
STUDY ON THE ENERGY CONSUMPTION OF SOLDIERS BY EXPERIMENTAL FEEDING METHOD AT THE X. UNIT IN 2022

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ABSTRACT

Purpose: We aimed to evaluate the energy consumption of the soldiers during labor, military training, and work.

Methods: Prospective study, case-by-case description.

Results: The calorific value of food provided through retrospective goods delivery note and goods received note of food and foodstuffs were 4,374 Kcal; actually was 4,074 Kcal. The ratio of thermogenic substances in the diet was not balanced. The average ingested energy of the study group was 3,458 Kcal/person/day. The average energy consumption of the research group was 3,600 Kcal/person/day. There 60.98% of soldiers had lost body weight (average weight loss of 300 g/person/15 days), 2.44% of soldiers kept body weight and 36.58% of soldiers gained body weight.

Keywords: Energy consumption, experimental feeding, Keys method

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1. INTRODUCTIONS

Each occupation and each type of labor in society has different characteristics. Of which, there are occupations with high specificity, where workers have to work in special environments and conditions, even very hard conditions. Military labor is a special type of work, in a toxic and dangerous environment, which can affect the life. At the same time, military labor requires high energy consumption. If the supply of nutrition is not enough and unbalanced, it will greatly affect the health and combat strength of the soldiers.

The soldier's rations at the X. unit was built, completed, and implemented a long time ago with the quantity providing 4,500 Kcal/person/day. This diet has not been adjusted to fit the health and labor and training regime of the unit in the current period. According to the health report of the military medical department of the X. unit, in 2021, there were 40% of soldiers in the units with signs of metabolic disorders. This not only adversely affects the soldier's health but also affects the ability to work, train and combat readiness of the unit. For an overview and evaluate the energy consumption of the soldiers during labor, military training, and work, we carried out this subject of scientific research for the energy consumption of soldiers in X. unit by experimental feeding method.

2. SUBJECTS AND METHODS

2.1. Subjects

Select 50 male soldiers in the X. Unit with the following criteria:

- + Voluntary participation in research.
- + At the age of 24-50 years.
- + Having normal health, not suffering from digestive diseases (gastroduodenitis, colitis), and other chronic diseases.
- + During the study period from July 27 to August 28, 2022, subjects with acute diseases (cough, fever) were excluded from the study.

2.2. Methods

- Study design: Prospective study, case-by-case description.
- Specific study method: Determining energy consumption by the Keys method, based on the principle that the change in body weight with the close relationship between ingested energy and energy consumption, concretely as follows:
 - + Step 1: Evaluate the weight of each soldier before the study.
 - + Step 2: Organize a separate kitchen and strictly manage food and foodstuffs according to the quantity and food standards approved by the Ministry of Defense of 4,500 Kcal/person/day.

+ Step 3: Evaluate the weight of each soldier after 15 days of study.

+ Step 4: Evaluate the energy consumption of each subject based on the ingested energy and weight change after the study.

- Study ethics: The study thesis was approved by the Department of military medicine. All information about research subjects was kept confidential and used for research purposes only.

- Data processing: Checking data daily, monitoring and randomly checking 20% of sheets to minimize errors during data entry. Clean, enter, and process data using Excel software and SPSS biomedical statistical software.

3. RESULTS AND DISCUSSIONS

3.1. Investigation of provided rations

- Retrospective goods delivery note and goods received note of food and foodstuffs at Unit X.s kitchen, results:

Table 1. Rations structure provided at the kitchen of X. Unit (person/day)

Name of foods	Unit	Result
Different types of food	gram	573
Shrimp and fish	gram	361
Different types of pork	gram	218
Pork rib	gram	16,2
Beef	gram	93
Milk and products	ml	550
Fowl	gram	209
Tofu	gram	56
Sesame and peanut	gram	18
Sugar	gram	10
Eggs	gram	16
Balut	gram	7
Cooking oil	ml	36
Fish sauce	ml	22
Green vegetables	gram	819
Different types of beans	gram	18,3
Fruit	gram	691
Seeds are rich in protein, and lipids	gram	15

Table 2. Energy and nutrients in the rations provided (person/day)

Nutrients	Unit	Result
Calory	Kcalo	4,374
Protein	gram	216
Lipids	gram	150
Glucid	gram	541
Cancium	mg	1,827
Phosphorus	mg	2.269
Iron	mg	18.7
Vitamin A	mg	1.585
Vitamin B1	mg	2.058
Vitamin B2	mg	1.751
Vitamin PP	mg	62.58
Vitamin C	mg	367
The calorific value of protein	%	20.0
The calorific value of lipids	%	31.0
The calorific value of Glucid	%	49.0
The ratio of animal protein	%	67.0
The vegetative ratio of lipids	%	43.0
The ratio of calcium/phosphorus		0.805
Ratio of Vitamin B1/1,000 Kcal		0.47

The work of ensuring food rations for the soldiers of the X. Unit was relatively well done. The calorific value of provided rations for soldiers was 4,374 Kcal/person/day, minerals were relatively balanced in different stages.

- The ratio of thermogenic substances in the rations was unbalanced: lipid in the rations was high (over 30%), and low glucid (under 50%) affected the absorption of substances. The high lipid ratio easily caused metabolic disorders and also reduced the value of the rations, reducing the food costs of the soldiers.

- The ratio of animal protein/total protein in the rations was still high (over 67%), greatly affecting the health of soldiers, easily causing metabolic disorders and chronic diseases.

3.2. Investigate actual rations

Table 3. Food structure and foodstuffs in the actual rations (person/per day)

Name of foods	Unit	Result
Different types of food	gram	510
Shrimp and fish	gram	175
Name of foods	Unit	Result
Different types of pork	gram	199
Pork rib	gram	26
Beef	gram	110
Milk and products	ml	470
Fowl	gram	220
Tofu	gram	25
Sesame and peanut	gram	14
Eggs	gram	75
Cooking oil	ml	30
Fish sauce	ml	37
Green vegetables	gram	876
Fruit	gram	610
Seeds are rich in protein, and lipids	gram	21

Table 4. Energy and nutrients in the actual rations (person/day)

Nutrients	Unit	Result
Calory	Kcal	4,074
Protein	gram	187.4
Lipids	gram	134.5
Glucid	gram	528.7
Cancium	mg	1,806
Phosphorus	mg	1,707
Iron	mg	16.6
Vitamin A	mg	1.02
Vitamin B1	mg	2.173
Vitamin B2	mg	1.296
Vitamin PP	mg	19.2
Vitamin C	mg	419

The calorific value of protein	%	18.4
The calorific value of lipids	%	29.7
The calorific value of Glucid	%	51.9
The ratio of animal protein	%	66.7
The vegetative ratio of lipids	%	41.8
The ratio of calcium/ phosphorus		1.058
Ratio of Vitamin B1/1,000 Kcal		0.53

After 15 days of directly weighing processed foods, and combined with the management and supervision of research subjects, we found that:

- The type of food was not diverse, the dishes were monotonous and turn around quickly, and the processing was not suitable for the taste, so the soldiers did not eat all the rations, there was still food left over. This greatly affected the ingested energy of the soldiers. Foods rich in protein (beans, fresh mushrooms, etc.) had not been focused on.

- The percentage of animal lipids and protein in the actual rations was still high, accounting for 29.7% and 66.7%, respectively. If soldiers eat too much for a long time will cause metabolic disorders and other chronic diseases. This greatly affected the health and combat readiness of the soldiers.

3.3. Determine energy consumption

After monitoring the body weight of the soldiers in the research group during the 15 days of experimental eating and calculating the ingested energy of each subject, the results:

Table 5. The ingested energy of the research subjects (n = 50)

The ingested energy	Results (Kcalo)
Highest	3,593
Lowest	3,288
Medium	3,458

Because the food was not suitable, so there were a lot of leftovers, both wasting food and greatly affecting the ingested energy of the soldiers. The

average ingested energy of the study subjects was 3,458 Kcal/person/day.

Table 6. The weight of the subjects after 15 days of study (n = 50)

Weight change	Results	
	n	%
Weight loss	31	60.98
Keep weight	1	2.44
Weight gain	18	36.58

There 60.98% of the soldiers were losing weight (300g/person/15 days). So, with an average ingested energy of 3,458 Kcal/person/ day, it was not enough for the military operations of the unit.

Table 7. Energy consumption of study subjects (n = 50)

Energy consumption	Results (Kcalo)
Highest	4,065
Lowest	3,113
Medium	3,600

Through 15 days of monitoring ingested energy and body weight of the research subjects, we calculated the energy consumption of each subject, the highest was 4,065 Kcal/person/ day, the lowest was 3,113 Kcal/person/day, the average was 3,600 Kcal/person/day

4. CONCLUSIONS

We carried out the study by the experimental method on 50 soldiers working at the X. unit for 15 days and concluded:

- The calorific value of the rations provided through retrospective goods delivery note and goods received note of food and foodstuffs was 4,374 Kcal, the ratio between the thermogenic substances was not balanced.

- The actual calorific value of the rations was 4,074 Kcal, and the ratio between the thermogenic substances was not balanced.

- The average ingested energy of the study group was 3,458 Kcal/person/day.

- The average energy consumption of the study group was 3,600 Kcal/person/day.

- There 60.98% of soldiers lost weight; 2.44% of soldiers kept weight and 36.58% of soldiers gained weight.

Based on the results of this study, we have some recommendations:

- Reduce the energy of rations provided to the study group from 4,500 Kcal/person/day to 3,600 Kcal/person/day.

- Balance the thermogenic substances in the rations: protein accounts for 18-20%, lipids account for 20-25%, and glucid accounts for 50-55%. Reduce the ratio of animal protein/total protein to 50%. Increase foods from legumes, and different types of nuts.

- Increase refined foods to reduce waste and reduce loss during food processing.

- Abundant in food sources, variety of rations, enhance cooking skills to help soldiers eat with appetite and eat all meals.

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