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Biologic-pharmacological providing of trainings, competitions and renewal of triathletes

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Purpose: *to analyze the main means of biologic-pharmacological providing of triathletes during different periods of sports activity.*

Material & Methods: *studying and generalization of special literature on problem of ensuring efficiency of training, competitive and renewal processes in continuous triathlon, analysis of features of application of sports food, medicamentous means and methods of passive renewal in kinds of sport on endurance.*

Results: *features of biologic-pharmacological providing of sportsmen are considered before, during and after triathlon competitions, and also expediency of application of methods of passive renewal therapy is shown.*

Conclusions: *sports food is balanced by products of the increased biological value, adequate drinking mode and medicamentous providing play the major role by preparation, successful overcoming of the combined distance and the subsequent full renewal with simultaneous use of methods of passive therapy.*

Keywords: *triathlete, sports food, products of the increased biological value, drinking mode, pharmacological providing, passive renewal therapy.*

Introduction

Training and renewal in cyclic kinds of sport represent a single whole of the training process. Restoration of functions of organism of a sportsman after the muscular work is meant as not only their return to the pre-working level, but also the transition of life support systems to the higher level of power and physical capacities [1; 5; 6; 8].
The creation of the training process in continuous triathlon includes also the correct organization of meal of a sportsman before, in time, after trainings and competitions. The daily diet of a sportsman has to be full as in quantitative, and in a qualitative sense. Non-compliance with this rule will have an adverse effect on operability of a triathlete.

The main requirement to sports food as to power supply source when performing endurance exercises is the existence in it of optimum ratio of carbohydrates, fats, proteins, vitamins, mineral substances and water (carbohydrates play the leading role). At the same time the carbohydrates processed in organism which are in blood-flow in the form of glucose are the most readily available energy source for muscles. Besides, they can stock up in muscle cells and liver in the form of glycogen. Excess carbohydrates will be transformed to free fatty acids and laid in the form of fatty tissue [6; 14].

Unfortunately, the organism of a sportsman can reserve only limited quantity of glycogen. About 2 thousand kcal in the form of glucose and glycogen can contain a well trained triathlete (weight of 70 kg). This amount of energy is enough approximately for 2–3 hours (depending on intensity) of the continuous muscular work [17]. Physical condition of a sportsman begins to worsen sharply (the feeling of strong fatigue, dizziness, muscular pains, violation of haemo-dynamic indicators of HR, AD, etc. appears) at the exhaustion of all glucose-glycogenous stocks. Speed of passing of the combined distance considerably decreases because power needs of organism begin to be satisfied only due to the transformation of fatty stocks that is the extremely inefficient way of power supply [1; 6].

The exit from this situation seems in the increase in maintenance of glycogen in muscles and a sportsman's liver to the greatest possible level even prior to physical activity, maintenance of reserves of carbohydrates during the performance of exercises and completion of the exhausted power supply sources after aerobic loading – and all this at the expense of the high-carbohydrate balanced sports food.

Possibilities of expansion of so-called "bottlenecks" of metabolic processes lie at the heart of application of the pharmacological means increasing the physical efficiency and accelerating the process of renewal of sportsmen who specialize in sports on endurance [6].

However, the questions concerning the biologic-pharmacological providing of a triathlete during the precompetitive period, during the competitions, during the post-competitive period, and also applications of passive methods for renewal of their sports working capacity are far not completely studied.

The purpose of the research:

to analyze the main assets of biologic-pharmacological providing of a triathlete during the different periods of sports activity.

Research problems:

1. To reveal features of food and drinking mode of a triathlete during the precompetitive period.

2. To show the value of use by the sportsman of adequately picked up sports food during the continuous triathlon competitions.

3. To consider specifics of the process of renewal of a triathlete during the post-competitive period.

4. To show the value of application of pharmacological means for the increase in working capacity and acceleration of the process of renewal of the sportsmen who specialize in sports on endurance.

5. To consider the role of methods of passive therapy as means for the acceleration of renewal of sports operability of a triathlete.

Material and Methods of the research

1) studying and synthesis of the data of literary and Internet sources for the assessment of the degree of study of problem and allocation of the key provisions which are the cornerstone of ensuring efficiency of training, competitive and renewal processes in triathlon;

2) analysis of features of application of sports food, medicamentous means and methods of passive renewal in sports on endurance.

Results of the research and their discussion

Correctly organized trainings of the triathlete in combination with balanced diet products of the increased biological value create prerequisites to accumulation of large number of glycogen in muscle cells and liver. However it should be noted that the increase in possibility of organism to increase glycogenous stocks due to its adaptation to the growing requirements – rather long process.

Balanced, adequate to training load and timely sports food is also one of the powerful means of renewal of muscular working capacity and physiological functions of organism of the sportsman after hard and long physical activity [10, 14].

Food and drinking mode during the precompetitive period

At this stage sports food has to provide the sportsman's organism to all necessary for successful overcoming of the combined distance of continuous triathlon.

It is necessary to increase the content of carbohydrates in food till 80% of total of the consumed calories and to provide the sufficient saturation of organism with liquid (as also 3–4 grams of water stock up with each gram of glycogen) in 10 days prior to participation in triathlon when planning diet (taking into account the type of the program and length of distance) [1; 6].

It is necessary to enter into daily food allowance surely juice and energy drinks a day before the participation in competitions, and it is recommended to include the small amount of vegetable food fibers in lunch reception of high-carbohydrate food – whole-grain bread, fresh fruit and vegetables (for simplification of cleaning of intestines in day of competitions).

It is desirable to reduce the use of firm foodstuff, having replaced them with the high-carbohydrate easily acquired food and energy drinks before 2–3 hours prior to start.

It is necessary to drink in addition up to 200 ml of the drink filling liquid for hour prior to the competitions.

It should be noted that it is necessary to test them during the intensive trainings before to eat any food or liquid before competitions [10].

Food and drinking mode during the competitions

Because the kind of sport triathlon includes the different in extent combined competitive distances, time of their overcoming differs significantly [2].

Passing of distances of *short* triathlon is in two-hour time frames for professional sportsmen (three-hour – for fans and veterans), i.e. the power stocks which are saved up in organism before start are quite enough for performance of the necessary muscular work [3; 7; 17].

It is desirable for a triathlete to use the liquid nutritious mixes consisting of digestible carbohydrates, enriched with complex of vitamins and mineral salts (single dose of reception of 100-200 ml at food temperature +15-20°C) for the replenishment of the energy spent during swimming at the cycle stage «Olympic sweatshirts». The special drinks containing glucose and small amount of the sodium, which is necessary for normal absorption of liquid, can effectively be used for the purpose of compensation of losses of liquid.

When overcoming **long** distances of triathlon of amount of glucose in blood and glycogen reserved in muscle cells and the sportsman's liver it is not enough for power supply of his organism throughout the whole race (a sportsman spends about 10 000 kcal on "classics") therefore the prevention of glycogenous exhaustion requires the additional food during the competition (for example, one of options of composition of nutritious mix: porridge broth (20 g of grain on 200 g of water), sugar – 50 g, cranberry jam – 50 g, glucose – 25 g, sodium phosphate – 3 g, ascorbic and lemon acids – 0,3 and 0,5 g properly).

Considering that professional triathletes should spend for conquest of classical distance about 8–9 hours, the closest attention, on an equal basis with technical, tactical and his physical training has to be paid to questions of food and compensation of losses of liquid of a sportsman on the track of race [2; 4; 5].

As in continuous triathlon competitions rules have forbidden any help to a sportsman, he takes with himself liquid individual food in special cycle flask which fastens in flask-holder on the frame of the bicycle or is placed in the cycle undershirt pocket [15; 16]. On conducted – and running segments of the track Nutritious points, where a triathlete also settle down, can leave his sports foods and drinks [13], which is prepared for themselves in advance.

Hard to digest products, and also causing dehydrations of organism and condition of discomfort (for example, congestion of gases in intestines), it is not necessary to include in diet during the competitions (vinaigrettes, salads, greasy and

spiced food).

As when passing super-marathon, a sportsman loses more than 5 liters of water, drinks, which are intended for its compensation, have to contain no more than 5–10% of glucose. If concentration exceeds 10%, the organism perceives them as energy source, but not as liquid (that fully does not provide adequate replenishment of water stocks).

As a rule, opportunities for the use of drinks are more, than during run at the cycle stage of. It is necessary to drink 100–200 ml of drink small drinks every 20 minutes of muscular work.

It is necessary to consider that the need of organism for liquid is influenced by also weather conditions because it is spent much more in hot, damp, windy weather [1; 6; 17].

Food and drinking mode during the post-competitive period have to promote active the return to norm of muscles and physiological functions of a triathlete which were broken during the intensive long loading, and also to full recovery of the spent power stocks of organism and renewal of its water balance [10; 14].

Sports food, which is used by a sportsman after the competitions, has to be, in principle, the same, as well as prior to them and consist of the products of the increased biological value including: carbohydrates – glucose, sucrose; separate amino acids – glutamic acid, methionine; mineral salts; products of intermediate exchange – lemon, amber, apple acids. For example, proteinaceous-glucose vitaminized chocolate, which is containing to 20% of milk proteins + 60% of glucose + vitamin E. The recommended single dose of reception is 25–100 g (depending on the done muscular work).

However sports nutritionists have certain recommendations concerning the beginning of meal during this period.

The maximum strengthening of activity of enzyme glycogen-synthetase (which increases ability of muscle cells to reserve glycogen) is observed within 2–4 hours directly after the finish, and then for days it comes back to the normal precompetitive level [6].

It is important to use this property of organism in an expedited manner to transform carbohydrates to glycogen at renewal after exercise stress. It is recommended to take “Sports drink” (300 ml) consisting of glucose, sugar, ascorbic, glutamic and lemon acids, sour phosphate of sodium, berry extract, fruit juice and water for this purpose after completion of overcoming the combined distance of continuous triathlon.

A triathlete should accept the special food including not less than 65% of difficult (glycogen, cellulose, pectines) and simple (glucose, fructose, lactose) carbohydrates in one hour after the end of competitions. To repeat the similar meal in two hours (an athlete has to use up to 400 g of carbohydrates for two receptions).

It is necessary to restore water balance of organism also completely except the replenishment of power stocks. It is necessary to drink water, such drinks as fruit juice, skim milk, herbal teas in small portions, but regularly throughout the day for this purpose [10; 14]. You should not wait when having felt thirsty because to observe the drinking mode correctly is problematic at emergence of thirst. The indicator of dehydration of organism is muddy or yellowish urine (its color has to be always light).

It is not recommended to take drinks with caffeine during renewal (coffee, black tea, Coca-Cola, Pepsi Cola, etc.) and alcohol (beer, longer, etc.) as all this is diuretics and forces organism not to fill up, and to lose water.

A triathlete needs several days for complete recovery of stocks of glycogen after overcoming long distance of triathlon and to compensate losses of liquid in organism, it will be required to it till 24 o’clock.

Triathlete chooses products of the increased biological value in sports food for himself taking into account their caloric content (carbohydrates – 4, kcal·g^{-1}, proteins – 4,3 kcal·g^{-1}, fats – 9,3 kcal·g^{-1}), on the basis of personal experience and recommendations of the sports nutritionist [14].

The best sources of proteins and carbohydrates of vegetable origin for food of sportsmen, who do sports on endurance, are the following products:

– bean (>20% of protein) – black, red and white beans, soy, lentil, dry whole and split peas;
– grain (>70% of carbohydrates) – barley, buckwheat, wheat, corn, rye grain, rice, oat flakes (the flattened grits);
– fruit and vegetables (≥90% of carbohydrates) – apples, bananas, baked potatoes.

Among the components of animal origin which are part of sports diets, low-fat dairy products (milk, yogurts, cottage cheese), and proteins – bird (chicken breasts), fish (cod, tuna) and white of egg are considered as the main sources of carbohydrates.

The intensive metabolism in organism of triathletes demands the increase in norm of reception of vitamins.

Correctly made food allowance after the trainings and competitions provides a sportsman’s organism with enough carbohydrates (for the replenishment of energy sources), proteins (for cellular structures), liquids (for all functions of organism), the balanced ratio of vitamins and mineral substances (for optimum work of cages) and serves as additional effective remedy of both renewal, and increase in the level of power opportunities of a sportsman [10; 14].

Pharmacological means for the increase in working capacity and acceleration of the process of renewal

Training loads of triathletes are rather high therefore except rational diet products of the increased biological value for the purpose of better preparation for competitions, they use also the following medicamentous means:

1) inosine, potassium orotate– for ensuring strengthening of synthesis of protein;
2) carnitine, Pananginum, glutamic acid, calcium glycerolphosphate, Aminalonum – medicines of power action;
3) Eleutherococcus, Saparalum, pollitabs – adoptogenny medicines;
4) different types of salts of iron – blood formation stimulators.

When carrying out the training process in the conditions of the mountain area it is in addition possible to accept vitamin E (on 50–100 mg a day) and vitamin B15 (on 1 tablet 3 times a day).

With the increase in intensity of loadings after the basic stage of preparation in need of regulation of physiological functions of organism of a sportsman can be used:

1) vitamin B5 (0,1 g a day) along with lipoic acid (25 mg a day) and niacinamide (5 mg a day);
2) thiamine (5 mg a day);
3) ascorbic acid (on 0,5 g 2–4 times a day) [1; 6].

Passive methods of renewal. Distance of a triathlete is the complex "test" on endurance, consisting of three tests heavy physically.

The major factor reducing the efficiency of sportsmen is insufficient renewal after long loadings during the training cycle that is promoted by the accumulation in organism of by-products of metabolism [11, 12].

The increased content of lactic acid in muscular tissue (muscular acidosis) leads to emergence in a sportsman of feeling of fatigue.

Methods of passive recovery therapy are used for acceleration of removal of lactate from muscles. The greatest distribution in sports practice was gained by the weakening bathtubs and massage, and also fresh bath and sauna (it is not recommended to accept right after the competitions, it is more expedient – next day since morning).

At moderate use the weakening bathtubs – one of the most pleasant ways of removal of muscular tension. Use of vortex bathtubs and Jacuzzi with water temperature +36°C promotes the improvement of blood circulation and acceleration of removal of lactic acid from organism.

Sports massage is also widely applied to renewal of triathletes after the trainings. Thanks to it, inflow of blood to muscles increases, removal of lactate accelerates and intake of nutrients to muscular tissue improves.

Fresh bath and sauna in combination with alternating douche are important for renewal of sports efficiency of a sportsman between morning and evening trainings. Action of high temperature and relative humidity of air increases the efficiency of recovery process (optimum indicators for fresh bath – air temperature +60–70°C at humidity of 20–70%; for dry-air (sauna) +100–140°C, at 10% respectively) [1; 6; 9].

Conclusions

On the basis of the conducted research it is possible to draw the following conclusions:

1. About 80% of carbohydrates of total of the calories consumed by it at full saturation of organism liquid have to be contained sports food of a triathlete within ten days before the start.

2. The use of individually picked up sports food as power supply source when passing of the combined track of race has to prevent the exhaustion of glucosic-glycogenous stocks of organism of a sportsman.

3. The main feature of renewal after long aerobic exercise stress is the use of ability of organism in an expedited manner (within 2–4 hours after the muscular work) to transform carbohydrates to glycogen what a triathlete needs the use of the special high-carbohydrate food including products of the increased biological value for.

4. Application of medicamentous means for the better preparation for competitions in continuous triathlon and the process of renewal after them promote the increase in opportunities of expansion of so-called "bottlenecks" of metabolic processes and regulations of physiological functions of organism.

5. The use of passive methods of renewal after exercise stresses in the types of sports activity, entering triathlon, increases inflow of blood to muscles, accelerates removal of lactate and improves intake of nutrients to muscular tissue.

Prospects of further researches. The subsequent researches will be directed to studying of questions of optimization of the specialized food of sportsmen at the organization of long-term training process in types of the program of triathlon.

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