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About the classification of specialized sports nutrition products

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Abstract. The methodological aspects of substantiating the expediency of the commodity classification of sports nutrition products included monitoring the actual nutrition of athletes, researching the market for specialized food products for athletes and consumer preferences of people with increased physical activity. It has been established that all athletes use specialized products in their practice with varying degrees of regularity. Most athletes want to use specialized foods in the form of traditional foods. The most in demand among the target audience are high-protein foods, biologically active food additives and carbohydrate-protein products, which are used by 59%, 55% and 32% of respondents, respectively. When asked about the manufacturer of specialized food products that the respondents accept, 87% named foreign companies. Evaluation of the actual diets of athletes showed that there is an imbalance in the main macronutrients in the diets compared to the recommended ratio of caloric content of proteins, lipids and carbohydrates. Based on the analysis of consumer preferences and metabolic characteristics of athletes in different sports, a fundamental classification of sports nutrition products has been developed, taking into account their macronutrient composition and energy value.

In the modern domestic commodity research nomenclature, food products of athletes are represented by a single group "Food products for nutrition of athletes" without a clarifying classification by any parameters [1]. The classification of specialized foods for athletes needs scientific justification. The most reasoned approach for ranking foods for athletes, proposed by the European Commission's Scientific Committee on Nutrition, takes into account dynamic biochemistry, a thorough analysis of the results of biomedical tests, macronutrient composition and energy value of specialized foods targeted at athletes (table 1).

Table 1. Nutritional and energy value of sports products of different categories.

Product category	Content intervals, %			Energy value / calorie content, kJ in 100 g / kcal in 100 g
	Protein	Fat	Carbohydrates	
Category A (foods rich in carbohydrates)	5-50	0-5	50-95	935-1800/220-425
Category B (carbohydrate-electrolyte solutions)	0	0	3-8	51-136/12-32

Category C (proteins and their components)	50-90	0-5	4-50	918-1800/216-425
Category D (vitamin and mineral complexes, as well as sources of minor and essential compounds)	0	0-1	0	0-37/0-9

In practice, nutritional products for athletes are sold in specialized departments or stores, or on Internet sites. Promotion of such products is an example of careful marketing. The involvement of the consumer in this market segment is carried out in terms of “healthy lifestyle”, “proper nutrition”, “normalization of metabolism and body functions”, etc.

According to the target orientation, food products for athletes are most often subdivided into the following types: a decrease in fat mass (fat burning), a set of muscle mass, an increase in strength and endurance, recovery after intense loads of various nature, prevention of diseases, etc. In this case, the products are not grouped into in accordance with dietary recommendations, and according to the laws of marketing policy: the same products are repeatedly repeated in different sections. For example, energy gels are offered in the sections “Carbohydrates”, “Blends and formulas”, “Increase in strength and endurance” [1, 2, 3]. For almost all types of products there is such a double, and often more, intersection that undoubtedly misleads the consumer.

The subject of these experimental and analytical studies were: commodity classification of sports nutrition products, actual diets and consumer preferences of persons with increased physical activity.

Research methods are: analytical method, survey-weight method and questioning method.

To assess the coverage of the target audience with specialized food products, a questionnaire was developed and posted on the educational portal of the Vologda State Dairy Academy named after N.V. Vereshchagin. A total of 1267 athletes of various specializations took part in the online survey.

In a study of the drinking regimen of athletes and the type of sports drinks consumed, the amount of fluid consumed during and immediately after exercise was monitored. The amount of fluid lost during exercise was calculated from the change in the athlete's body weight before and after training. To increase the reliability of the studies, training of medium intensity, duration 1.5 hours at an ambient temperature of 21-22 ° C [4].

The study of actual diets involved physical education students with high levels of physical activity and daily exercise. All subjects were in the 19-29 age group. In total, 57 people took part in the observation, of which 19 were women and 38 were men [5]. The studies were carried out by questionnaire-weighting method, which is used to study individual and family nutrition [6]. Food consumption was recorded by interviewing within 7 days. The consumption of products was controlled by weighing. The products were chosen by the respondents at their discretion. Seven days with the most traditional diet were taken into account, that is, holidays, fasting days, etc. were excluded.

Nutrition was assessed for all indicators, including biological value. Daily energy consumption is calculated taking into account age, gender, basic metabolic energy consumption, energy consumption for physical activity, specific dynamic action of food, cold thermogenesis [7]. The chemical composition and energy value of the actual diet under study was established by a calculation method based on the compiled layout of products by meals and per day as a whole. The calculations used the reference tables “Chemical composition of food” [8]. The calculation was carried out according to calculation tables separately for organic, mineral and vitamin composition. The organic composition (the amount of proteins, fats, carbohydrates) was calculated separately for each meal, and the mineral and vitamin composition - for the diet as a whole.

The analysis and evaluation of the obtained data were carried out in terms of the correspondence of the energy value and nutritional composition to the established values of the individual physiological need of the organism for food. For this, the relative ratio between proteins, fats and carbohydrates was assessed. In this case, the amount of proteins was taken as a unit. Then the proportion of the energy value of the diet due to proteins, fats and carbohydrates was calculated, expressed as a percentage of the total energy value of the diet.

In particular, the average basal metabolic rate (BE) of the adult population of Russia (kcal / day) [7] was interpolated for the corresponding age group, taking into account the athlete's body weight. Further, the daily energy expenditure (Q_{day}) c was determined taking into account the physical activity of the study participants, multiplying the basal metabolic rate (BE) by the corresponding coefficient of physical activity (K_{fa}) according to the formula [7]:

$$Q_{day} = BE \cdot K_{fa}$$

In order to identify the ratio of macronutrients in the diet, the actual caloric intake of proteins (Q_p , kcal), fats (Q_f , kcal) and carbohydrates (Q_c , kcal), was calculated by multiplying the amount of proteins (P , g), fats (F , g) and carbohydrates (C , g) by the corresponding coefficients, which are 4 kcal or 17 kJ for protein and carbohydrates, and 9 kcal or 37 kJ for fat.

Further, the calculation of the actual calorie content in the diet of proteins (W_p , %), fats (W_f , %) and carbohydrates (W_c , %) was calculated relative to the total caloric content of the diet (Q_{fact}) according to the formulas:

$$W_p = \frac{Q_p}{Q_{fact}} \cdot 100 \quad W_f = \frac{Q_f}{Q_{fact}} \cdot 100 \quad W_c = \frac{Q_c}{Q_{fact}} \cdot 100$$

The analysis of the use of specialized food products showed that all athletes, with varying degrees of regularity, use such products in their practice (figure 1). Moreover, more than 55% (n = 697) of survey participants are guided by the trainer's recommendations.

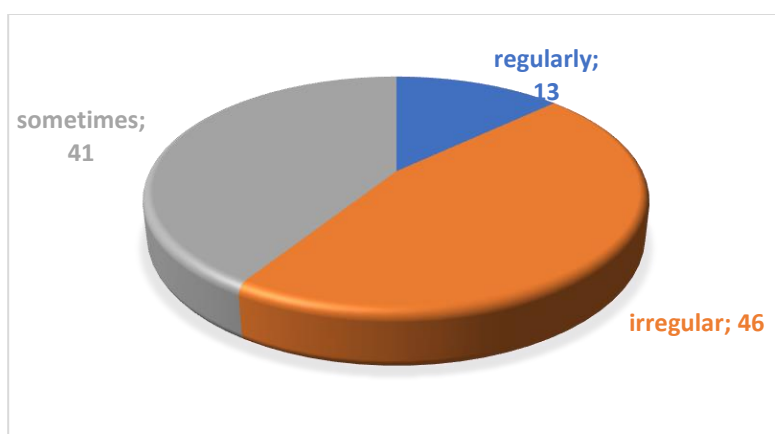


Figure 1. The regularity of specialized food products intake by athletes, percentage of the number of respondents (n = 1267).

The main periods of consumption of specialized foods are training and recovery, they were named, respectively, by 48% (n = 608) and 39% (n = 494) of respondents, and 22% (n = 279) - competitive and constantly. When analysing consumer preferences, it was found that, having the opportunity to choose products as a source of protein, dry mixes agree to use only 14% (n = 177) of the respondents, as a source of carbohydrates - 5% (n = 63). As a source of fat, 15% (n = 190) of the survey participants are satisfied with butter, 17% (n = 215) with vegetable oil. Most athletes prefer to use specialized products in the form of traditional food products, and 93% (n = 1178) of the respondents wished to include dairy products in the number of specialized ones, although only 11% (n = 139) of the survey participants are aware of such products [1].

High-protein products, biologically active food additives and carbohydrate-protein products are most in demand among the target audience, which are used by 59% (n = 748), 55% (n = 697) and 32% (n = 405) of respondents, respectively. When asked about the manufacturer of specialized food products that the respondents accept, 87% named foreign companies [1].

When determining the need for body hydration during and immediately after exercise, a close correlation was revealed between body weight and the amount of lost moisture, described by the equation $\hat{y}_x=0,017 \cdot x-0,075$ ($r=0,732$). It was found that more than half of the participants do not

replenish the required amount of lost fluid, only 6% of the respondents use isotonic drinks to rehydrate the body. The majority of the subjects, namely 72% of the respondents, eliminate dehydration with ordinary or mineral water [4].

In form, specialized food products for athletes are mainly represented: drinks, cocktails, gels, pastes, oils, dry mixes, bars, tablets, capsules, powders. Such division of goods by state of aggregation, physical and chemical form and degree of dispersion does not inform about specific functional features but misleads the consumer about the need to accept the offered food products.

Evaluation of the actual diets of athletes showed that the calorie content of the diets is generally below the recommended value. The calorie deficit in men was 17.0%, and in women - 23.9%. The identified lack of animal protein reached 30.9% in the diet in men and 39.3% in the group of women.

The analysis of individual results, taking into account the athlete's body weight, did not reveal the probabilistic risk of insufficient protein intake, since the interval of protein content per kilogram of body weight in men was 1.00-1.30 g / kg, in women - 0.90-1.12 g / kg, and the average values are 1.16 and 0.99 g / kg, respectively. However, the dietary fat and carbohydrate content did not meet the recommendations. The carbohydrate content is reduced, mainly due to polysaccharides in the daily diet of men by 23.5% compared with the recommended value and by 36.0% in women. The diets of the majority of the subjects lacked foods with an average glycemic index and foods with prebiotic properties. At the same time, an excess of fat consumption was revealed by 4.9% and 7.6% in men and women, respectively. Consequently, there is an imbalance in the diets of the main macronutrients compared to the recommended ratio of calories of protein, lipids and carbohydrates, which should be 12:30:58. In this study, this proportion in the group of men was 11:35:54, and in the group of women - 11:38:51. Also, in the group of women, a low probabilistic risk of insufficient intake of micronutrients such as calcium, thiamine and riboflavin was revealed, since their content in the daily diet averaged 636 mg, 0.93 mg and 0.96 mg, respectively [1].

In most cases, 57.5% of the subjects did not have enough traditional nutritive sources of chondroprotective substances to meet their physiological needs (figure 2). Only 7.6% of respondents had products based on meat and fish broths or offal in their daily diet, which confirmed the relevance of nutritional support and the need to develop products with chondroprotective action [9].

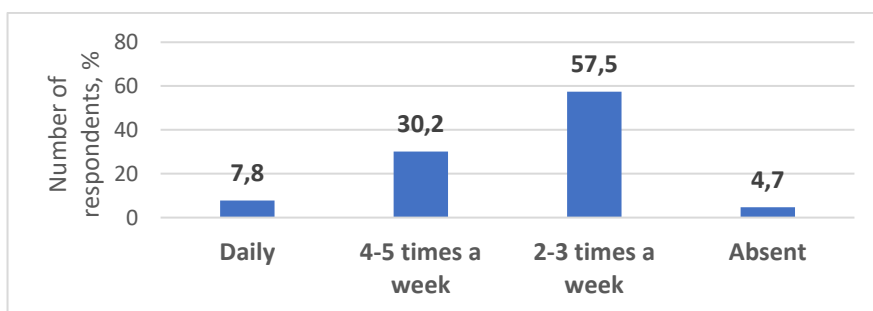


Figure 2. The frequency of the presence in the diet of nutritive sources of chondroprotective substances.

The consumption of milk and dairy products among people actively involved in sports is much lower than the norms recommended by the Ministry of Health of the Russian Federation (table 3). Consequently, classic dairy products, despite their high nutritional value known to experts, are not positioned by athletes and people actively involved in sports as one of the most important in the diet [10].

Table 2. Amount of dairy products (g / week) in diets and according to the recommendations of the Ministry of Health of the Russian Federation in 2016.

Product	Recommendations of the Ministry of Health of the Russian Federation	Real consumption
Milk and fermented milk drinks	2071	780
Curd cheese	365	100

Sour cream	58	53
Cheese	134	25
Butter	38	28

Based on the analysis of consumer preferences and metabolic characteristics of athletes of different sports, a fundamental classification of sports nutrition products has been developed, taking into account their macronutrient composition and energy value, which serves as a methodological basis for the inclusion of specialized food products in individual and typical diets of athletes (table 2).

Table 3. Principal classification of sports nutrition products.

Product type	Macronutrient composition,%			The energy value (caloric content), kJ / kcal
	Protein	Fats	Carbohydrates	
Protein	More than 30	0-5	Less than 30	850-1800/240-425
Carbohydrate	Less than 30	0-5	More than 30	850-1800/240-425
Balanced formula ^a	1-16.5	1-16.5	4-67	85-2100/29-500
Lightweight protein profile formula	1-30	0-2	1-10	34-754/8-180
Lightweight carbohydrate profile formula	1-10	0-2	1-30	34-754/8-180
Rehydration drinks ^b	0.0-1.0	0.0-0.2	3.0-8.0	51-160/12-38

^a – the weight ratio between protein, fat and carbohydrates is 1: 1: 4.

^b – osmotic concentration ranges from 240 mmol / kg H₂O to 350 mmol / kg H₂O.

The studies performed prove the expediency and timeliness of the classification and the importance of creating specialized products for athletes in the innovative development of food technologies.

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