
	Beans	20,0	3,32
	Carrots	15,0	0,08
	Onions	10,0	0,09
	Butter	7,0	0,07
Stewed meat with potatoes	Meat	85,0	12,42
	Potatoes	300,0	3,13
	Tomatoes	5,0	0,10
	Onions	10,0	0,09
	Butter*	5,0	0,05
	Butter	5,0	0,05
Fresh carrots	Fresh carrots	100,0	0,60
Apples	Apples	100,0	0,25
Bread	Bread	150,0	8,85
	For lunch:		36,70
Supper			
Millet gruel in milk	Millet	50,0	3,68
	Milk	120,0	3,74
	Sugar	5,0	—
	Butter	5,0	0,05
Kefir with sugar	Kefir	200,0	6,24
	Sugar	20,0	—
Bread	Bread	100,0	5,90
Roll with butter	Roll	50,0	3,44
	Butter	10,0	0,10
	For supper:		23,15
	Total for day:		95,55

Table 10
(cont'd)

Fats	Carbo- hydrates	Calorie count	Ca	P	Fe
			in milligrams		
5	6	7	8	9	10
0,32	43,97	205,98	13,2	86,40	0,72
0,30	0,60	43,50	45,0	90,0	0,16
2,79	3,95	52,40	96,0	74,40	0,10
4,20	0,03	39,37	0,75	0,85	0,01
—	4,72	19,37	—	—	—
1,15	0,05	15,91	8,0	23,0	0,30
—	5,0	20,50	9,0	22,0	0,45
3,49	4,94	65,50	120,0	93,0	0,20
—	18,90	77,50	—	—	—
—	—	—	—	—	—
0,39	45,18	217,07	27,0	93,0	0,90
8,40	0,06	78,74	1,50	1,70	0,02
21,04	127,40	835,84	320,45	484,35	2,85
0,39	45,18	217,07	27,0	93,0	0,90
8,40	0,06	78,74	1,50	1,70	0,20
8,79	45,24	295,81	28,50	94,70	1,10
0,61	0,17	32,0	2,85	46,84	1,20
0,19	18,59	83,64	10,0	43,0	0,70
0,34	10,0	57,80	26,40	95,0	1,58
0,03	0,89	4,28	5,60	12,70	0,05
0,01	0,71	3,33	2,40	12,0	0,03
5,88	0,04	55,12	1,05	1,19	0,01
1,22	0,34	64,0	5,76	103,68	1,42
0,43	41,80	188,19	22,50	97,0	1,75
—	0,35	1,85	0,30	0,75	0,01
0,01	0,71	3,33	2,40	12,0	0,03
4,20	0,03	39,37	0,75	0,85	0,01
4,20	0,03	39,37	0,75	0,85	0,01
0,21	6,41	30,74	40,80	105,40	0,43
—	9,83	41,33	5,40	9,90	0,35
0,90	61,95	298,50	39,0	316,50	8,55
18,23	151,85	942,85	165,96	857,66	16,15
0,93	31,18	151,61	7,0	163,0	—
4,19	5,93	68,60	144,0	111,60	0,24
—	4,72	19,37	—	—	—
4,20	0,03	39,37	0,75	0,85	0,01
5,24	5,04	94,98	240,0	186,0	0,40
—	18,90	77,50	—	—	—
0,60	41,30	199,0	26,0	211,0	5,70
0,20	22,59	108,51	13,50	46,50	0,45
8,40	0,05	78,74	1,50	1,70	0,02
23,76	125,75	837,58	432,75	720,65	6,82
71,82	450,24	2 912,18	947,65	2 157,36	26,93

Table 11

Composition of Studied and Suggested Rations for Children 3 to 7 Years of Age in Comparison with Physiological Norms

Показатели 1)	Физиологические нормы 2)	Состав изученного рациона 3)	Состав предложенного рациона 4)
Белки (г) . 5	68	62,5	68,9
Жиры (г) . 6	65	52,4	66,0
Углеводы (г) . 7	241	315,4	283,9
Калорийность (кал) . 8	1871	2035	2072
Кальций (мг) . 9	1000	486	1065
Фосфор (мг) . 10	1500	1090	1615
Железо (мг) . 11	15	24,1	20,3
Соотношение Са:Р . 12	1:1,5	1:2,26	1:1,51

1) Indices; 2) Physiological Norms; 3) Composition of studied rations; 4) Composition of suggested rations; 5) protein (grams); 6) fats (grams); 7) carbohydrates (grams); 8) calorie count (calories); 9) calcium (mg); 10) phosphorus (mg); 11) iron (mg); 12) ca.:P ratio.

Table 12

Vitamin Content in Suggested Rations for Children 3 to 7 Years of Age

Наименование витаминов 1)	Количество (мг) 2)
Витамин А . 3	9,25
Витамин В ₁ . 4	1,2
Витамин В ₂ . 5	1,8
Витамин РР . 6	11,3
Витамин С . 7	71,5
В том числе витамин С за счет овощных соков, свежих фруктов и ягод .	21,9

1) Name of vitamins; 2) quantity (mg); 3) vitamin A; 4) vitamin B₁; 5) vitamin B₂; 6) vitamin PP; 7) vitamin C; 8) vegetables juices, fresh fruits & berries including vitamin C.

Table 13

Composition of Studied and Suggested Rations for Pupils
in School Children's Homes Compared with Norms

1 Показатели	2 Физиологические нормы		5 Состав изученного рациона	6 Состав предлагаемого рациона	
	3 для детей от 7 до 11 лет	4 для детей от 11 до 15 лет		7 для детей от 7 до 11 лет	8 для детей от 11 до 15 лет
белки (г) 9	78	98	79	78	97
жиры (г) 10	81	86	50	75	82
углеводы (г) 11	297	424	435	356	423
калорийность (ккал.) 12	2291	2940	2541	2479	2900
кальций (мг) 13	1000	1000	505	1117	1161
фосфор (мг) 14	1500	1500-2000	1486	1785	2054
железо (мг) 15	15	15	34	21,7	27,2
отношение Ca:P 16	1:1,5	1:1,5-1:2,0	1,0:2,93	1:1,60	1:1,77

1) Indices; 2) Physiological norms; 3) for children 7-11;
4) for children 11-15; 5) Composition of rations studies; 6)
7) composition of suggested rations; 7) for children 7-11; 8)
8) for children from 11 to 15; 9) protein (grams); 10) fats
grams); 11) carbohydrates (grams); 12) calorie count (calo-
ries); 13) calcium (mg); 14) phosphorus (mg); 15) iron (mg);
16) relationship of Ca,:P.

Table 14

The Vitamin Content in Suggested Rations for School
Children's Homes

1 Наименование витаминов	2 Рацион для детей 7-11 лет	3 Рацион для детей 11-16 лет
витамины А 4	6,5	6,1
витамины В ₁ 5	1,3	1,5
витамины В ₂ 6	1,8	3,0
витамины РР 7	17,5	15,9
витамины С 8	64,2	60,1
всех витаминов С за счет овощных соков, све- жих фруктов и ягод 9	23,3	18,6

1) Name of vitamins; 2) Ration for children 7-11; 3) Rations
4) for children 11-16; 4) Vitamin A; 5) Vitamin B₁; 6) Vitamin
7) Vitamin PP; 8) Vitamin C; 9) Vitamin C included in
vegetable juices, fresh fruits and berries.

The Problem of the Organization of Laboratory Control
for Nutrition of the Population

A. M. Chistyakova and K. V. Karpov

Systematic study of nutrition of various occupational and age groups of the population for purposes of increasing its efficiency in accordance with the current requirements of science is the division of the work of the medical hygienist. The activity of the sanitation physician is carried out by various methods in this direction: investigative-descriptive, interrogative-statistical, methods of studying gas exchange, balance method, and by means of laboratory examination of the food, etc.

The laboratory method of determining the caloric count and chemical composition of the food occupies one of the important places in the study of nutrition of the population. In varying combinations with other methods it gives a better idea of the actual condition of nutrition and is the most precise method. This method is widely applied in laboratories of the sanitary-epidemiological stations, and when there is good organization in the work it makes it possible for sanitation physicians to work with objective data and to attain an improvement in the nutrition of the population effectively. Suitable performance and organization of laboratory control of nutrition is of importance for the successful work of the sanitation physician in the area of increasing the efficiency of the nutrition of the population.

For the purpose of studying the organization of laboratory control of nutrition we made an investigation of 27 laboratories of /^{rayon} sanitary epidemiological stations in the city of Leningrad. We were interested in the volume of work of the laboratories in the study of nutrition, their adequacy in numbers of personnel. At the same time, we became acquainted with the nature of the methods used in each laboratory for the purpose of determining the chemical composition and caloric count of the food, the order of formulating the results of analysis, and other problems of laboratory practice.

It was established by means of the examination that despite the adequate equipment of laboratories and adequate manning with qualified physicians and sanitation chemists, the steady increase in the number of analyses in the study of nutrition and the constant perfection of methods of investigation, there are a number of organizational deficiencies in the work of the laboratory.

From an acquaintance with the manner of carrying out laboratory control in other cities it was shown that these defects are not local but rather are noted in a number of laboratories and other cities (Kiev and Minsk). Therefore, the recommendations made below for the regulation of laboratory matters may be useful for laboratory workers in other sanitary epidemiological stations.

There are no standard methodological apparatuses, systems and methods of analysis in the rayon laboratories. Each laboratory carries out an examination of the food according to its own systems and methods. In a number of laboratories the rations are examined according to a well-developed system: proteins are determined according to the Kjeldahl ^{method} with the use of various catalysts; fats, by the extraction method in a Soxhlet apparatus; carbohydrates, by the difference; vitamin C, by the accelerated method of the State Vitamin-Control Station with the use of ^{Tilmanna} stain; other vitamins and mineral salts are calculated according to tables. Here it should be noted that the original samples, the state of aggregation of the sample being analyzed (dry weight of food converted to a homogenous state, the quantity, the concentration and the volume of the reagents used in the laboratories investigated were different in many cases).

Certain laboratories use a well-developed system of analysis, but the proteins are determined by an accelerated method (according to the Bosin-Weismann method).

In a number of laboratories of suburban rayons the analysis of the food is usually made according to the abbreviated system of ~~K~~ Kzemplarskiy; the fats are determined by the acid method of Gerber; the proteins and carbohydrates (in total) by the dry residue; the vitamins and mineral salts are not determined and not /are/calculated according to tables. Nevertheless, the suburban rayons of the large centers are usually health-resort rayons and are in particular need of a proper organization of control of nutrition.

The absence of any uniformity in methods of investigation not only excludes the generalization of material on a city-wide scale, but can lead to the inefficient expenditure of work time and reagents. Thus, for example, almost all the laboratories investigated determine each course separately by means of investigation in the process of obtaining ^{the content of} the various food components (proteins, fats and carbohydrates) for an analysis of the 24-hour rations, whereas many rations from ^{the} children's home medical institutions consists of 10-13 or more individual courses.

We consider it better to investigate the composition of the rations as an average sample after the complete ration has been converted to a homogenous state, if there are no particular indications for the laboratory investigation of various parts of the ration (breakfast, dinner, etc.) or of each course separately. If the determination of the composition and caloric count of the ration is accomplished according to ^{an} average sample from the entire mass of the ration, the characteristic features of the diet, and in the given case of the distribution of the caloric count according to various meals, may be established by computation according to the food-product assortment.

Cases have been noted where samples of food are sent to the laboratory without indicating the purpose of the examination. As a result of this, the laboratory is not able to use the best systems and methods of analysis.

The aims of laboratory investigation of the food may be different.

a) Food may be examined for clarification of the degree to which the ration corresponds to the physiological requirement of certain population groups. In this case, the entire 24-hour rations are sent to the laboratory; these rations are taken from the meal ~~at~~ the time of distribution

(entrées, dressings and sweets are selected after careful mixing; pieces of meat and fish, cutlets, pies, etc. are taken exactly according to weight indicated in the menu). The laboratory investigation in such cases is carried out according to a well-developed system ^{for} all the constituents of the food (proteins, fats, carbohydrates, vitamins, mineral salts). The samples for analysis should come into the laboratory regularly and uniformly:

on certain dates of each month in a quantity which is adequate for subsequent characterization of the biological rating of the rations and in any case no less than one or two rations a month for each installation being studied. For a more complete characterization of the nutrition with respect to the variety of the food product assortment, the establishment of daily and monthly variations in the content of various food substances, etc. it is recommended that in parallel with the laboratory investigation an additional calculation be made with respect to the apportionments by means of calculating tables for the ^{chemical} composition and *nutritive* value of the food products. P. G. Budagyan considers it necessary to make a theoretical calculation ^{of} no less than six-seven rations per month, which amounts to 18-21 rations per season, and 72-84 rations a year. The theoretical computation of the apportionments should be made by the food-sanitation physicians of the sanitary epidemiological stations. This will make it possible for physicians to study ^{nutrition} more thoroughly.

b) In various cases the laboratory may be confronted with the task of determining only the protein or the vitamin or the mineral composition of the rations, of various dishes, food products or the preservation of substances in the prepared food which have been stewed or extracted with water during the course of culinary processing (vitamins, mineral salts and others). In such cases it is ~~not necessary~~ to send a complete 24-hour ration to the laboratory, and the samples of interest to the physicians may be sent (for example: vegetables, fruits, vegetable courses -- for their content and preservation of vitamin G; of various food products or culinary products -- for their content of mineral salts, etc.). The investigations of these samples are made according to systems

and methods described in appropriate textbooks.

c) A considerable number of investigations needs to be carried out for the control of correct apportionments of food. Here, there is no need to send a complete 24-hour ration for analysis, but the physician may limit himself to sending various courses for the investigation. It is recommended that the selection of courses be made from the table. In this case, the analysis is best made according to a well-developed system by establishing separately the percentage of the apportionment which relates to proteins, fats, carbohydrates and calorie count, particularly in the examination of food from children's

adolescents' and medical institutions. The abbreviated system of investigation (according to Ekzemplyarskiy) may be recommended only in those cases where there is no need to use data concerning the protein content in the courses being investigated (vegetable *and* fruit, certain groat courses, etc.). It should be taken into consideration that in the investigation of courses the making of apportionments not uncommonly shows that the sample sent to the laboratory is of a weight which deviates, in one direction or the other, from the amount indicated in the menu, as a result of which the analysis performed shows an overfulfilment or an underfulfilment of the apportionment and, in a very small number of investigations, does not reflect the true situation. In our opinion, in drawing conclusions it would be better if the data obtained by the laboratory were applied not only to the weight of a single portion

brought to the laboratory but also to the mean weight of the sample. The mean weight of the sample should be obtained by a person who is taking the sample for analysis by means of weighing 10-15 portions directly from the table at the installation during the entire time that food is being given out. The average weight of the portion is indicated in an accompanying document which is sent to the laboratory along with the sample.

In the analysis of samples for the apportionment the necessity may arise of determining the ^{chemical} composition of the original unprocessed food, because the composition of various types of food products may vary considerably and may not correspond to the available data in certain seasons. The data obtained by the laboratory concerning a lack of correlation of the weight of the course to that given out, an underfulfilment of the apportionment with respect to various ingredients or to calorie count oblige the sanitation physician to select samples *again* and several times at short intervals of time with the aim of excluding any accidental occurrences, and if unsatisfactory analyses are repeated he should take prompt measures for improving the nutrition.

d) Finally, the laboratory may be confronted with the task of answering several questions simultaneously, for example, the composition and calorie count

of the rations, the construction of the apportionment, the degree of care used in the culinary processing of the food, its quality, etc. The samples should be taken and the methods of examination selected depending on the problems confronting the laboratory.

The aim of the investigation should be clearly indicated in the accompanying document sent to the laboratory along with the sample and the menu. The absence of this information complicates the work of the laboratory considerably. The matter of formulation of the menus is particularly unfavorable in this respect. This important document, without which the investigations can not be made, is not uncommonly filled out in a careless manner. The food products in the apportionment are not designated by their complete names, the varieties of food, for example, of meat, are not indicated, nor are the percentage of waste, the method of processing, etc. In the menus sent to the laboratory not uncommonly such names, deprived of individuality with respect to the variety involved, may be encountered as: meat, fish, vegetables, instead of the correct designation: meat--fatty mutton, Dutch cheese with 50 percent fat, etc.

In the table of apportionment sent to the laboratory the weight of the products should be indicated in grams^{net}, which makes it unnecessary for the workers to carry out excessive calculations and permits them to avoid incorrect conclusions when the quantity of wastes deviates from the officially established norms. The food product assortment should be written separately for each meal; bread, sugar, butter should also be distributed in accordance with the various meals. The menu should be signed, of necessity, by the person performing the calculations, by the cook and by the person who has taken the sample. An example of a properly made out menu is given in Table 1.

A properly made-out menu makes it possible to reduce the time of the investigation considerably and to obtain more correct results.

In certain laboratories inadequate attention has been given to a clear-cut formulation of the results of the examination made. This is explained by the fact that the laboratory does not have a uniform laboratory blank form; the printing of the blanks has not been centralized; a number of laboratories makes out the blanks by hand, which takes up considerable time.

The question of which indices resulting from the examination made need to be entered on the laboratory blank requires clarification. On the basis of numerous works carried out by various authors on the study of the state of nutrition of groups, the most important indices have been established, which,

in our opinion, should be reflected in the blank. We recommend a "uniform blank" form (Table 2) according to the indices of which it is possible to make a more thorough analysis of the nutrition under study subsequently.

Under the column "note", ^{of Table 3, III,} additional data are written ⁱⁿ which are necessary for the physiological evaluation of the ration, for example, the quantity of animal protein, bread proteins, milk fats, distribution of calorie count ⁱⁿ meals in % (first breakfast, second breakfast, lunch and supper) and others in the rations.

We call ~~it~~ "uniform blank", because part of the data in it obtained in the laboratory by means of chemical determination and calculated data which are needed in the examination are filled in by laboratory workers, while the remaining information, characterizing the completeness of the ration, ~~is~~ filled in by *food sanitation* physicians of the sanitary epidemiological station. The food sanitation physicians draw a motivated conclusion *from the* data obtained concerning the degree to which the ration corresponds to the physiological nutritional norms. On the basis of a study of the laboratory and theoretically computed results for various rations throughout the year (or other period of time) the physicians of the sanitary epidemiological stations generalize the material on the state of nutrition in the groups investigated. The objective material obtained in this way makes it possible for sanitary epidemiological stations to pose problems of improving nutrition to community organizations with a sounder basis in the event they do not satisfy the approved norms.

We consider it expedient to suggest also a blank form for filling in laboratory data obtained with the aim of a control of the manner of *making out* the apportionment (Table 3). This form makes it possible to establish not only the degree to which the apportionment is made according to the quantitative index (calorie count), as is customary at the present time, but makes it possible to characterize the completeness with which the various food components--proteins, fats and carbohydrates--are brought to the consumer.

Finally, our attention should be focussed on the inadequate use of laboratory workers and physicians of sanitary epidemiological stations, who do not work directly in the laboratories, in the work. The laboratories of the sanitary epidemiological stations have accumulated considerable material on the quantitative and qualitative characteristics of nutrition chiefly of private

groups. This very valuable material is inadequately utilized by food sanitation physicians ^{and} is not thoroughly generalized so as to contribute actively to the organization of proper nutrition on the basis of the data obtained.

Despite a number of deficiencies noted in the organization of laboratory control of nutrition the rayon laboratories are improving the methods of their work from year to year. While it was only recently that in a great majority of rayon laboratories the rations of the population nutrition were evaluated according to an abbreviated scheme, that is only from the point of view of the calorie count, at the present time a well-developed system of investigation is used for this, and not only a quantitative but also a qualitative rating of the food examined is given. The great majority of laboratories has mastered the method of determining vitamin C in the food well, and certain of them are studying methods of determining other vitamins (B₁, carotene) and determining in a laboratory manner the concentration of calcium and phosphorus in various food products.

The rayon laboratories are confronted with the task of mastering all the latest methods of investigation in the ^{very} near future for the complete evaluation of the nutritional products of prepared food. For this purpose it is necessary to raise the organizational-methodological aspect of laboratory activity to a higher level. The need has matured long ago for revising and unifying the system and methods of laboratory control of nutrition, the forms of recording the material, centralized supply of the laboratories with uniform analysis blanks, etc. In connection with these problems for increasing the prophylactic work it seems expedient to recommend that the laboratories in cooperation with the food sanitation physicians increase the volume of investigations performed with respect to the intensified study of the population nutrition by means of arranging their time for carrying out various types of analyses. With this aim in view the workers of the laboratory in cooperation with physicians of sanitary epidemiological stations should work out annual, quarterly and monthly graphs for the receipt of ^{material for} analyses systematically, thereby bringing them to a fine point of accuracy.

It is to be recommended that in the study of nutrition of groups the personnel of laboratories and physicians should not be divided into many areas of work simultaneously but rather should purposefully concentrated, at first on a narrower front and gradually expanding the scope of their activity (for studying the nutrition of trade schools, the rations of childrens

homes, hospitals, etc.). A closer connection of practical workers in laboratories with scientific institutions of the rayon, oblast, republic, etc. should be put in to smooth running order.

In the present article we have thrown light on the problem of regulating laboratory investigations of the calorie count and chemical composition of food, since this is one of the most important bases for the thorough study and increase in the efficiency of the population nutrition. An improvement in the laboratory control of the quantitative and qualitative composition of food requires the comprehensive participation and interaction of the laboratory unit and hygienic physicians not only of the sanitary epidemiological stations but also of the departmental *sanitation* service. Close association, mutual information and constant exchange of experience are obligatory conditions for the further improvement in the work of the sanitary epidemiological stations in the field of proper organization of nutrition of various occupational and age groups of the population. The comprehensive work of all the units of the sanitation service will contribute to the most effective utilization of the latest achievements in the science of nutrition in the practical activity of the sanitation organs.

Меню ①	Выход ②	Раскладка - набор												
		③ Хлеб пшеничный формовой	④ Хлеб ржаной из об- ной муки (88%)	⑤ Рис 1 сорта	⑥ Крупа гречневая ядрица	⑦ Мука пшеничная 1 сорта	⑧ Манка 1 сорта	⑨ Масло сливочное 1 сорта	⑩ Композит-жир	⑪ Молоко	⑫ Мясо (говядина) с ней утилитности	⑬ Судак свежий	⑭ Шпинат	⑮ Петрушка
②8 1-й завтрак														
②9 Каша рисо- вая, манная с маслом	240,0			50,0				5,0		50,0				
③0 Суп с овощами	240,0					5,0		5,0						
③1 Хлеб пше- ничный, чай с сахаром	200,0 + +180,0 +15,0	200,0												
③2 2-й завтрак														
③3 Котлеты кар- тофельные с творогом	200,0					20,0		5,0						
③4 Кофе с моло- ком и сахаром	180,0 + 15,0									50,0				
③5 Хлеб пше- ничный	150,0	150,0												
③6 Обед														
③7 Борщ на мяс- ном отваре	500,0							8,0						
③8 Котлеты мяс- ные с макаро- нами	100,0 75,0	15,0			5,0	40,0		8,0 5,0			60,0			
③9 Кисель виш- невый	200,0													
④0 Хлеб ржаной	250,0	250,0												
④1 Ужин														
④2 Судак отвар- ной свежий с картофельным пюре на молоке	130,0 230,0							10,0		75,0			80,0	
④3 Каша греч- невая рассып- чатая с моло- ком	190,0 125,0				75,0			5,0		125,0				
④4 Хлеб пше- ничный	100,0	100,0												
④5 Итого	3320,0	465,0	250,0	50,0	75,0	30,0	40,0	28,0	23,0	300,0	60,0	80,0	30,0	
④6 Шпинат (%)														
④7 Картофель 30		Свекла 23		⑤1 Морковь 20		⑤2 Лук 20		⑤3 Мясо (говядина) средней утилитности 20		⑤4 Петрушка 20		⑤5 Судак свежий 20		
④8 Капуста 20		Кабачки 30												

Table 1

Menu Apportionment

For 29 July 1954 in RU [Trade School] No. 38, From Dining Room No.
(Name of Dining Room, Address, Telephone No.)

(Please see page 79
for translation
of headings)

Table 1

Headings

- 1) Menu
- 2) Outlay
- 3) Wholewheat bread
- 4) Rye bread from wallpaper [?] flour (99%)
- 5) Rice, one kind
- 6) Groats, buckwheat
- 7) Wheat flour, one kind
- 8) Macaroni, one kind
- 9) Sweet butter, one kind
- 10) Compound fat
- 11) Milk
- 12) Meat (beef of average fatness)
- 13) Fresh pike, perch
- 14) Thin curds
- 15) Sour cream, one kind
- 16) Fresh carrots
- 17) Pumpkin
- 18) Onions
- 19) Spinach
- 20) Parsley, root
- 21) Parsley, greens
- 22) Beets
- 23) Fresh cabbage
- 24) Fresh potatoes
- 25) Tomato puree
- 26) Fresh cherries, one kind
- 27) Apportionment -- Food products in grams net
- 28) First breakfast
- 29) Gruel, rice, semolina with butter
- 30) Minced meat rolled in cabbage leaves, with vegetables
- 31) Wholewheat bread, tea with sugar
- 32) Second breakfast
- 33) Potato cutlets with curds
- 34) Coffee with milk and sugar
- 35) Whole-wheat bread
- 36) Lunch
- 37) Beet soup in a meat decoction
- 38) Meat cutlets with macaroni
- 39) Cherry jelly
- 40) Rye bread
- 41) Supper
- 42) Pike-perch decoction, fresh, with potato puree in milk
- 43) Buckwheat gruel poured over with milk
- 44) Whole-wheat bread
- 45) Total

- 46) Waste (%)
- 47) Potatoes. 30
- 48) Cabbage. 20
- 49) Beets 23
- 50) Eggplant. 30
- 51) Carrots
- 52) Onions
- 53) Meat (beef) with moderate amount of fat
- 54) Fresh pike-perch
- 55) Spinach
- 56) Parsley
- 57) Signatures: Food Sanitation Physician
- 58) Calculator
- 59) Chief cook
- 60) Sugar, granulated
- 61) Potato flour
- 62) Vinegar
- 63) Salt
- 64) Tea
- 65) Biscuit crumbs

Table 2

① Штамп лаборатории

② АНАЛИЗ № _____

③ Что доставлено (перечень блюд и их вес по каждой части рациона: завтрак, обед, ужин) _____

④ Кто направил _____

⑤ Откуда _____

⑥ Характер упаковки _____

⑦ Дата поступления в лабораторию _____

⑧ Дата окончания анализа _____

⑨ ДАННЫЕ ИССЛЕДОВАНИЯ

⑩ Качество кулинарной обработки блюд (вид, запах, вкус) _____

⑪ II. Теоретический подсчет меню-раскладки по каждой части рациона

12	13 I завтрак			14 II завтрак			15 Обед			16 Ужин		
	Наименование блюда 17	Выход 18	Выход 19	Наименование блюда 19	Выход 20	Выход 21	Наименование блюда 21	Выход 22	Выход 23	Наименование блюда 23	Выход 24	Выход 25
25	Продукты 26	Вес нетто 27	б. ж. у. 28	Продукты 29	Вес нетто 30	б. ж. у. 31	Продукты 32	Вес нетто 33	б. ж. у. 34	Продукты 35	Вес нетто 36	б. ж. у. 37
46	Итого			Итого			Итого			Итого		

(Please see page 83 for translation of headings)

Table 2
(cont'd)

47 III. Состав и калорийность суточного рациона

	48 По анализу	49 По расчету раскладки	50 % к теоретическому	51 Примечание
52 Общий вес суточного рациона (г)				
53 Общий сухой остаток (г)				
54 Общее количество минеральных солей (зола) (г)				
Белки (г) 55				
Жиры (г) 56				
Углеводы (г) 57				
58 Общая калорийность рациона				
59 Содержание витамина С в овощных и фруктовых блюдах на порцию (мг)				
a) a)				
b) b)				
v) c)				
r) d)				

В примечании записываются дополнительные данные, необходимые для физиологической оценки рациона, например количество в рационе животного белка, белков хлеба, молочных жиров, распределение калорийности по приемам пищи в % (I завтрак, II завтрак, обед и ужин) и др. (see running text)

60 IV. Витаминный и минеральный состав рациона

61 Содержание в миллиграммах

62 Витаминов						63 минеральных солей					
A	каротин	B ₁	B ₂	PP	C	кальций	фосфор	железо	магний	калий	натрий
	64					65	66	67	68	69	70

71 V. Заключение

72 Заведующий лабораторией

73 Производитель анализ

74 Сакитарный врач

(Please see page 83-84 for translation of headings)

Table 2

Headings

- 1) Laboratory stamp
- 2) Analysis No. _____
- 3) Material brought in (list of courses and their weight for each portion of the ration: breakfast, lunch, supper) _____
- 4) Who sent it _____
- 5) Where it came from _____
- 6) Nature of the packing _____
- 7) Date arrived at laboratory _____
- 8) Date of completion of analysis _____
- 9) Data of Investigation
- 10) I. Quality of Culinary Processing of Courses (Appearance, Odor, Taste)
- 11) II. Theoretical calculation of menu apportionment for each portion of the ration
- 12) Menu
- 13) First breakfast
- 14) Second breakfast
- 15) Lunch
- 16) Supper
- 17) Name of course
- 18) Outlay
- 19) Name of course
- 20) Outlay
- 21) Name of course
- 22) Outlay
- 23) Name of course
- 24) Outlay
- 25) Apportionment
- 26) Products
- 27) Net weight
- 28) p.
- 29) f.
- 30) c.
- 31) Products
- 32) Net weight
- 33) p.
- 34) f.
- 35) c.
- 36) Products
- 37) Net weight
- 38) p.
- 39) f.
- 40) c.
- 41) Products

- 42) Net weight
- 43) p. .44) f. 45) c. 46) Total
- 47) III Composition and Calorie Count of 24-hour Ration
- 48) According to analysis
- 49) According to computation of the apportionment
- 50) % of theoretical
- 51) Note
- 52) Total weight of 24-hour ration (g)
- 53) Total dry residue (g)
- 54) Total quantity of mineral salts (ash) (g)
- 55) Proteins (g)
- 56) Fats (g)
- 57) Carbohydrates (g)
- 58) Total calorie count of ration
- 59) Concentration of vitamin C in vegetable and fruit courses per portion (in mg) a) b) c) d)
- 60) IV. Vitamin and Mineral Composition of the Ration
- 61) Content in Milligrams
- 62) Vitamins
- 63) Mineral salts
- 64) Carotene
- 65) Calcium
- 66) Phosphorus
- 67) Iron
- 68) Magnesium
- 69) Potassium
- 70) Sodium
- 72) Director of the Laboratory
- 73) Performed the analysis
- 74) Sanitation Physician

Table 3

① Штамп лаборатории _____

② АНАЛИЗ № _____

③ Что доставлено (перечисление и вес блюд) _____

4 Кто направил _____

5 Откуда _____

6 Характер упаковки _____

7 Дата поступления анализа _____

8 Дата окончания анализа _____

⑨ Данные исследования

⑩ Качество кулинарной обработки доставленных блюд (вид, запах, вкус)

⑪ Наименование доставленных блюд	I		II		III	
	Выход (12)		Выход (12)		Выход (12)	
	⑬ Наименование продуктов	⑭ Вес нетто (г)	⑮ Наименование продуктов	⑯ Вес нетто (г)	⑰ Наименование продуктов	⑱ Вес нетто (г)
⑲ Раскладка — набор продуктов по каждому блюду и их вес						
⑳ Данные анализа	По раскладке	По анализу	% выполнения	По раскладке	По анализу	% выполнения
30 Вес блюда						
31 Вес сушого остатка						
32 Зола						
33 Жиры						
34 Белки						
35 Углеводы						
36 Калорийность брутто						

37 Заведующий лабораторией

38 Производит анализ

39 Заключение

40 Санитарно-пищевой врач

(Please see next page for translation of headings)

Table 3

Headings

- 1) Laboratory stamp
- 2) Analysis No. _____
- 3) What was brought into the laboratory (list and weight of courses)
- 4) Who sent it in _____
- 5) Where it came from _____
- 6) Nature of packing _____
- 7) Date of arrival of analysis _____
- 8) Date of completion of analysis _____
- 9) Data of examination
- 10) Quality of culinary processing of courses brought in (appearance, odor, taste)
- 11) Name of courses brought in
- 12) Outlay
- 13) Name of product
- 14) Net weight (g)
- 15) Name of product
- 16) Net weight (g)
- 17) Name of product
- 18) Net weight (g)
- 19) Apportionment -- assortment of products according to each course and their weight
- 20) Data of analysis
- 21) By apportionment
- 22) By analysis
- 23) % to which carried out
- 24) By apportionment
- 25) By analysis
- 26) % to which carried out
- 27) By apportionment
- 28) By analysis
- 29) % to which carried out
- 30) Weight of course
- 31) Weight of dry residue
- 32) Ash
- 33) Fats
- 34) Proteins
- 35) Carbohydrates
- 36) Gross calorie count
- 37) Director of Laboratory
- 38) Performed the analysis
- 39) Conclusion
- 40) Food sanitation physician

1288

END