BIOSCIENCES BIOTECHNOLOGY RESEARCH ASIA, November 2014. Vol. **11**(Spl. Edn.), pgs. 43-49

Venison as the Staple Food of the Indigenous Minorities Inhabiting the North of Yakutia, Russian Federation

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doi: http://dx.doi.org/10.13005/bbra/1438

(Received: 27 September 2014; accepted: 10 October 2014)

A decrease in the venison consumption has led to a shortage of protein, amino acid, vitamin and mineral nutrition of indigenous minorities of the Republic of Sakha (Yakutia) of the Russian Federation, that, in turn, is a factor in the development of various alimentary diseases. In the overall prevalence of diseases the data on diseases of the endocrine system (from 3 to 30 times), and diseases of the blood and blood-forming organs (by 4-8 times) considerably exceed the indicators of the other regions. Boiled meat and broth made of venison have excellent organoleptic characteristics. Venison contains 19.55±0.03% of protein, 18.81±0.05% of fat, essential amino acids – leucine, lysine, methionine and tryptophan, nonessential amino acids – tyrosine and cystine, and all the essential major and minor mineral elements, saturated and monounsaturated fatty acids, vitamins A, B12, B3, B1, Bc, E, the energy value of venison is 254.77±5.10 kcal.

Key words: Reindeer, Venison, North, Fat, Proteins.

The circumpolar world extends all the way up to the North Pole, on its territory there are different countries and oceans. Although this region is inhabited by different peoples with different cultures, yet they have much in common, such as hunting, fishing, domestic reindeer breeding, cultural values , lifestyle and nutrition[1-3]. The territory of Yakutia is inhabited by over a hundred nationalities, Evens, Evenks, Yukagirs, Chukchi, Dolgans and other peoples constituting not more than 4% of the total population of the Republic of Sakha (Yakutia) and they are considered the indigenous minorities of the North. Above-mentioned indigenous minorities of the North dispersedly having settled over vast Arctic areas has been formed as an ethnic group on this particular area. Over the centuries, they have led a unique nomadic and semi-nomadic lifestyle, that turned to be their scheme of life. These peoples have a distinctive ancient culture, their livelihoods are inextricably connected with the ancestral lands and traditions.

According to the census carried out in 1989 and 2002, the population of indigenous minorities has increased by 4,621 people. Despite the increase in the population of indigenous minorities in the whole republic, in the areas inhabited by indigenous minorities of the Republic of Sakha (Yakutia) there marked a decrease in the average population, a decline in natural population growth (from 1990 to 2003 the average annual population decreased by 15.5 thousand people, natural population increase declined by 3.1 times).

The ethnic occupation of indigenous minorities is domesticated reindeer breeding, and as a result of national selection for centuries such

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reindeer breeds as Chukchi, Even and Evenk breeds were developed. Even reindeer breed constitutes 63.46% of the total number of reindeer of the Republic of Sakha (Yakutia) and plays the largest role in the meat products supply of indigenous minorities in their nomadic lifestyle[4-6].

However, at the present time in connection with the decline in agricultural production in the Far North, associated with a sharp reduction in the reindeer population, a decrease in the meat production, there is insufficient venison consumption in the diet, according to the data the protein-lipid nutrition type of the indigenous minorities of the North turned out to be lipid-carbohydrate[7]. A decrease in meat and fish consumption has led to a shortage of the protein, amino acid, vitamin and mineral nutrition of the indigenous population, that, in turn, is a factor in the development of various alimentary diseases[8-9].

Within this framework we set a goal to study the socio-demographic characteristics of the indigenous population of the North of Yakutia, the nosological spectrum of diseases detected at the health checks, nutritional value, chemical composition and energy value of the meat of domesticated Even reindeer as a source of the staple food of indigenous minorities inhabiting the North of Yakutia.

MATERIALS AND METHODS

The field of the present study

Yakutia is located in the North-East of Asia within the 7,603'- 55,029' of the north latitude and 10,503'-162,051' of the east longitude. The area of Yakutia (3,103.2 thousand km^2) occupies 18% or almost one fifth of the territory of the entire Russian Federation. As far as the climate severity is concerned, this is an area of the cold pole of the northern hemisphere and extreme temperature fluctuations. Long-term average January temperatures in Oymyakon and Verkhoyansk are 49-50° C below zero, minimum temperatures are 68-71° C below zero. Summers are short, but relatively hot (on the most part of the territory maximum temperature reaches 36-38°C above zero, on the coasts of the Laptev Sea it reaches 29-32° C above zero), with sustained sunshine (twenty-four-hour polar day). Domesticated reindeer population in Yakutia during the study period is 190.15 thousand reindeer.

Study materials and methods

The experimental part of the study was carried out in 2010-2014 in Oimyakon region of Yakutia, in the Yakutsk reindeer laboratory of the Scientific and Research Institute of Agriculture (Fig. 1). In order to study the venison nutritional value the samples were taken from 3 (three) reindeer heads of each class of the reindeer herd #6 of the Federal State Unitary Enterprise "Yuchyugeyskoe", reindeer had been bred in the mountain-taiga zone of Yakutia. Reindeer under study were heavily fleshed, kept in natural climatic conditions, without additional feeding. The slaughter was carried out in late November. The average temperature during the slaughter was 39.9º! below zero. Varietal cutting of adult reindeer and fawns carcasses on joints was carried out according to the Specifications of the Russian Federation No. 9214-030-00670203-2011. Venison sampling for laboratory research was performed according to the method[10], the chemical analysis was carried out in the laboratory of the Yakut Scientific and Research Institute of Agriculture.

Fig. 1. The Republic of Sakha (Yakutia) of the Russian Federation

The results of the study

Socio-demographic characteristics of the population under the study

In order to carry out the survey of the adult population inhabiting the settlement Zhilinda in Oleneksky region of the Republic of Sakha

(Yakutia) we formed the representative selection by gender and age consisting of 150 people, including 69 men (46%), 81 women (54%). The average age of the women studied amounted to 43.3±16.6 years old, while the average age of men amounted to 41.1±16.4 years old. All the people studied were divided into 6 groups according to their age: the first group consisted of 15-24 year-olds; the second group – 25-34 year-olds; the third group – 35-44 year-olds; the fourth group – 45-54 years; the fifth group – 55-64 year-olds; the sixth group – 65 year-olds.

Table 1. Personal incomes of the population inhabiting the settlement Zhilinda in Oleneksky region of the Republic of Sakha (Yakutia)

Personal income (RUR)	Abs.	%
More than 7,500	48	32.0
From 5,000 to 7,500	25	16.7
Less than 5,000	77	51.3

In the analysis of socio-demographic factors, the low living standards of the respondents attracted our attention. The average total family income is less than 10,000 rubles, personal income of the half of the population is less than 5,000 rubles, which is significantly less than the minimum subsistence level for the region under the study (Table 1).

The nosological spectrum of diseases detected at the health checks

In the settlement Zhilinda 484 residents have been inspected, including the adults – 276 (89% of the adult population) and children – 208 (100% of the child population). The results are presented in Table 2. The prevalence of detected diseases was compared with the results of previous health checks we had carried out in different areas of the republic.

Table 2. The prevalence of the detected pathology under the classification of diseases (per 1,000 residents inhabiting the studied areas)

Disease classes under the classification of diseases	Zhilinda settlement	Oleneksky region	Eveno-Bytantaysky region	Mirninsky region	Vilyusky region
Neoplasms	29.1	-	66.4	17.4	38.0
Diseases of the endocrine system	568.1	92.2	187.1	17.4	143.3
Diseases of the blood and blood-forming organs	338.6	39.8	87.4	43.4	73.0
Mental diseases	13.5	884.9	103.1	60.8	181.3
Diseases of the nervous system	253.4	327.0	311.2	269.5	175.4
Diseases of the circulatory system	475.8	593.2	583.9	417.9	482.5
Respiratory diseases	312.2	115.2	597.9	539.1	406.4
Diseases of the digestive system	996.1	578.6	1,006.9	573.9	397.7
Diseases of the urinary organs	759.2	1,074.0	580.4	234.7	309.9
Diseases of the musculoskeletal system	125.7	62.0	65.6	530.4	505.8
Diseases of the skin and subcutaneous tissue	133.4	-	132.9	95.6	26.3
Eye disorders	735.6	-	-	-	-
Congenital anomalies	19.3	46.1	-	30.0	17.5
In total	4,760.0	2,601.1	4,328.0	2,973.9	2,862.6

As can be seen from Table 2, in the overall prevalence of diseases in the settlement Zhilinda the data on diseases of the endocrine system (from 3 to 30 times) and diseases of the blood and blood-forming organs (by 4-8 times) considerably exceed the indicators of the other regions. This requires an in-depth analysis of the nosological entities of these disease classes.

Tasting evaluation of the venison and venison broth

An overall tasting score of boiled venison and broth is presented in Table 3. The results of the tasting showed that the indicators of female reindeer boiled meat and broth exceeded the indicators of boiled meat made of male reindeer by 0.22 points, on the broth – by 0.21 points, and also exceeded the fawn meat respectively by 0.08 and 0.57 points.

Table 3. Tasting evaluation of the venison and venison broth (points obtained)

S. No	Classes of reindeer	n	Boiled venison M±m	Venison broth M±m
1	Female reindeer	3	4.43±0.08	4.59±0.06
2	Male reindeer	3	4.21±0.11	4.38±0.15
3	Fawns	3	4.35±0.07*	4.02±0.25*

*P≤0,05

Chemical composition and energy value of the Even reindeer meat

As for the content of nutrients and energy value, female reindeer meat slightly exceeds the meat of male reindeer and fawns (Table 4). Female reindeer meat contains 19.55±0.03% of protein, 18.81±0.05% of fat, the energy value amounts to 254.77±5.10 kcal, the male reindeer have the following respective indicators: 19.30±0.33%, 18.22±0.82% and 248.34±4.57 kcal; fawns have the following respective indicators: 19.01±0.56%, 17.51±1.41% and 240.43±5.47 kcal (Table 4). The data obtained show that the energy value of female reindeer meat greatly exceeds the calorific value of the male reindeer and fawn meat.

Table 4. The chemical composition and energy value of the Even reindeer meat under the classes of reindeer

Indicators	Classes of reindeer		
	Female reindeer	Male reindeer	Fawns
Moisture, %	58.59±0.65	59.47±0.72	60.58±1.54
Protein, %	19.55±0.03	19.30±0.33	19.01±0.56*
Fat, %	18.81±0.05	18.22±0.82	17.51±1.41*
Carbohydrates, %	1.82±0.01	1.79±0.01	1.70±0.17
Ash, %	1.23±0.0	1.22±0.02	1.20±0.03
Energy value, Kcal per 100 g	254.77±5.10	248.34±4.57	240.43±5.47*

Approximate calculation of the daily maintenance of nutrients due to the consumption of domesticated reindeer meat

At the venison consumption per 500 g a day, the daily maintenance of the human organism is provided by animal proteins by 2.4 times; the content of limiting amino acids exceeds their daily maintenance for several times; the content of saturated fatty acids exceeds the daily maintenance by 140-165%, monounsaturated fatty acids – by 115-120%, polyunsaturated fatty acids – by 155-180%, cholesterol – by 60-115%; as for major mineral elements: calcium – by 75%, phosphorus – by 95-135%, potassium – by 10-30%, magnesium – by 25-45%, sodium – by 10-20% and chloride – by 15-20%; as for minor mineral elements: the content of iron exceeds its daily maintenance by 200%, copper – by 150%, zinc – by 5.0-7.5%, iodine – by 500%, manganese – by 50-70%, selenium and cobalt – by 35 to 50%; as for vitamins: the content of vitamin A exceeds its daily maintenance by 120-200%, vitamin E – by 120-200%, vitamin D – by 20-25%, thiamine (B1) – by 175-230%, riboflavin (B2) – by 50%, pantothenic acid (B3) – by 35-70%, pyridoxine (B6) – by 75-110%, cyanocobalamin (B12) – 115%, folic acid (Bc) – 10%, biotin – 1.0-2.0% and niacin (PP) 165-215% (Table 5).

The studies we carried out have shown that the Even reindeer meat have high nutritional and biological value, thus the indigenous minorities, eating such high-quality meat, provide their body with nutrients in sufficient quantities.

Study findings

1. In order to improve the quality of life of the

Table 5. Approximate calculation of the daily maintenance of nutrients due to the consumption of domestic reindeer meat

	Units	Daily maintenance nutrients under the Sanitary Rules and Regulations of the Russian Federation	Venison consumption per day		
			100 g quantity	500 g %	%
Animal proteins	g	40-50	19.0	48.0%	2.4 times
Essential amino acids					
leucine	g	4-6	16.0	4-5	20-25
lysine	g	3-5	18.0	3-3.5 times	15-17 times
methionine	g	2.4	4.6	2-1.5 times	10.0 times
tryptophan	g	1	2.2	2 times	10 times
Nonessential amino acids					
tyrosine	g	3-4	6.60	1.7-2.2	8.5-11.0
cystine	g	2-3	2.50	100%	5 times
carbohydrates	g	400-450	1.8	0.1%	0.5%
fats	g	80-100			
including animal fats	g	75-80	18.0	22-25%	110-125%
Fatty acids					
saturated	g	23-24	8.0	30.35	150-165%
monounsaturated	g	45-48	11.0	23-24	115-120%
polyunsaturated	g	7-8	2.5	31.36	155-180%
Cholesterol	g	0.3-0.6	0.07	12-23	60-115%
Major mineral elements					
calcium	mg	800-1,000	15.0	15.0%	75.0%
potassium	mg	2,500-5,000	315.0	2-6%	10-30%
phosphorus	mg	1,000-1,500	270.0	19-27%	95-135%
magnesium	mg	300-500	24.0	5-9%	25-45%
sodium	mg	4,000-6,000	140.0	2-4%	10-20%
chloride	mg	5,000-7,000	190.0	3-4%	15-20%
Minor mineral elements					
iron	mg	15.0	15.0	100%	500%
copper	mg	2.0	0.36	30.0%	150.0%
zinc	mg	10.0-15.0	0.015	1.0-1.5%	5.0-7.5%
iodine	mg	0.1-0.2	0.119	100%	500%
manganese	mg	5.10	0.07	10-14%	50-70%
selenium	mg	0.5	0.035	7.0%	35.0%
cobalt	mg	0.1-0.2	0.015	10.0%	50.0%
Vitamins:					
Vitamin A	mg	1.5-2.5	0.6	2.4-40%	120-200%
Vitamin E	mg	1.5-2.5	0.6	24-40%	120-200%
Vitamin D	mcg	10-15	0.5	4-5%	20-25%
Thiamine (B1)	mg	1.5-2.0	0.70	35-47%	175-230%
Riboflavin (B2)	mg	2-2.5	0.24	10.0%	50.0%
Pantothenic acid (B3)	mg	5-10	0.70	7.0-14.0%	35-70%
Pyridoxine (B6)	mg	2-3	0.44	15.0-22.0	75-110%
Cyanocobalamin (B12)	mcg	3.0	0.70	23%	115%
Folic acid (Bc)	mcg	400	8.0	2.0%	10.0%
Biotin (Vitamin H)	mg	0.15-0.3	0.06	0.2-0.4%	1.0-2.0%
Niacin (Vitamin PP)	mg	15-20	6.50	33-43%	165-215%

indigenous minorities of the Republic of Sakha (Yakutia), in particular their physical and social functioning, it is necessary to work on increasing incomes and improving living conditions of the population.

2. A decrease in the meat and fish consumption has led to a shortage of protein, amino acid, vitamin, mineral nutrition of the indigenous population, that, in turn, is a factor in the development of various alimentary diseases.
3. In the overall prevalence of diseases in the settlement Zhilinda the data on diseases of the endocrine system (from 3 to 30 times) and diseases of the blood and blood-forming organs (by 4-8 times) considerably exceed the indicators of the other regions. This requires an in-depth analysis of the nosological entities of these disease classes.
4. As for organoleptic characteristics and the content of nutrients, female reindeer meat have the best properties. This venison exceeds male reindeer boiled meat by 0.22 points and broth by 0.21 points; by the content of the protein female reindeer meat exceeds male reindeer meat by 0.35%; as for the content of fat – by 0.59% and the energy value – by 6.43 kcal; and fawn meat respectively: 0.08 and 0.48 points; 0.54%; 0.71% and 14.34 kcal.
5. At the venison consumption per 500 g a day, the daily maintenance of the human organism is provided by animal proteins by 2.4 times; the content of limiting amino acids exceeds their daily maintenance for several times; the content of saturated fatty acids exceeds the daily maintenance by 140-165%, monounsaturated fatty acids – by 115-120%, polyunsaturated fatty acids – by 155-180%, cholesterol – by 60-115%; as for major mineral elements: calcium – by 75%, phosphorus – by 95-135%, potassium – by 10-30%, magnesium – by 25-45%, sodium – by 10-20% and chloride – by 15-20%; as for minor mineral elements: the content of iron exceeds its daily maintenance by 200%, copper – by 150 times, zinc – by 5.0-7.5%, iodine – by 500%, manganese – by 50-70%, selenium and cobalt – by 35 to 50%; as for vitamins: the content of vitamin A exceeds its daily maintenance by 120-200%, vitamin E – by 120-200%, vitamin D – by 20-25%, thiamine (B1) – by 175-230%, riboflavin (B2) – by 50%, pantothenic acid (B3) – by 35-70%, pyridoxine (B6) – by 75-110%, cyanocobalamin (B12) – 115%, folic acid (Bc) – 10%, biotin – 1.0-2.0% and niacin (PP) 165-215%.
6. It has been concluded that in order to increase the natural growth and the preservation of health of the indigenous minorities inhabiting the North of the Republic of Sakha (Yakutia) it is necessary to provide them with a sufficient quantity of venison.

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