

## STUDIES ON THE INFLUENCE OF DIET FOODS ATHLETE IN THE COMPETITION STAGE

Sorin-Iulius BARBUICA<sup>1</sup>, Camelia HODOSAN<sup>1</sup>, Anca BORDIANU<sup>2</sup>,  
Suzana-Elena VOICULESCU<sup>3</sup>

<sup>1</sup>University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Animal  
Productions Engineering and Management, 59 Marasti Blvd, District 1, Bucharest, Romania

<sup>2</sup>University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania; "Bagdasar-Arseni"  
Emergency Hospital, Bucharest, Romania

<sup>3</sup>University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania

Corresponding author email: sorin.barbuica@yahoo.com

### Abstract

*During the performance of any activity and especially on the effort in specific sports activities, the body expends energy in calories. Using an adequate diet we follow body energy reserves forming needed during effort and contests. Performance Athlete diet will be more strict to cope with the physical effort. Therefore we recommend that athletes must consume high caloric density foods like cereals, juices, honey, fruit yoghurt, hydrating beverages, vegetables, fruits, chicken, turkey and beef, fish, eggs, soy products etc. All these are required not to be absent from athlete diet. The research method was based on bibliographic study and experimental methods in order to determine the best food groups required in an athlete's diet.*

**Key words:** competition stage, diet, food, sports.

### INTRODUCTION

Because sports activity unfolds on stages which last longer (training) it is required to establish that diets based on this (Alexandrescu, 1994). A new problem arises, the necessity of finding a correct athletes diet, representing a succession of food rations, considering the consumption of energy necessary for the sportive activity; characteristics of the effort by sport branch and the preparation period; weather conditions; nutritive value of food; individual features (weight, age, gender, etc) (Craciun, 1996).

Since sports effort is achieved mainly with the help of muscles, muscle metabolism must be perfectly adapted to the body's effort, which can be achieved through methodical training, with numerous repetitions of movements in order to form stereotypes.

Food is made up of a number of nutritional factors. The well-defined substances from a chemical point of view and indispensable to humans are: proteins, lipids, carbohydrates, mineral salts, vitamins and water. From the point of view of the role they play in the body, they are divided into two groups: energetic or

caloric and protective or maintenance. The first group includes carbohydrates and lipids. The second group can be divided into two subgroups: one with the role of recovery which includes proteins and some mineral salts (calcium, phosphorus, sodium, chlorine, potassium, etc.) and the other subgroup has a catalytic action to regulate some chemical reactions and this group includes vitamins, some mineral salts (cobalt, iodine, etc.) and water.

Meat in general and liver in particular have a strong erythropoietic action as these foods contain essential amino acids. Because it contains lysine, meat stimulates the growth process in general, especially muscle growth. Given their nutritional value and mainly their class I protein content, which is much needed during effort in sports, it is recommended that athletes consume a certain amount of meat or fish per day, especially during speed and strength exercises.

Also, vegetables and fruits are part of the group that includes all foods of vegetal origin containing lot of water. Vegetables and fruits are full of of vitamin C. The role of vitamin C

in the body is very important. It is involved in cellular respiration stimulating redox processes. Also, it enhances the antitoxic action of the liver and increases the overall resistance of the organism. For this reason, sport activity vitamin C should not only be used sporadically or before the start but systematically throughout the training and competitions in order to make use of all the benefits of this vitamin. Furthermore, vegetables and fruits are the most important source of carotene (provitamin A). Highest in carotene content belongs to: leafy greens, carrots, beets, tomatoes, radishes, cherries, peaches. Vegetables and fruits, in addition to their high vitamin content, also contain minerals. As food predominating alkaline miliequivalents providers they are indispensable for ensuring the acid-base balance of the ration for athletes. Fruit and vegetables are also a source of carbohydrates which, along with vitamins, increase glycogen reserves in liver and improve its functional status.

A balanced diet containing all of the previously mentioned types of food needs to be taken into account during the competition stage in order to ensure that the athlete is in full shape.

## **MATERIALS AND METHODS**

The most important elements of research methodology brings: bibliographic study method and experimental method.

The diet of the athlete must meet the following requirements:

- 1) The athlete performs sporting effort not so much on food ingested immediately before exercise as reserves in the body
- 2) To achieve the necessary neuromuscular effort for effective sports activities, it is necessary a rich blood irrigation to organs intensively used in effort in damage of blood irrigation of unsolicited ones, as is the particularly case of the digestive tract which must be left idle during exercise.
- 3) As body adaption to workout is done in time, adaptation to a modified diet should be done gradually.
- 4) Assimilation coefficient varies depending on the nature of food and every individual (Barbuica, 2015).

In general, in terms of energy requirements we can establish three major periods in the composition of athlete diet depending on the stage of training (Barbuica, 2015).

- Preparatory stage
- Competitive stage
- Recovery stage and rest (recovery rest)

## **RESULTS AND DISCUSSIONS**

The paper, experimental research results consist of the presentations from different studies on diet depending on the stage of training.

### **Preparatory Stage**

In preparation for the general development of general resistance, diet must contain an increased amount of vitamins, especially B group (B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>) and vitamin C that acts in metabolic processes (Craciun, 1996). For strength-duration efforts should be increased, and the amount of carbohydrates that is realized based on sugar, fruits and vegetables that contain vitamins along and minerals and less on the account of pasta and bread. Gelatine and vitamin zing jelly fruits consumption helps to improve the resistance in speed endurance mode. At the end of preparatory stage when prevail exercises for speed developing, we recommend increasing the amount of protide, especially the phosphorus compounds found in milk, cheese, meat, etc.

A special importance is the correct distribution of food and daily meals:

- breakfast food should provide 25-30% of caloric intake;
- lunch food should provide 40-45% of caloric intake;
- dinner food should provide 30-35% of caloric intake.

Content of evening meal will avoid exciting foods (chocolate, cocoa and coffee) and meat in large quantities (Banu, 2005).

### **Competitive Stage**

Overall food remains as in the preparatory stage, but we introduce foods with a higher heating value and easier assimilate. During competitions diet should not differ too much with the previous one. Food rations higher in terms of quantity and easily assimilate will increase by focusing especially on

carbohydrates, dairy products, minerals and vitamins (B<sub>1</sub> and C) which helps substantial athlete effort, even if eaten the day of the contest (Alexandrescu, 1994).

In sports games or tests that require speed and endurance in equal measure, will ensure a balanced diet made up of carbohydrates (bread, pasta, rice, etc.), phosphorus (milk, cheese, eggs), vitamins (B<sub>1</sub>, C), vegetables and fruits (juices and syrups).

The food required for this competition stage needs to be rich in vitamins B<sub>1</sub> and C, carbohydrates and minerals (phosphorus, sodium, potassium).

The products with a high content of vitamins B<sub>1</sub> and C are found in Table 1 as well as the ones containing a significant amount of minerals (potassium, sodium, phosphorus, calcium, magnesium) in Table 2 (Rosoiu, 2003).

Table 1. Amount of vitamins B<sub>1</sub> and C present in 100 g of consumed product

Types of food	VITAMIN B <sub>1</sub> (mg)	VITAMIN C (mg)
Cow milk	45	2,0
Cheese	50	1,0
Eggs	120	-
Oatmeal	250	-
Whole wheat bread	250	-
Pasta	120	
Peppers	110	150
Cucumbers	70	8
Spinach	60	10
Tomatoes	35	10
Leek	140	200
Green beans	150	20
Blueberries	-	15
Rosehip	30	1000
Oranges	60	50
Grapes	50	3
Nuts	550	5

Metabolism is the transformation that takes place in living cells based on nutrients when the energy needed for these processes and the development of biological phenomena take place. Metabolism comprises two phases: anabolism and catabolism. Anabolism is the phenomenon of assimilation of nutrients from food and their incorporation in the forms of the human body. Catabolism is the phase of

dissimilation and degradation of assimilated substances. The qualitative and quantitative balance of metabolism represents nutrition.

Table 2. The amount of minerals (mg) present in 100 g of consumed product

Type of food	Minerals (mg)				
	K	Na	Ca	Mg	P
Cow milk	160	50	125	12	90
Milk powder	1280	400	1000	76	760
Egg yolk	120	50	140	15	500
Egg white	150	180	5	10	35
Oatmeal	360	35	60	120	350
Pasta	140	200	22	35	110
Whole wheat bread	190	400	28	45	200
Parsley	900	35	300	50	120
Carrots	220	100	50	15	40
Green salad	320	60	55	40	50
Spinach	700	17	13	11	35
Tomatoes	310	25	15	20	30
White cabbage	400	30	72	70	60
Bananas	380	3	8	40	30
Strawberries	160	2	25	13	30
Chestnut	510	8	35	350	150
Cherries	220	3	18	10	20
Melon	320	14	20	20	30
Apples	260	2	36	16	50
Dried plums	800	12	55	30	90

It consists of all the phenomena that occur in the body after digestion and absorption of food in the intestine. Part of the energy provided by food is used in the form of mechanical, chemical, thermal, electrical energy, the other part is kept in reserve, and the rest is eliminated. If there is a balance between the two phases of metabolism, the body's nutritional status is good and no disorders occur.

Diet during the break has on one hand the role to replenish reserves spent, and on the other hand to eliminate organism fatigue. For this it is recommended consumption of liquid, sugar and minerals, especially potassium in order to recover losses during efforts. If muscle cramps occur is recommended to drink salt water (salt 1-2 g/l).

During competition days should be avoided indigestible foods like: venison, fatty meats,

bacon, beans and dry peas, cabbage, rye or wheat bread etc. Alcoholic drinks, acid and carbonated juices and syrups made with chemicals and incentives must be avoided too. In order to obtain the correct food ratio of an athlete's diet, the energetic requirements need to be met for 24 hours depending on the type of physical effort.

To help the body recover after exercise sportive must facilitate detoxification. Body's water balance must be maintained at constant limits. After the competition when in blood circulating, metabolite results from the effort required a greater amount of water to eliminate. Therefore after exercise it is not enough just managing salty water but we will add potassium for the diuretic effect). Detoxification can be achieved through a ration with a sufficient intake of water, sodium chloride, potassium chloride, alkaline salts and vitamins, especially B<sub>1</sub> and B<sub>6</sub> a moderate percentage of lipids and carbohydrates, but low in protein. It should be administered 24 hours after the competition.

Carbohydrates needed in the sportive body should be provided at a rate of 65-70% polysaccharides (starch), which gradually digest and does not cause hyperglycaemia and only in proportion of 30-35% of mono and disaccharide (glucose, fructose, lactose, sucrose, etc.). Vegetal foods also contain an important polysaccharide called cellulose. This accelerates the intestinal transit in large amounts shorten the time of action of enzymes on food and absorption during trophies. The amount of cellulose used needs to be higher in the preparatory stages and recovery stages. In competitive stage cellulose intake must be smaller in order to not disturb the digestion. Hence, the average quantity of food required is presented in Table 3.

Table 3. The average quantity of food with the energetic value of the ratio around 4500 calories

Type of food	Average quantity (g)
Beef	350
Milk	300-500
Eggs	2 pieces
Pasta	50
Fresh vegetables	500
Fresh fruit	500
Oil	30
Bread	300

This food ratio helps at obtaining the required amounts of salts and vitamins in the body. In Table 4, as well as figure 1, the main types of food in average quantities are presented by mentioning how many proteins, lipids, carbohydrates and calories are found in each one of them.

Table 4. Types of food required in an athlete's diet ration

Type of food	Amount per week	Proteins	Lipids	Carbohydrates	Calories
Beef	3 days x 250 g = 750 g	150	37	-	975
Cow milk	7 days x 300 mL = 2100 mL	70	70	96	1340
Eggs	7 days x 60 g = 420 g	65	60	3	830
Pasta	4 days x 50 g = 200 g	26	2	148	732
Vegetables	7 days x 400 g = 2800 g	16	31	324	1280
Fruits	7 days x 400 g = 2800 g	16	31	324	1280
Oil	7 days x 30 g = 210 g	-	199	-	1850
Whole wheat bread	7 days x 250 g = 1750 g	148	26	375	3762

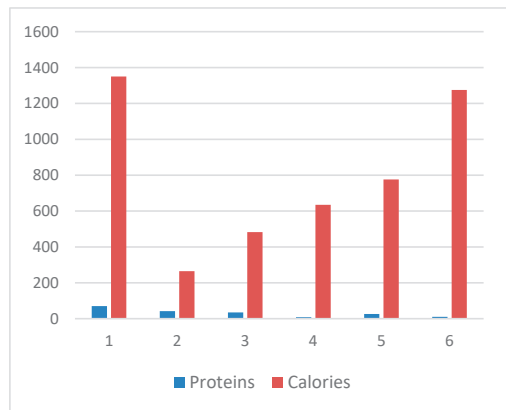


Figure 1. The amount of proteins and caloric value in the food ration in the competition stage

Hypoglycaemia resulting from an intense and prolonged effort is accompanied by a decrease in plasma potassium. It is therefore recommended that after an exhausting effort to administrate to the athletes both carbohydrates and potassium.

The research results shows the nutritional values of meat, fish and their derivatives,

athletes food ration, but also the advantages and disadvantages of using these food groups in the diet of athletes. Meat, fish and their derivatives along with milk and cheese are a good source of protein with high biological value (Class I proteins). Thus light meat, especially beef, contains 17 to 22% protides, while weak fish contains 15-20% protides. Their association with cereal products raise cereal product's nutritional value. Meat, fish and their derivatives contain significant amounts of minerals. Meat, especially the viscera (liver, kidney) is the richest source of iron. Meat and fish are rich in phosphorus, potassium and sodium but low in calcium. Meat is the most important source of Vitamins PP, B<sub>2</sub> and B<sub>6</sub>, while fish is a source of Vitamins A and D.

After the competition, the athlete loses a small amount of its reserves of fat. For that ratio to remain balanced and still respect the relationships between foods he can eat: butter, pasta or rice and oil in salads. For recovering of the potassium amount it is recommended the consumption of dried fruit at dinner. Other minerals (magnesium, calcium, iron, etc.) suffer certain changes, but losses may not be compensated immediately.

Carbohydrates reserve should be recovered avoiding massive ingestion of sugars. There are enough carbohydrates ingested at dinner table in form of pasta, rice, potatoes, fruit or fruit juice.

Dishes of meat and fish make up sources of vitamins of equal importance as foods originating from. Meat and fish are also a source of energy according to their fat content. The living organism needs food in order to cover energy costs. This energy is expressed by high calories. Depending on the energy requirements of the body we can talk about basal metabolism (basic) and effort metabolism (professional and sport).

Additionally, during sport activities the need for Vitamin C reaches an average of 150-200 mg per 24 hours, while during the competition stage may reach 300-400 mg per 24 hours (even up to 500 mg per 24 hours on authors opinion). This dose must not be exceeded as it may cause various undesirable side effects including sleep, excitement, muscle cramps. In case of hypovitaminosis C muscle

fatigue may occur. This happens more often in winter and spring due to lack fresh vegetables in the diet. Vegetables and fruits should provide 15% of the caloric value of the ration. If this percentage is not reached it is desirable to provide a supplement of Vitamin C athletes as juices. In some studies a correlation between vitamins is required as an excess of one vitamin may influence the effect of another. For example, provitamin A in excess leads to hypovitaminosis C.

Foods can also be divided into essential and non-essential. The essential ones are taken from the external environment because they cannot be synthesized by the body. For example, minerals, vitamins, the following amino acids (lysine, tryptophan, phenylalanine, methionine, cysteine, leucine, isoleucine, threonine, tyrosine, valine and some fatty acids, such as linoleic acid, linolenic acid and arachidonic acid. In order to be useful to the body, food is subjected to transformations, some outside the body and others inside it. Through the digestion process that takes place in the digestive tract, food is broken down under the action of various digestive ferments, first in the substances that are formed (proteins, lipids, carbohydrates, salts, etc.). They are further broken down into simple elements that are absorbed in the intestinal mucosa. After absorption the nutrients pass into circulation and reach the cells where they are metabolized. Diet dominated by meat has the advantage that it allows muscle to increase their volume and strength. Animal proteins stimulates the the nervous activity and facilitates the transmission of nerve excitations which consequently helps to increase effort capacity especially in the speed contests. In high intensity effort sports (running, throwing, sports games) and in those in which force prevails by imposing a large muscle development (weightlifting, wrestling) 2.3-2.5g protein per kg of body weight per 24 hours are required. Of these 60 % must be of animal origin and 40 % of vegetable origin.

## CONCLUSIONS

The sports performances obtained worldwide have reached values that years ago seemed inconceivable. For their achievement, the athletes are subjected to a complex training

process, in which the effort often requires the body to exceed its maximum physiological limits. To meet these requirements and in order to stay close to these sports activity for as long as possible, it must combine the training process with the observance of the sports life regime, in which the correct nutrition has a primordial role. Given their nutritional value and especially their Class I protein content (necessary during the effort), it is recommended that athletes consume at least 250-300 grams of meat or fish per day especially on speed and strength efforts. The diet of the preparatory phase change depending on the nature and intensity of effort.

Also, in general the athlete nutrition must not have a high volume but to consist of foods with high biological value. The assimilation of food is helped by correct ration composition and preparation of good food especially those vegetal. The manner in which of the feed ration for athletes whose caloric needs are up to 5000-5500 calories per 24 hours is made. To obtain the results were taken into account: 1 g of protein emits by burning 4.1 high calories; 1 g of fats emits by burning 9.3 calories; 1 g of carbohydrates emits by burning 4.1 calories. Since the ration is set weekly the respective amounts will be increased by 7.

Meat is recommended to be administered on meals before special effort. In the evening meat consumption should be reduced because it can adversely affect the sleep. Meat derivates and canned fish are more nutritious, have a high caloric value, but are harder to be digested. Consuming of large amounts of meat derivates and canned fish determine the change in internal pH to acidic, which is unfavorable for sport activities, especially after the finish of exercises.

## REFERENCES

- Alexandrescu, C. (1994). *Athlete's diet*. Bucharest, RO: Didactica si Pedagogica Publishing House.
- Banu, C. (2005). *Food - Nutrition - Health*. Bucharest, RO: Agir Publishing House.
- Barbuica, I. S. (2015). Studies on the importance of using meat, fish and their derivatives in athlete's diet, *Scientific Papers Animal Science and Biotechnologies*, 48(1), 369-372.
- Barbuica, I. S. (2015). Study on the use of vegetables and fruits in athlete's nutrition, *Scientific Papers Animal Science and Biotechnologies*, 48(2), 215-217.
- Craciun, M. (1996). *Athlete's diet*. Bucharest, RO: Didactica si Pedagogica Publishing House.
- Rosoiu, N. & Serban, M. (2003). *Medical Biochemistry*. Constanta, RO: Muntenia Publishing House.