TOURISM AND FOREST HUNTING MANAGEMENT

УДК 613.2 : 612.392 – 048.26

A. M. Bondaruk[1], V. G. Tsygankov[1], L. N. Zhurihina[2], S. V. Fedorovich[2], V. V. Gulin[3]
[1]Belarusian State Technological University
[2]Scientific and Practical Center of Hygiene
[3]Republican Center for Hygiene, Epidemiology and Public Health

ASSESSMENT OF BIOLOGICAL VALUE AND SAFETY OF FOOD IN THE DIET DEVELOPING FOR TOURISM AND RECREATIONAL ACTIVITIES

The qualitative composition of food for people leading an active life, should be selected based on individual physical characteristics. Anyway, the food must contain all the essential macro and micro elements. When the optimal supply structure ensures high performance and primary prevention of many diseases (cardiovascular, atherosclerosis, cancer, and others), increases immune resistance, and enhanced protection from the effects of adverse environmental factors.

Methodological approaches to estimation the safety and biological value of food production in the Tetrahymena pyriformis. Has done a ranking of food products for the food composition and energy value. Determine the balance of these foods in the daily diets. Offered a table of the calculation of the amount of food for the cultivation of a Tetrahymena pyriformis. Developed and experimentally tested two versions of the environment necessary for the study of biological value and food safety in the Tetrahymena pyriformis.

Key words: tourism and recreation, biological value, food safety concentrate.

Introduction. The purpose of the recreational tourism can be identified as recreation of people by the means of tourism. The purposes of tourist recreational activities are practically inseparable from the purposes of complete rest (they are solved simultaneously). So, one may call the recreational tourism as health-improving tourism. At the same time, if this or that technique of health-improving is applied during tourist activities (the method and means of health-improving are considered and appropriate activities are planned), they can be referred to as health-improving and recreational. Any recreational tourist activity focuses on a health-improving approach (health-improving reason), where the process of health-improving is going "on its own" in the context of passive or active relaxation.

The recreational tourism, especially in its active forms, allows the influence of unfavorable factors of everyday routine (emotional tension, hypokinesis, excessive malnutrition etc.) to be eliminated or weakened. Firstly, muscular activity and the elimination of unfavorable consequences of muscular weakness together with the training of the core functional systems (cardiovascular, respiratory, supporting-motor, neuroendocrinological etc.), providing the organism's capacity to work supports an effective rest and health-improving of the participants of the tourist-recreational activity. Secondly, apart from medium-intensity physical exercises, change of the environment and positive emotional background caused by communication with a pleasant company and nature carries health-improving effect. Changing from neuroemotional system to new objects provides a "way-out" from every-day monotonous conditions. The suggested physical exercises are not considered as monotonous or tiring with a positive emotional background. Instead, they are easily endured and provide rest and health-improving of the participants.

Thirdly, natural recreational resources themselves provide health-improving effect. There is no need to prove how beneficial are such factors as staying under the sunlight, clean air and water, the influence of phytonsides, high of which is found in pine forests, etc. The strengthening effect of air-water procedures is obvious as well. Natural immune system is stimulated in natural recreational conditions; regular participants of the health-improving hikes note increased immunity against pathogens. High-quality tourist service and regular (as opposed to the city rush) dietary, exercise and relaxation schedule provide complete rest and health-improving of tourists.

People sticking to a healthy way of life need to measure the amount of exercise and ensure recovery after them. The recovery is impossible without a balanced diet, that provides the organism with energy and material necessary for the production of new cells. The ration of the participants of tourist hikes should be developed in the following way:

1) providing the necessary amount of calories, microelements and vitamins;

2) activation and normalization of the metabolic processes;

3) weight regulation;

4) improvement of the morphological indicators [2].

The tourists spend a lot of energy on maintaining the primary vital functions (heart function, digestion, respiratory) during physical activities, and internal organs perform in an enhanced mode during athletic exercises. In case there are not enough nutrients, energetic imbalance may occur, which can lead to organism's depletion.

Composition of the food should be selected according to individual physical characteristics and level of stress of those sticking to a healthy way of life. In any case, the food should contain all the necessary macro- and microelements.

According to the composition of the food, proper diet should be close to this formula: 30% proteins, 60% – carbohydrates, 10% – fats. Enough attention should be paid to microelements and vitamins, which can be provided either by various kinds of food or by specialized medication compounds.

From a hygienic point of view, the quality of food includes three main components [5].

1. Nutritional value of food, meaning its richness in vital nutrients, which provide the organism with energy, food macro and micronutrient. The optimal nutrition structure procures high operability and primary prevention of many diseases (cardiovascular, atherosclerosis, cancer, and others.). It also increases immune resistance and intensifies protection from impact of adverse environmental factors.

2. Food safety, as food can be the main carrier and source of potentially dangerous chemical and biological agents. Thereby safety standards (the ultimate permissible and other regulations, which compliance ensures the safety of foodstuffs for humans) were worked out.

3. High consumer properties of foodstuffs, which give them the appropriate color, smell, taste, form.

High quality of the foodstuffs should reckon for compliance with all three components, but one of the main principles of formation of food product's quality is their safety [6].

Main part. Analysis of Belarusian and foreign sources, as well as the results of our previous researches on the medical and biological evaluation of food products produced by different technologies have shown that biotesting of food products on Tetrahymena pyriformis requires individualization of methodological approaches to the assessment of safety and biological value of different groups of products. Important methodological moments during the test are: the selection of the researched product, composition of the Tetrahymena piriformis culture medium on its basis and the composition of the comparison standard [7].

While developing methodological approaches to the assessment of food products on the Tetrahymena pyriformis we were guided by the necessity of extrapolating the obtained results to humans. Therefore, we took into account the daily human need for food and micronutrients

To solve the assigned tasks an analysis of the chemical composition of foodstuffs was implemented. According to the results of analysis, all food products having similar composition of nutrients and energy value are consolidated into separate groups: meat, milk, fats, grain and products of its processing, fruits, vegetables and potatoes separately.

Daily ration with energy value of 2,000 to 8,000 kilocalories was analysed in the selected groups. For each group of products within the ration we calculated averaged value "kcal/g", called "conditional energy density (CED)" (Table).

The group of meat products within the ration is characterized by the absence of carbohydrates. That's why during the research of meat and the products of its processing on Tetrahymena pyriformis carbohydrates must be added into the culture medium. In the research of the fats both carbohydrates and proteins should be added in the nutrient medium for ciliates. Grain products and potatoes can be the only source of nutrients in the culture medium of the test object. In the research of honey or the confectionery the culture medium Tetrahymena pyriformis must be supplemented with protein.

The main groups of products balanced on mini and macronutrients

Groups of products	Mass percentage, %	Energy percentage, %	CED, kcal/g	Proteins, g/g	Fats, g/g	Carbohydrates, g/g
Meat, fish, seafood	8.0	10.0	1.41	0.17	0.08	0.00
Dairy	18.0	11.0	0.68	0.04	0.03	0.04
Fats	1.2	9.0	8.34	0.00	0.92	0.00
Grain processing products	8.0	17.0	2.29	0.09	0.02	0.43
Potatoes	14.0	10.0	0.80	0.02	0.00	0.16
Vegetables, herbs	14.0	3.0	0.24	0.02	0.00	0.04
Fruits, berries, juice	27.0	12.0	0.47	0.005	0.00	0.10
Sugar, honey, confectionery	10.0	28.0	3.21	0.005	0.00	0.94

Food products are examined for Tetrahymena pyriformis in s, isoefficient to the different levels of the daily ration.

Casein (a standard of comparison and scaling, that is conventional in the international practice of the research) is typically used as an internal standard in the research of the biological value of food products. The use of casein in the experiment has some technical difficulties. Therefore, we studied the growth of Tetrahymena pyriformis in the culture medium containing as a protein component human serum albumin, milk protein coprecipitate, casein peptone aside from casein. The carbohydrate components of the culture medium were glucose, starch, maltodextrin. Yeast extract or a mixture of vitamins were sources of vitamins. Mineral elements were also applied into the culture medium.

According to the rules of the good nutrition content of proteins and carbohydrates in the human ration in a proportion of 1:4 is optimal.

The composition of medium 1 consisted of casein (the protein component), glucose (carbohydrate source), minerals, yeast extract (source of vitamins).

In medium no. 2 starch was the carbohydrate source, the mixture of water-soluble and fat-soluble vitamins was taken instead of vitamins, besides medium was supplemented with fats (the mixture of sunflower oil and pork fat).

The composition of media 3 and 4 included glucose, mineral elements, vitamins, but the source of protein in medium 3 was coprecipitate and in medium 4 was casein peptone.

The ratio of protein and carbohydrates in all mediums is 1:4. Population growth was investigated with protein in the culture medium 1, 2, 4 mg/ml. Number of infusorian was determined during the time of exposure to 24, 48, 72, 96 hours (Fig. 1, 2, 3, 4).

Graphical analysis of Tetrahymena pyriformis curves of population growth over the life cycle did not reveal any abnormalities in all culture media.

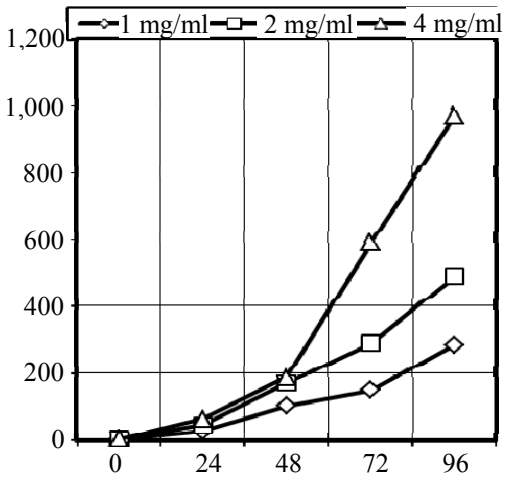

Fig. 1. Population growth of Tetrahymena pyriformis in medium no. 1

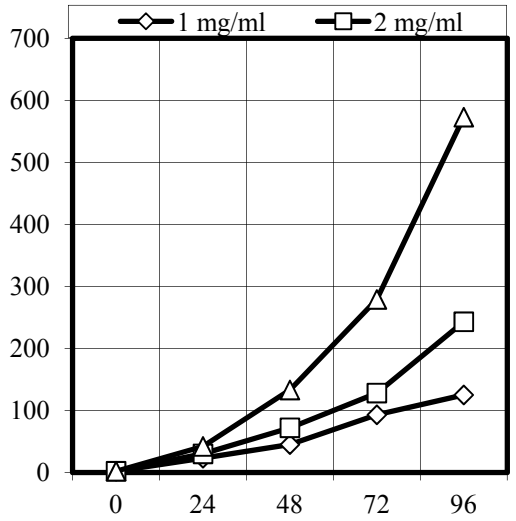

Fig. 2. Population growth of Tetrahymena pyriformis in medium no. 2

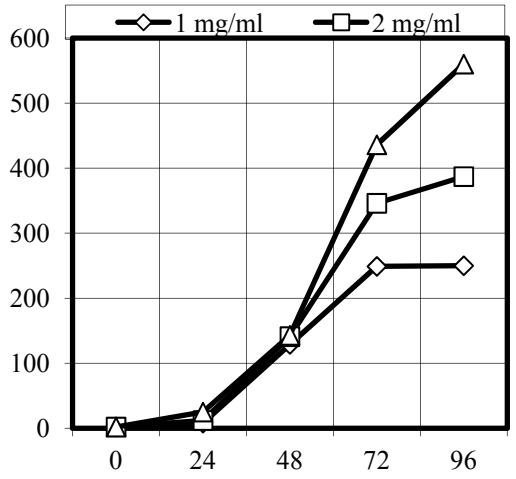

Fig. 3. Population growth of Tetrahymena pyriformis in medium no. 3

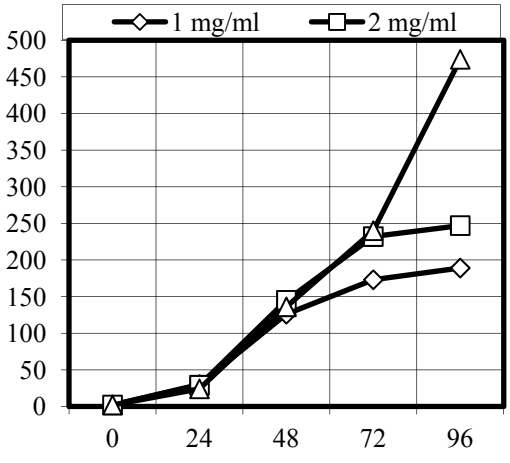

Fig. 4. Population growth of Tetrahymena pyriformis in medium no. 4

Maximum growth was observed with of the protein in medium no. 4 mg/ml. However, when the

source of vitamin in the culture medium was yeast extract (medium no. 1) the population growth was at the higher level comparing with medium no. 2, 3, 4 that contained a mixture of synthesized vitamins.

It can be assumed that the reason for the lower generative activity of Tetrahymena pyriformis in medium no. 2, 3, 4 can be synthesizing vitamins.

The growth of population in medium no. 2 (source of protein is casein) and medium no. 4 (the source of the protein is casein peptone) occurs at the same rate. In medium no. 3 (the source of protein is coprecipitate) the population growth was twice higher than in medium no. 2 and 4.

Infusorians in all analysed medium were without visible morphological and functional failures. The analysis revealed that protein is suitable for use along with casein, a milk protein casein peptone and coprecipitate in the study of biological value and safety of food. It is proposed to use two standards. The composition of standard no. 1: protein (casein coprecipitate, peptone), carbohydrates (glucose, starch, maltodextrin), mineral elements, yeast extract.

The composition of standard no. 2 is protein (casein coprecipitate, peptone), carbohydrates (glucose, starch, maltodextrin), mineral elements and vitamins. The choice depends on the standard composition of the investigational product and the purpose of the experiment. Thus, the standard no. 2 should be used while biotesting specialized food products containing vitamins.

Conclusion. Methodological approaches have been used for assesment of safety and biological value of food products on the Tetrahymena pyriformis. These approaches consisted in the splitting of food into groups according to nutrientnym composition and energy value; in determining the balance of the food groups in the daily diet of various energy value; in developing a table for the calculation of the culture medium s of Tetrahymena pyriformis products. Two standarts of comparison that are required in the study of biological value and food safety by the Tetrahymena pyriformis have been developed and tested.

References

1. Jasoveev M. G., Dosin Ju. M., Krylova O. V. *Prirodnye faktory ozdorovleniya* [Natural healing factors]. Minsk, 2004. 198 p.

2. *Aktualizirovannyy dolgosrochnyy prognoz razvitiya napravleniy fundamental'nykh issledovaniy v Rossiyskoy Federatsii na period do 2030 goda* [Updated long-term fovecast for the development directions of basic research in Russian Federation for the period till 2030]. Moscow, IPRAN, 2013. 52 p.

3. Onishhenko G. G. Food quality: hygiene, quality standards. *Voprosy pitaniya* [Nutrition], 2004, no. 3, pp. 9–13 (In Russian).

4. *Nauchno-prakticheskiy kommentariy k Federal'nomu zakonu «O kachestve i bezopasnosti pishchevykh produktov» (postateynyy)* [Scientific-practical commentary to the Federal Law "About food quality and safety"]. Available at: http://tso.su/doc/komment.doc (accessed 15.04.2013).

5. Vinohodov D. O. *Nauchnye osnovy biotestirovaniya s ispol'zovaniem infuzoriy: avtoref. dis. … d-ra biol. nauk* [The scientific basis of bioassay using ciliates. Abstract of thesis diss. DSc (Biology)]. St. Petersburg, 2007. 40 p.

6. Dunn M. S., Rockland A. B. Biological value of proteins determined with Tetrahymena gelei. *Proc. Soc. Biol. Med.*, 1947, vol. 64, pp. 377–379.

7. Bogdan A. S. Study of the quality of plant products grown in the conditions of an intensification of production and man-made pollution. *Sovremennaya metodologiya resheniya nauchnykh problem gigieny: sb. nauch. tr.* [Modern scientific methodology for solving health problems: proceedings], Minsk, 1992, pp. 216–230 (In Russian).

Information about the authors

Bondaruk Alla Mikhailovna – PhD (Medicine), Assistant Professor, the Department of Tourism and Nature Management. Belarusian State Technological University (13a, Sverdlova str., 220006, Minsk, Republic of Belarus). E-mail: bam-1962@tut.by

Tsygankou Vasily Georgiyevich – PhD (Medicine), Assistant Professor, the Department of Tourism and Nature Management. Belarusian State Technological University (13a, Sverdlova str., 220006, Minsk, Republic of Belarus). E-mail: vgz@tut.by

Zhurihina Lidia Nikolaevna – PhD (Biology), Senior Researcher. Scientific and Practical Center of Hygiene (8, Akademicheskaya str., 220012, Minsk, Republic of Belarus). E-mail: pitanie_b@rspch.by

Fedorovich Sergei Vladimirovich – DSc (Medicine), Professor, Chief Researcher. Scientific and Practical Center of Hygiene (8, Akademicheskaya str., 220012, Minsk, Republic of Belarus). E-mail: pitanie_b@rspch.by

Gulin Vadim Vacheslavovich – Deputy chief medical officer for laboratory work. National Center for Hygiene, Epidemiology and Public Health (50, Kazintsa str., 220099, Minsk, Republic of Belarus). E-mail@rsheph.by

Received 17.02.2016