

A healthy eating plan for employees engaged in oil and gas exploration and production in the Far North

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Abstract. Proper nutrition is undoubtedly one of the most important factors of good health. Currently, the priority field of study for the Russian nutritionists is the development of well-balanced nutrition plans which can help to prevent or alleviate the most common medical conditions and work-related diseases. Extensive research has been carried out for the stated program for the Development of Hydrocarbon Resources in the Northern Regions of Russia, including the Far North, where the huge oil and gas fields are located, and the specialists of Art-Life scientific production association have developed a healthy eating plan to help people working in the Far North maintain general well-being.

1 Introduction

The extreme weather conditions of the Far North are well-known, and because of the climate-related health threats this climatic zone in Russia is regarded as highly unfavourable for living. Employees who are brought to the Far North from other Russian regions experience an extended strain arising from both extreme cold and difficult work conditions. Research has demonstrated a phospholipids deficiency which leads to the exhaustion of the body's compensatory mechanisms, occupational diseases and pathological processes. Therefore, in order to improve the living conditions, it is primarily important to develop well-balanced diets with all the necessary micronutrients and macronutrients included. At the same time, the costs should also be taken into the account, as a very limited range of foods can be produced in the Far North; most foodstuffs have to be delivered from elsewhere [1,6-15].

In addition to the unfavourable weather conditions, employees engaged in oil and gas exploration and production suffer from chemical, physical and other harmful factors of the industrial environment. These negative factors disrupt metabolism and the immune system, and consequently affect general well-being, work performance and life expectancy. Therefore, there are a number of factors to be taken into account when developing diets aimed at replenishing nutrients and improving the general well-being of people living and working in the Far North [1-5].

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2 Materials and methods

The materials used are natural raw materials of plant and animal origin, semi-finished products, laboratory and experimental samples of the food supplement. Standardized and modified test methods have been used to assess the quality characteristics of the product

3 Results and discussion

Although, nowadays Russian authorities are looking into ways to promote healthy dietary practices, the recent data on food consumption indicate the overall decrease in the consumption of fruit and vegetables, meat, dairy and fish products as well as the increase in sugar consumption. These changes inevitably result in different noncommunicable diseases and conditions. Comparing the nutritional guidelines for different Russian regions, we can notice certain differences. The Nutritional guidelines for the regions of the temperate climate zone and the Far North developed by the Federal State Budgetary Scientific Institution - the Institute of Nutrition, Biotechnology and Food Safety are presented in Table 1.

Table 1. Daily Nutritional Guidelines

Foods	Temperate climate zone (gram)	Far North (gram)
Whole grains	64.0	345.2
Fruit and vegetables	302.0	315.0
potatoes	275 .0	300 .0
Meat	167 .0	250 .1
Dairy	486 .0	1747 .1
Fats	40 .0	85 .0
Sugar	86 .0	115 .0
Fish	51 .0	54 .8

As can be seen from the table, the differences are significant, as energy intake has to be in balance with energy expenditure. Although other individual characteristics like gender, lifestyle, and physical activity have to be considered, climate is still a very important one. Thus, the energy intake for people living in the Far North is one and a half times as large as the energy intake for people living in the temperate climate zone.

Because of the chronic cold exposure people working and living in the Far North have to adjust to cold temperatures, but cold acclimatization takes time and while people are adapting to cold, iron and fluorine deficiencies cause iron deficiency anaemia, increased dental caries, hypovitaminosis and unsettle the immune system. For these reasons, foods fortified with minerals and vitamins have to be included in the diets of people in the Far North to help maintain healthy dietary practices.

One of the possible solutions, which can successfully cater for employees engaged in oil and gas exploration and production in the Far North, provide all the essential micronutrients and allow to develop healthy food environments, is the use of dietary supplements.

The specialists of Art-Life scientific production association have developed their healthy eating plan to help people working in the Far North maintain a healthy diet and prevent work-related diseases. The plan includes the following dietary supplements:

- Soft drinks concentrates (a vitamin fortified beverage with a choice of flavours)

- Fruit and berry jelly drinks fortified with vitamins and calcium (a wide choice of flavours)
- Protein shakes with vitamins and amino acids
- Protein bars

In addition, Omega 3 dietary supplement is recommended to be consumed. The complex is a source of essential fatty acids, vitamin E, selenium, lipoic acid, and dihydroquercetin. The data on the healthy eating plan are presented in Table 2 and the recommended healthy eating plan is shown in Figure 1.

Table 2. The Proposed Healthy Eating Plan: Contents

Drinks	Recommended daily amount (prepared drink in ml)	Contents		% RDI per drink/bar
Made from soft drinks concentrate fortified with vitamins	200 (once a day)	Energy value, kcal	56.4	2.0
		Carbohydrates, g	10.51	3.0
		Organic acids, g	0.4	-
		Vitamin A, mg	0.5	62.5
		Vitamin C, mg	100	167
		Vitamin B ₁ , mg	1.1	79
		Vitamin B ₂ , mg	1.1	69
		Vitamin PP, mg	10	56
		Tannin, mg	11.25	3.8
		Caffeine, mg	7.5	15
Fruit and berry jelly drinks fortified with vitamins and calcium	200 (once a day)	Silybin, mg	30	100
		Energy value, kcal	49.05	2.0
		Carbohydrates, g	13.62	4.0
		Organic acids, g	174	-
		Vitamin A, mg	0.5	63
		Vitamin E, mg	15	150
		Vitamin B ₁ , mg	1.9	136
		Vitamin B ₂ , mg	3.0	188
		Vitamin B ₆ , mg	7.3	365
		Vitamin PP, mg	9.0	50
		Vitamin B ₅ , mg	6.5	108
		Vitamin B ₁₂ , mcg	6.5	650
		Vitamin B ₉ , mg	0.6	300
		Vitamin H, mcg	48	96
Vitamin C, mg	30	50		
Calcium, mg	130	13		
Protein shakes with vitamins and amino acids	100 (three times a day)	Energy value, kcal	123	15
		Proteins, g	8.12	32
		L-carnitine, g	0.13	129
		L-taurine, g	0.13	99
		Glutaminic acid, g	1.20	26
		Isoleucine, g	0.39	58
		Methionine + cystine, g	0.42	70
		Valine, g	0.42	50
		Tryptophan, g	0.13	49
		Phenylalanine + tyrosine, g	0.62	42
		Threonine, g	0.33	41
		Leucine, g	0.59	38
		Lysine, g	0.49	36
		Arginine, g	0.56	27
		Proline, g	0.41	27
		Histidine, g	0.18	26
		Glycine, g	0.26	22
		Aspartic acid, g	0.76	18
Alanin, g	0.34	15		

Table 2. Continued

		Serine, g	0.36	13
		Carbohydrates, g	12.2	10
		Lactulose, g	1.0	150
		Dietary soluble fiber, g	0.265	40
		Fats, g	4.65	17
		Medium chain triglycerides, g	0.39	-
		Vitamin B ₁ , mg	0.31	22
		Vitamin B ₂ , mg	0.37	23
		Vitamin B ₃ , mg	3.67	20
		Vitamin B ₅ , mg	0.92	15
		Vitamin B ₆ , mg	0.37	19
		Vitamin B ₉ , mg	0.074	37
		Vitamin B ₁₂ , mcg	0.83	83
		Vitamin C, mg	12.8	21
		Vitamin E, mg	1.38	14
		Calcium, mg	144	15
		Phosphorus, mg	149	19
		Iodine, mcg	23.7	16
Protein bars	1 bar (60 gram)	Energy value, kcal	173.45	7
		Proteins, g	20.34	27
		Fats, g	2.89	5
		Carbohydrates, g	16.52	5
		Calcium, mg	40.5	4
		Phosphorus, mg	33.75	4
		Iodine, mcg	6.75	5
		Soluble dietary fiber, g	3.49	12
		L-carnitine, g	0.11	37
		Caffeine, mg	11	22
		Vitamin B ₁ , mg	0.42	30
		Vitamin B ₂ , mg	0.48	30
		Vitamin B ₃ , mg	5.4	30
		Vitamin B ₅ , mg	1.8	30
		Vitamin B ₆ , mg	0.6	30
		Vitamin B ₉ , mg	0.06	30
		Vitamin B ₁₂ , mcg	0.0003	30
		Vitamin C, mg	18.0	30
Vitamin D, mcg	1.5	30		
Vitamin A, mg	0.24	30		
Vitamin E, mg	3.0	30		
Omega 3 complex	1 capsule	Eicosapentaenoic acid	90	35
		Docosahexaenoic acid	60	
		Alpha linolenic acid	200	
		Lipoic acid	9.0	30
		Dihydroquercetin	7.5	30
		Vitamin E	3.0	30
		Selenium	0.01	15

* Recommended daily intake in accordance with Technical regulations of the Eurasian Economic Union 022/2011.

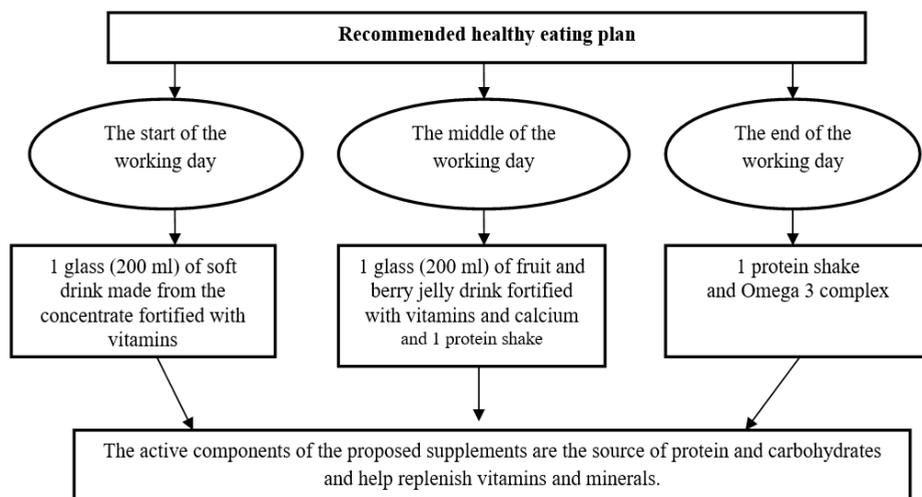


Fig. 1. Recommended healthy eating plan.

4 Conclusion

The proposed healthy eating plan helps counteract the effects of stress, improve digestion, and has a positive effect on gastric secretion. The active components improve liver function, regulate the viscosity and pH of blood and, thus, the heart rate and heart activity; strengthen metabolic processes, and increase efficiency. In addition, the active components make a favourable impact on the central nervous system, improving coordination of movements.

Vitamins perform catalytic functions and stimulate chemical reactions in the body. They assist in forming and functioning of enzymes, help absorb nutrients, enhance cell growth and overall strengthening of the body.

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