COMPARATIVE ANALYSIS OF FIELD RATION
FOR MILITARY PERSONNEL OF THE UKRAINIAN ARMY AND ARMIES OF
OTHER COUNTRIES WORLDWIDE

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Abstract. For the purpose of improvement of the Ukrainian nutritional standards this Article provides comparative analysis of field rations of different countries worldwide to make a proposal on improvement of food-stuff assortment in food ration for military personnel in the Armed Forces of Ukraine, Army of USA, the British Army, Army of Germany, Army of Italy, Army of Canada, Army of France, Army of Belarus, Army of Armenia. In accordance with the comparative analysis it was established that ration composition used for the Armed Forces of Ukraine military personnel lags behind developed countries of the world both in nutrition arrangement and in nutrient composition, especially in relation to assortment and variety of ration food-stuff. Moreover, a field ration is strictly unified and doesn’t consider individual needs of military personnel in calories, proteins, fats, carbohydrates, food fibers. Selection of individual field ration takes to account only age of military personnel, i.e. individual needs related to nutrition composition such as physical abilities, level of physical activity, gender, type of occupation before military conscription and etc. are not considered.

The obtained results confirms practicability of assortment products assortment included to field rations for the purpose to correct nutrition rations towards optimal balance for military efficiency of army, adaptation of military personnel to physical and psychological loads.

Key words: field ration, military ration, nutrition ration, military personnel, nutritional standards of nutrition, nutrient composition.

ПОРІВНЯЛЬНИЙ АНАЛІЗ НАБОРУ СУХИХ ПРОДУКТІВ ДЛЯ ВІЙСЬКОВОСЛУЖБОВЦІВ УКРАЇНСЬКОЇ АРМІЇ ТА АРМІЙ ІНШИХ КРАЇН СВІТУ

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Анотація. Із метою вдосконалення складу українських норм харчування, проведено порівняльний аналіз набору сухих продуктів різних країн світу, щоб у подальшому внести пропозиції по покращенню асортименту харчових продуктів у складі раціонів для військовослужбовців Збройних Сил України. У статті наведено набір продуктів та нутрієнтний склад продовольчої норми харчування для військовослужбовців Збройних Сил України, армії США, Великої Британії, Німеччини, Італії, Канади, Франції, Ізраїлю та В'єтнаму. На основі порівняльного аналізу встановлено, що склад продовольства взаємозалежний для військовослужбовців Збройних Сил України відставає від розвиваних країн світу як в організації харчування, так і в нутрієнтному складі, особливо в асортименті та різноманітності харчових продуктів у раціоні. Також набір сухих продуктів значно лімітований та не враховує індивідуальні потреби в калоріях, білках, жирах, вуглеводах і вітамінах. Вибір індивідуального набору сухих продуктів враховує тільки вік військовослужбовців, тобто не враховує індивідуальні потреби щодо адаптації організму військових до фізичних та психологічних навантажень.

Ключові слова: набір сухих продуктів, раціон харчування, військовослужбовці, норма харчування, нутрієнтний склад.

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to military personnel nutrition. Food provision to military personnel and residents called to arms during mobilization statement is performed according to the approved nutrition standards or military personnel and according to procedure established by “Regulation on Food Provision of Different Countries Worldwide in Piece-Time” [1].

**Statement of the Problem**

Comparative analysis of military personnel nutrition standards of different countries worldwide is necessary to make further proposals on improvement of food assortment in food composition for the Armed Forces of Ukraine military personnel.

**Literature Review**

The author of centralized field feeding support, so called “military field kitchen boiling tank” Автором централізованого польового харчування, так званого на той час «воєнно-похідну кухню-самовар» was a resident of Zhmerinka town A. Turchanovich, which is confirmed by patent document from March 8, 1904. Daily food provision standards by military ration were established only in 1934 in USSR and they were changed and supplemented with time. At the present time many works both in media and scientific works of M. P. Gulich, Yu. M. Deputata, I. P. Koziarin, V. N. Korzun, V. Yu. Mykhailets, V. I. Tsypryian and V. E. Shevcheno at el. [2-6] are dedicated to study of military personnel nutrition problems.

Annually worldwide about $1464.0 bln. are spent to sustentation of armed forces [7]. The five top countries spending the highest cost include USA, the People's Republic of China, Russia, Saudi Arabia and the United Kingdom. Ukraine comes 114-th in the list of countries according to military expenses according to GDP rate. Based on evaluation of data as on 2017 Ukraine is going to spend 5% of GDP (approximately UAH 129 bln.) [8]. In accordance to the declaration of the AFU logistic service, the Ministry of Defense of Ukraine only in 2015 130 tbs of field rations were procured at a cost of UAH 17.3 bln. In 2015 the actual cost of nutrition provision under field condition constituted from UAH 64.00 to UAH 96.00, and under stationary conditions it constituted from UAH 54.66 to UAH 89.75. In 2016 a new modern field unit was developed, which costs UAH 110 per unit supplied with a heater in the basic unit [9].

The quality of military personnel nutrition under field conditions requires special attention. According to Regulation of the Cabinet of Ministers No 426 “On Nutrition Standards of Military Personnel of the Armed Forces, other military groups and State Service of Special Connection and Information Protection, Police, common and command stuff of subdivisions of combat support to areas of Anti-terror operation of the State Fiscal Service, common and command personnel of authorities and subdivisions of civil defense” from March 29, 2002 it was established that the dietary factor is included to number of leading effects on health of the Armed Forces of the state Staff while with definition of such biological characteristics as organization of body, special properties of metabolism, status of immune system, morbidity and etc. Nutrition ration based on scientific evidences with consideration of military activity specifics will support health promotion and physical development of military stuff, elevate resistance to loads and will have positive effect on its fighting ability [10].

Daily field ration is purposed for military personnel nutrition, when it is impossible to cook hot meal from products according to the main standard [11]. The following requirements are applied to a modern field ration:

- possibility of long-termed storage, products requiring special storage conditions should be excluded;
- products must be ready-to-eat or simple in preparation;
- should include digestible products that don’t cause digestive disorders, allergies and etc.;
- packing (usually hermetic of water-proof material) should protect products against soaking and contamination;
- should provide necessary nutrition and caloric value [12].

**Study**

Under modern conditions during military service the military personnel has to endure significant physical and nervous and psychological stress. Moreover, the compliance of daily ration with scientifically justified principles of sensible ration is very important. The first of them is energetic balance, i. e. caloric value of daily ration should comply with energy consumption of the body. Energy consumption of different categories of military personnel vary in dependence on conditions and character of military activity, and constitutes 3000 kilocalories for officers of headquarters, teachers and some other categories, and comes up to 4500 kilocalories for airborne personnel of jet aviation. Energy consumption of the army constitutes 3500 – 4000 kilocalories [1,5]. According to recommendations of the Special Committee (Research Task Group-154) of NATO energy consumption during regular operations constitutes not less than 3600 kilocalories/day and 4900 kilocalories/day for fighting operations [1,5].

Individual nutrition ration of the military personnel out of a military unit is calculated for energy consumption by one person during a day or per one food intake. Moreover, it is also necessary to notice that field rations are issued during warfare and at repositioning of military stuff. In Table 1 it is shown a daily field ration for military personnel of Ukraine according to standard No 10.
Table 1 – Daily field ration for military personnel of Ukraine according to standard No 10 [10]

| Name of Product                          | Standard №10 | Airborne forces, naval establishment | Group of 10 persons |
|------------------------------------------|--------------|-------------------------------------|---------------------|
| Crackers of first grade wheat flour      | 300          | 300                                 | 350                 |
| Canned meat (meat breakfasts of the highest grade) | 325          | 325                                 | 367.5               |
| Canned meat (liver paste)                | 100          |                                     | 100                 |
| Canned meat and vegetables (a choice of meat with porridge) | 650          | 650                                 | -                   |
| Natural honey                            | 40           | 20                                  | -                   |
| Sugar                                    | 90           | 90                                  | 90                  |
| Instant coffee                           | 2            | 2                                   | -                   |
| Natural black tea                        | 4            | 2                                   | 6                   |
| Paper tissue, pieces                     | 3            | 3                                   | -                   |
| Hygienic tissue, pieces                  | 3            | 3                                   | -                   |
| Black chocolate (cacao not less than 56%)| -            | 40                                  | -                   |
| Dried fruits (raisins)                   | -            | 40                                  | -                   |
| Minty caramel                            | -            | 15                                  | -                   |
| Salt                                      | -            | 6                                   | -                   |
| Pepper                                   | -            | 0.9                                 | -                   |
| Different cereals (or paste goods)       | -            | -                                   | 270                 |
| Food concentrates of soups               | -            | -                                   | 36                  |
| Canned snack vegetables                  | -            | -                                   | 120                 |
| Vegetable seasoning                      | -            | -                                   | 7                   |

In the Ukrainian army the field ration is called Standard No 10 – “Daily Field ration” [10]. It is manufactured in accordance with standard TU-9194-461-04605473-03 (with amendments No 2). Total weight of individual daily nutrition ration (IDNR) constitutes 1625 g, the content weight is 1330 g. In accordance to the label on the package the energetic value constitutes 4800 kilocalories [13], this high-caloric daily menu in the first turn leads to quick satisfying of hunger. The it should be noticed that this ration is not balanced by nutrition value, it is characterized by high content of fats, carbohydrates, insufficient amount of essential amino acids, vitamins and mineral substances. Similar ration is strictly unified and doesn’t consider individual need of military personnel in calories, proteins, fats, carbohydrates, food fibers and etc. Selection of individual field ration considers only age of military personnel, i. e. doesn’t consider individual needs related to nutrition ration composition, such as physical abilities (weight, height), level of physical activity, gender, occupation before military conscription [13].

Table 2 – Daily field kit of products for the Ukrainian Army according to Standard No 15 [14]

| Name of Product                          | Ration of breakfast/ supper, gram | Ration of lunch, gram | Quantity per one person, gram |
|------------------------------------------|-----------------------------------|-----------------------|-------------------------------|
| Crackers of first grade wheat flour      | 50/50                             | 50                    | 150                           |
| Biscuits of first grade wheat flour or branny rye flour | 0/50                             | 50                    | 100                           |
| Ready-to-eat soup (meat borsch or meat soups in assortment) in retort pouch | -                                | 500                   | 500                           |
| Ready-to-eat main course (porridge with meat or vegetables with meat in assortment) in retort pouch | 350/350                          | 350                   | 1050                          |
| Instant coffee                           | 2/0                               | 2                     | 2                             |
| Tea                                      | 0/2                               | 2                     | 4                             |
| Sugar                                    | 10/10                             | 10                    | 30                            |
| Natural honey                            | 0/20                              | 20                    | 20                            |
| Fruit jam (in assortment)                | 20                                | 20                    |                               |
| Ground black pepper                      | 0.3                               | 0.3                   |                               |
| Salt                                     | 1/1                               | 1                     | 3                             |

Directive No 696 “On amendments introduction to nutrition standards for the Armed Forces military personnel and other military groups” from October 3, 2016 establishes provision of standard by portions, i. e. breakfast, lunch and supper taking to account number of rations necessary for provision of military personnel with adequate nutrition.
A new standard No 15 is established, it constitutes a daily field kit of products (Table 2), an improved alternative of daily field ration. Innovations include additional inclusion to the ration of dry fruits, chocolate, coffee, testy soups and main course. Additionally to each ration (breakfast, lunch, supper) the bottled water is issued calculated as 0.5 l per ration independently from season, and as 1 l within period from June 1 to September 1. Due to new packing technologies (retort-package) ready meals will be obtained without previous thermal treatment, which will provide compactness and easy use during use [14].

Constitute an issue for comparison of field ration composition for the Ukrainian Army and armies of other countries or the purpose of its analysis and definition of compliance of the Ukrainian Army rations with existing modern standards and recommendations. The comparison was performed based on analysis both of regulatory materials of different countries and existing publications related to this subject.

In accordance with common practice procurement of military rations in the most countries is performed in compliance with national standards of provision with mandatory consideration of military service type, level of military equipment development and methods of armament, principles of warfare, that eventually should be reflected both in structure of rations and military personnel nutrition arrangement in whole. Provisional standards and rations in armies of other countries are relatively stable and are continually optimized in relation of its structure (on account of new products inclusion), filling and packaging of rations [1].

The composition of dry MRE unit of USA Army in accordance with menu No 1 “Chili with beans” is provided in Table 3. Four types of individual rations are used in USA troops, e.g. MRE (Meal, Ready-to-Eat), FSR (First Strike Ration), MCW (Meal, Cold Weather) та LRP (Long Range Patrol) [15].

MRE kit is the most common in the Armed Forces of USA. It includes 24 options of menu, it is usually used during 21 days after deployment at warfare. The ration is hermetically packed to a package of thin plastic material. In 2008 new easily opened packages were brought into production. Shelf-life expansion is provided by four-layer structure of the package: polyester, nylon, foil and polyethylene. For the purpose of definition of usability grade of ration a package is equipped with a round orange indicator. After manufacture the central part has lighter color of bigger diameter, with time it becomes darker. Speed of color change is proportional to temperature. If the central part is darker then external one, then the ration is not good for use. Additionally to the indicator the package is labeled with number of menus and name of main course (without soup), starter, dessert and drinks (tea, coffee or cacao as well as lemonade). Each ration has salt, two gummies, matches, several sheets of toilet paper, wet tissue and a plastic spoon [1,15].

| Name of product                | Quantity, g | Name of product                | Quantity, g |
|--------------------------------|-------------|--------------------------------|-------------|
| Chili with beans               | 227         | Chocolate bakery food          | 52          |
| Processed cheese               | 43          | Bread                          | 71          |
| Instant strawberry-cream drink | 70          | Cracker                        | 37.8        |
| Instant coffee                 | 1.7         | Sugar                          | 4           |
| Dried cream                    | 4           | Iodine-treated salt            | 4           |
| Red ground pepper              | 2           |                                 |             |

Nutrient composition of dry MRE units (in gram) includes proteins – 126 (including animal-derived – 83); fats – 157; hydrocarbons - 528; energetic value – 3995 kilocalories, calcium – 1705 mg, iron – 26 mg, sodium – 6850 mg [1].

FSR kit is designed for military personnel nutrition during 72 hours, under conditions of military mission far away from its subdivision with intense relocations and loads. Special features of the ration: sandwiches, canned fish and chicken, high-caloric drinks, dry beef, chocolate and other products. FSR kit has half the weight and half the size of MRE kit designed for one day. For the purpose of military personnel equipment weight reduction FSR ration is designed to provide use of only one package instead of three MRE rations per a day. Nutrient composition of the represented ration (per 100 g) includes proteins – 13; fats – 34; hydrocarbons – 53. Energetic value constitutes 2900 kilocalories, calcium – 655 mg, iron – 15 mg, sodium – 4034 mg [1,15].

MCW and LRP kits are designed for military personnel nutrition during military mission far away from their subdivision under low temperatures or during long-termed operation with intense relocations. Main consumers of these rations are marine corps and USA special Operations Forces. Shelf-life of the rations are the same as of MRE, but completed studies showed that the shelf-life of the main course is significantly longer. Main course in composition of kits is frozen or dry. Moreover, the ration composition includes cheese, butter, cookies, nuts, chocolate bars, candies, sugar, coffee, high caloric drinks, a plastic spoon. Additional drinks for liquid replenishment are supplied under condition of dry meal. Limitation of sodium in rations prevents dehydration under low temperatures [1]. Nutrient composition of MCW and LRP kits (per 100 g) includes: protein – 14; fats – 34; hydrocarbons – 52. Energetic value of MCW – 2461 kilocalories, calcium – 1690 mg, iron – 29 mg, sodium – 7715 mg. Energetic value of LRP kit constitutes 1540 kilocalories, calcium – 563 mg, iron – 10 mg, sodium – 2572 mg [1,15].
The American scientists continue to conduct studies relating menu and packages of the ration according to results of the ration use during warfare. Its modernization constitutes a part of Assault Special Purpose Improvement Program (ASPIP). In accordance with this program it is planned to increase number of menu options up to nine with optimal content of hydrocarbons, vitamins, amino acids, caffeine and antioxidants [16]. Improvement of food quality or military personnel of Special Operations Forces will allow to improve its physical and psychological state during military mission under any weather conditions.

Nutrition of the military personnel of the British Army is also performed according to unified ration that is applicable to all types of troops (Table 4). The British ration is called as multiclimate ration. The British field rations are designed to be used during 24 hours. Basic nutrition of the army (and country population) includes meat, fish, milk, vegetables and fruits. Strict fulfillment of conventional regimen of nutrition designed for four food intakes is remarkable. It includes first breakfast, lunch, dinner and tea-time [12]. The rations are balanced and approximated by consumption properties to regular food. Shelf-life of products is designed for 5 years.

| Table 4 – Composition of the United Kingdom Army ration [1,16] |
|---------------------------------------------------------------|
| **Name of product** | **Quantity, g** | **Name of product** | **Quantity, g** |
| Bread and bun goods | 340 | Cheese | 50 |
| Wheat flour | 70 | Sugar | 60 |
| Cereal, beans | 60 | Salt | 14 |
| Paste goods | 44 | Coffee, cacao | 4 |
| Meat | 175 | Tea | 2 |
| Bacon, ham | 85 | Spices, seasoning | 10 |
| Fish | 45 | Potato | 453 |
| Fats, margarine | 42 | Vegetables | 284 |
| Vegetable oil | 20 | Fresh fruits | 125 |
| Butter | 25 | Fry fruits | 25 |
| Fresh milk | 405 | Jam marmalade | 62 |

Chemical composition and energetic value of this ration is as follows: proteins – 107 (including animal derived – 65); fats – 155; hydrocarbons – 618; energetic values – 4294 kilocalories, calcium – 1444 mg, iron – 21 mg, sodium – 8293 mg [1].

Main field of further optimization of nutrition rations for the British military personnel besides optimization of organizational feeding includes also study related to creation of new individual rations designed for food provision to forces of quick deployment during warfare at full separation of subdivisions from foodstuff provision bases. The ration kits include products maximally prepared for consumption. Product kits with comparable caloric capability are used one after another for 3-4 days [17].

In Germany a field ration is called Military Combat Ration, or Einmannpackung (EPa), and it is designed for 2 food intakes. The ration composition is provided in Table 5 and it is used at high physical load [1,17].

| Table 5 – Composition of field rations of the German Army [1,17] |
|---------------------------------------------------------------|
| **Name of product** | **Quantity, g** | **Name of product** | **Quantity, g** |
| Wheat bread | 340 | Cheese | 25 |
| Wheat flour | 45 | Sugar | 50 |
| Cereals, bean concentrates | 90 | Salt | 14 |
| Paste goods | 30 | Coffee, cacao | 14 |
| Meat | 200 | Tea | 1 |
| Smoked meat | 75 | Spices, seasoning | 12 |
| Fish | 50 | Potato | 430 |
| Fats, bacon | 50 | Fresh vegetables | 270 |
| Canned products | 102 | Fresh fruits | 150 |
| Butter | 30 | Jam marmalade | 35 |
| Fresh milk | 430 |

In the German Army a differentiated approach is applied to nutrition of military personnel. Daily ration dependently on energetic consumptions volumes may be of three types; at low physical load the caloric capability doesn’t exceed 2800 kilocalories, at middle – 3152 and at high physical load it comes up to 3524 kilocalories [1]. On basis of energetic value the German ration includes proteins – 96 g (including animal deriveds – 60 g), fats – 126 g and hydrocarbons in amount of 501 g. Its energetic value constitutes 3524 kilocalories, calcium – 900 mg, iron – 19 mg and sodium – 8300 mg [1].

Nature of the German population nutrition is reflected also in provision of the military contingents. Meat products (sausages, ham, bockwursts) are widely used in the ra-
The meat is used as a part of main course, usually in natural form and more seldom as minced meat. Potato and different vegetables, e.g., cabbage, bean pods, carrot, beans, pea are widely used as garnish. The German army also has kits of individual rations the part of which recently was elevated from 20 to 40% [17]. The following products (Table 6) are included to one of the individual ration options. It is necessary to notice that food concentrates that are manufactured in the mass scale in Germany are widely used in the military rations (15.5 kg per head of population annually).

### Table 6 – Composition of one of individual ration options for the military personnel of German Army [1,17]

| Name of product | Quantity, g | Name of product | Quantity, g |
|-----------------|-------------|-----------------|-------------|
| Crackers (2 ×125) | 250 | Sugar (3 ×12.5) | 38 |
| Cans (beef in fat) | 100 | Tea (2 ×2.4) | 4.8 |
| Cans (sausage for beer) | 100 | Coffee | 3.5 |
| Food concentrates of soup and main course containing 80 g of pork | 300 | Chocolate | 50 |
| | | Canned orange and grape juices | 30 |
| | | | 30 |

The Italian field ration is called Special Military Ration Pack. One field ration is designed or 3 food-intakes: breakfast, lunch and supper. The nutrition ration of the Italian Army military personnel includes different products: paste goods, vegetables, fruits, beef, low fat pork, wine, spices and etc. Standards of daily provision by soldier ration are provided in Table 7. Traditional Italian food is widely represented in nutrition norms – spaghetti, cannelloni, lasagna dressed with tomato sauce, cheese, meat, beans and vegetables [5]. Regimen of military personnel varies: breakfast is light, includes bread, cheese, coffee; dinner is caloric and includes starters, soup and main course, wine; supper includes cold main course, salad and drinks [17].

### Table 7 – Composition of special military ration of the Italian army [1,17]

| Name of product | Quantity, g | Name of product | Quantity, g |
|-----------------|-------------|-----------------|-------------|
| Wheat bread | 420 | Sugar | 20 |
| Rise | 80 | Salt | 20 |
| Paste goods | 200 | Coffee | 4 |
| Meat | 160 | Spices, seasoning | 25 |
| Fish | 80 | Fresh vegetables | 300 |
| Olive oil | 40 | Tomatoes | 75 |
| Butter | 15 | Dry vegetables | 60 |
| Milk | 200 | Fruits | 300 |
| Cheese | 40 | Dry grape wine | 500 |

The nutrient composition of the ration (in 100 g) includes: proteins – 100 (including animal deriveds – 63); fats – 129; hydrocarbons – 521; energetic value – 3650 kilocalories, calcium – 1079 mg, iron – 33 mg, sodium – 5250 mg [1].

The Canadian individual field rations are called Supper Menu (меню на вечерю) або Individual Meal Pack (IMP). The Canadian individual field rations are design for 3 food-takes. They include soup (mushroom, chicken or tomato), main course (meat, omelette, chicken and etc.), fruits and desserts (peaches, apples, cherries, strawberries, muesli, jam and etc.), drinks (tea, coffee, cacao, fruit soluble mixes) and dining minor items such as biscuits, tissue, salt and pepper, matches, toothpicks, gummies, spoons, sauces and etc (Table 8).

### Table 8 – Composition of individual field ration of the Canadian army [1,17]

| Name of product | Quantity, g | Name of product | Quantity, g |
|-----------------|-------------|-----------------|-------------|
| Wheat bread | 420 | Sugar | 20 |
| Rise | 80 | Salt | 20 |
| Paste goods | 200 | Coffee | 4 |
| Meat | 160 | Spices, seasoning | 25 |
| Fish | 80 | Fresh vegetables | 300 |
| Olive oil | 40 | Tomatoes | 75 |
| Butter | 15 | Dry vegetables | 60 |
| Milk | 200 | Fruits | 300 |
| Cheese | 40 | Dry grape wine | 500 |

The nutrient composition of the ration above includes proteins – 141 g (including animal derived – 75 g), fats – 123 g, hydrocarbons – 681 g; energetic value is 4395 kilocalories, calcium constitutes 1016 mg, iron constitutes 26 mg, sodium constitutes 9381 mg [1].
The French field ration is called Individual Reheateable Combat Ration, and designed for 24 hours. It includes 2 main courses (ready-to-cook products, meat with salad, fish with potato, chicken with vegetables and rise, etc.) and a starter (usually canned fish). Also a package of instant soup, biscuits, drops, cheese sauce and cacao with sugar (Table 9).

Table 9 – Composition of a field ration for the French Army military personnel [1,17]

| Name of product         | Quantity, g | Name of product         | Quantity, g |
|-------------------------|-------------|-------------------------|-------------|
| Stewed turkey           | 300         | Cacao                   | 20          |
| Ragout with beans       | 300         | Sugar                   | 44          |
| Liver paste             | 10          | Salt, pepper            | 6           |
| Cheese                  | 42          | Nougat                  | 40          |
| Tomato soup             | 41          | Fruit soup              | 20          |
| Cookies                 | 280         | Chocolate               | 25          |
| Coffee                  | 42          | Candies                 | 24          |
| Cream for coffee        | 19          | Caramel                 | 40          |
| Instant drink           |             |                         | 21          |

For successful performance of the mission out of stationary location of military subdivisions attached for rations the foreign armies provide several options of field ration [1,17]. This way 24-hour field ration of NATO includes menu “A”, “B”, “C”, “D”, “E”, “F”, “G”, that contain besides various starters, main courses and drinks, including gummies, matches, matches for all types of weather, toilet paper, tablets for water purification. The options of content may vary in dependence on assortment of products at the moment of packing. One field ration for NATO military personnel is represented in Table 10 as example.

Table 10 – Composition of field ration for NATO military personnel [1,17]

| Name of product         | Quantity, g | Name of product         | Quantity, g |
|-------------------------|-------------|-------------------------|-------------|
| Stewed beef             | 300         | Sugar (3 × 12.5)        | 38          |
| Turkey with beans       | 300         | Cream for coffee (2 × 3)| 6           |
| Liver paste             | 200         | Salt                    | 3           |
| Jam (2 × 25)            | 50          | Biscuit (2 × 125)       | 250         |
| Tea (2 × 1.2)           | 2.4         | Chocolate               | 80          |
| Coffee (2 × 3.5)        | 7           | Fruit powder for drink (2 × 30) | 60        |

The nutrient composition of the ration above (in 100 g) includes proteins that constitute 104 (including animal derived – 56 g); fats constitute 114; hydrocarbons constitute 440; the energetic value constitutes 3200 kilocalories, calcium is >800 mg, iron is 20 mg [1].

By the Order of the Minister of Defense of the Republic of Belarus No 3 from January 3, 2013 “On establishment of standards for ration provision to military personnel and feeding of staff animals in the Armed Forces during peace time and the procedure of its application” 4 standards for military personnel nutrition were established [19] (Table 11).

Table 11 – Composition of common military ration for military personnel of the Belorussian Army [19]

| Name of product                                      | Quantity, g | Name of product | Quantity, g |
|------------------------------------------------------|-------------|-----------------|-------------|
| Bread of 1st grade wheat and rye flour mixture       | 250         | Gutted fish without head | 100         |
| Bread of highest grade wheat flour                   | 70          | Sunflower oil   | 35          |
| Ban of highest grade wheat flour                     | 160         | Butter          | 30          |
| 1st grade wheat flour                                | 15          | Milk or kefir   | 100         |
| Different cereals                                    | 110         | Sour-cream, cheese | 30          |
| Paste goods                                          | 35          | Solid rennet cheese | 15          |
| Meat (1st grade beef, pork)                          | 100         | Sugar           | 60          |
| Bird meat                                            | 100         | Salt            | 20          |
| Tea                                                  | 2           | Ground pepper   | 0.3         |
| Dry bay leaf                                        | 0.2         | Ground mustard  | 0.6         |
| Tomato paste                                         | 6           | Fresh vegetables| 830         |
| Natural fruit and berry juices, fresh fruits         | 100         | Jelly concentrate (or dry fruits) | 30         |

The nutrient composition of the Belorussian ration (in gram) includes proteins – 121 (including animal derived – 68); fats – 157; hydrocarbons – 368; energetic value constitutes 3450 kilocalories. Gross weight is 1.7 kg. Shelf-life is 2 years.

There are six field rations for military personnel of the Armenian Army, including airmen, patients of mili-
tary hospitals and students of military colleges. Special ration No 6 is established for soldiers called to the frontline and subject to greater physical loads, when they need more calories. This military personnel undergoes greater psychological stresses, so their ration contains more sweets, jam, cookies, condensed milk, chocolate, caramel (Table 12).

| Name of product                                      | Quantity, g | Name of product                                      | Quantity, g |
|------------------------------------------------------|-------------|------------------------------------------------------|-------------|
| Military crackers                                    | 100         | Meat with pea and potato                             | 250         |
| Sugar                                                | 30          | Muesli bars (2 ×40)                                  | 80          |
| Canned meat and vegetables                           | 250         | Instant soups                                        | 100         |
| Porridge with beef, sunflower oil, barley, onion, salt, ground black pepper | 250         | Tea (3 ×2,4)                                        | 30          |
| Jam                                                  | 45          | Coffee                                               | 30          |

The nutrient composition of the ration above includes proteins – 108 g (including animal derived – 65 g), fats – 116 g, hydrocarbons – 593 g; energetic value constitutes 3895 kilocalories [20].

**Conclusions**

Based on the comparative analysis it was established that food products included to individual rations for military personnel of foreign armies are represented in wide range. The most of them are canned, which provides longer storage and plays essential military applicable role (protection against different types of contamination). Use of heating devices supplied in the kit allows to elevate its nutrition properties on account of improvement of organoleptic parameters. Multifunctionality of the rations above is provided also by means of water purification that allows to solve extremely important hygienic problem as provision of the military personnel under field conditions not only with food products, but also with safe drinking water.

The comparison above of nutrition in the Ukrainian Army with armies of NATO members confirms that in this field Ukraine lags behind develop countries both in nutrition arrangement and in nutrient composition, especially in assortment and variability of different food products in ration. The national nutrition standards require essential correction towards optimal balance for provision of fighting ability of the army and adaptation of the military personnel to physical and psychological loads.

**References:**

1. Nutrition Science and Food Standards for Military Operations (Nutrition et normes d’alimentation pour les opérations militaires). Final Report of RTO Task Group: Mode of access: URL: natorto.cbw.pl/uploads/2010/3/TR-HFM-154-ALL.pdf
2. Pulicat MP, Zdorovia ludny: naukovi osnovy kharchuvannia. Zdorovia Ukrainy, 2003; 1: 38-39.
3. Koziar IJ, Ivakhno OP. Psychologia bezpechenosti vkyorystannia kharchoviy produktiv, shcho mistoatn manohastynky. Zbirnyk naukowych prats spivrobnykiv NMAPO im. P.L. Shupyka 2014; 23(3): 54-62.
4. Deputyt IvM, Pulicat MP. Vinokuriva. NH. Hihienichna otsinka dobovoho rinoshun kharchuvannia viskovosluzibovstsv strekohiv sluzby ZS Ukrainy. NH. nasel. mists. 2004; 44: 559-563.
5. Starobubstev SO, Kuzelenuk IJ, Troibich VI. Matematychni modeli optymizatsii rinoshun kharchuvannia viskovosluzibovstsv. Systemy ozeroznennia i viskova tekhnika, 2009; 2: 111-114.
6. Karpenko PO, Persiechina SM, Hryshchenko IM, Melnychuk NO, za zah. red. Karpenko PO. Osnovy rasional’nogo i likuval’nogo kharchuvannia (navch. Posib). Kyiv. nats. tokh. -on. un-t, 2011.
7. Pro prodovol’sche zabezpechenia Zbroinykh Syl Ukrainy na mmyyi chas (nakaz vid 20.12.2002 № 402): Rezhym dostupu : zakoni.rada.gov.ua/laws/show/d0992-02/page5. – Nazva z ekranu
8. Nazvano biudzhet ukrainskoi armii u 2017 rozi. Rezhym dostupu: http://faktyictv.ru/ru/ukrainia/20160906-nazvano-byudzhet-ukrainskoi-armiyi-u-2017-rotui– Nazva z ekranu
9. Viskovy biudzhet-2017: Skilky Ukraina vytratyit na tekhniku i oboronu (Tablytia). Rezhym dostupu : http://www.depo.ua/ukr/war/proekt-viskovogo-byudzhetu-2017
10. Viskovy biudzhet – 2017: Skilky Ukraina vytratyit na tekhniku i oboronu (Tablytia). Rezhym dostupu : http://www.depo.ua/tar/viskovy-byudzhet-

**Table 12– Composition of the Armenian Army ration [20]**

| Name of product                                      | Quantity, g | Name of product                                      | Quantity, g |
|------------------------------------------------------|-------------|------------------------------------------------------|-------------|
| Military crackers                                    | 100         | Meat with pea and potato                             | 250         |
| Sugar                                                | 30          | Muesli bars (2 ×40)                                  | 80          |
| Canned meat and vegetables                           | 250         | Instant soups                                        | 100         |
| Porridge with beef, sunflower oil, barley, onion, salt, ground black pepper | 250         | Tea (3 ×2,4)                                        | 30          |
| Jam                                                  | 45          | Coffee                                               | 30          |
**Нутриціологія, дієтологія, проблеми каркування**

**СРАВНИТЕЛЬНЫЙ АНАЛИЗ НАБОРА СУХИХ ПРОДУКТОВ ДЛЯ ВОЕНИСЛУЖАЩИХ УКРАИНСКОЙ АРМИИ И АРМИЙ ДРУГИХ СТРАН МИРА**

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**Аннотация.** С целью усовершенствования состава украинских норм питания в статье проведен сравнительный анализ набора сухих продуктов разных стран мира, чтобы в дальнейшем внести предложения по улучшению ассортимента сухих продуктов и нутриентного состава продовольственной нормы питания для военнослужащих Вооруженных Сил Украины, армии США, Великобритании, Германии, Италии, Канады, Франции, Беларуси, Армении. На основе сравнительного анализа установлено, что соотношение норм питания в сторону оптимальной сбалансированности для боеспособности армии, обеспечение адаптации организма военных к физическим и психологическим нагрузкам. В статье приведен набор продуктов и сухих пайков с целью корректировки рационов питания в сторону оптимальной сбалансированности для боеспособности армии, обеспечение адаптации организма военных к физическим и психологическим нагрузкам.

**Ключевые слова:** набор сухих продуктов, сухие пайки, рацион питания, военнослужащие, состав норм питания, нутриентный состав

**Список литературы:**
1. Nutrition Science and Food Standards for Military Operations (Nutrition et normes d'alimentation pour les opérations militaires). Final Report of RTO Task Group. [Electronic resource] – Mode of access: URL: rtoro.cwb.pi/uploads/2010/3/TR-HFM-154-ALL.pdf
2. Гулич М.П. Здоровье человека: научные основы питания [Текст] / М.П. Гулич // Здоровье Украины. - 2003. – № 1. – С. 38-39
3. Козарин И. П. Вопрос безопасности использования пищевых продуктов, содержащих наночастицы [Текст] / И. П. Козарин, А. П. Инвек // Сборник научных трудов сотрудников НМАПО им. П. Л. Шупика. – 2014. – Вып. 23 (3). – С. 54-62. – Режим доступа: http://nbuv.gov.ua/UJRN/Shupika_2013_23(3)_30.
4. Депутат Ю. М. Гигиеническая оценка суточного рациона питания военнослужащих сухими продуктами в Вооруженных Силах Украины [Текст] / Ю. Депутат, М. П. Гулич, Н. М. Винокуров // Гиг. насел. мест. – 2004. – Вып. 44. – С. 559-563.
5. Стародубцев С. А. Математические модели оптимизации рационов питания военнослужащих [Текст] / С. А. Стародубцев, Ю. И. Кушнерук, В. И. Тробюк // Системы вооружения и военная техника. – 2008. – № 2. – С. 111-114. (Научные основы рационального питания военнослужащих: Учеб. Пособ. – Вольск: ВВУТ, 1995. – 356 с.)
6. Основы рационального и лечебного питания: [учеб. пособие] / П. А. Карпенко, С. М. Обичвич, И. М. Гриценко, Н. М. А. Мельник // Под общ. ред. П. А. Карпенко. – М.: Кнeв. нас. торг.-экон. унт. 2011. – 304 с.
7. О продовольственном обеспечении Вооруженных Сил Украины в мирное время (приказ от 20.12.2002 № 402). [Электронный ресурс] – Режим доступа: zakon4.rada.gov.ua/laws/show/z0992-02/page5 – Название с экрана
8. Назван бюджет украинской армии в 2017 году // http://nl.wikipedia.org/wiki/Сухой_пайок
9. Нормы питания военнослужащих Вооруженных Сил и других военных формирований, утвержденных постановлением Кабинета Министров Украины от 29 марта 2002 № 426 // Официальный вестник Украины. – 2002. – № 14. – С. 739, 2013, № 100. – С. 366.

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