Hygienic Safety and Nutritional Value of the Yakut Horse Meat

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Heavy metal content in meat of Yakut young horse was under study.

It was revealed that concentrations of Zn, Cu, Fe and Mn in the investigated samples of meat didn't exceed maximum concentration limit (San 2.3.2.560-96.) and corresponded to hygienic requirements. In the investigated samples of meat pesticides were not noted. Estimations of amino acid and vitamin content of horse meat from Ojmjakonsky region testify to rather high food value in the studied samples.

Thus background indicators of meat toxic elements depend on such conditions of animal husbandry as local, natural, climatic, fodder, ecological and territorial.

Keywords: heavy metals, toxic elements, horse meat, the Yakut horse.

INTRODUCTION

Manufacture of ecologically safe production of animal husbandry is of great significance nowadays in connection with man's uninterrupted technogenic influence on ecosystems and growth of natural circulation of chemical elements. The latter has considerably increased the heavy metal absorption into the environment and human body through food chains.

Various aspects of ecotoxic receipt into biological objects of the environment and foodstuff of animal origin were studied (Bojarchenko E.K., 1983; Hecht. H., 1984; Kabata-Pendias A, Pendias Kh., 1989; Kraczkowski N., 1993; Talanov G. A, 1994; Nezavitin A.G., 1995; Sagitov E.S., 1995; Malyarov M. A, 1996; Tjutikov S.V., 1997; Smirnov P. N, Pavlova A.I., 1997; Tairova A.R., 1999; Nezavitin A.G., V.L.Petuhov, Vlasenko A.N., 2000; Fomichev J.P., 2000; Donnik I.M., 2000; Gabysheva Z.A., 2001; Kalsina O. I, 2001; Kolesnikov V. A, 2003; Kashin A.S., 2003; Pasternak A.A., 2003; Gerunova L.K., 2003; etc.). The works conducted by authors have shown that the content of heavy metals in animal husbandry production considerably exceeds maximum permissible concentration and depends on a degree of ecological intensity and infringement factors of natural complexes where this production is made [2].

Ecological purity and safety of animal originated foodstuff which prevail in diet of a man

living in the north are considered one of primary factors of health protection of the population. The Yakut horse meat has a specific structure and properties, and is of great interest for manufacturing special foodstuff. Today the population of the republic consumes basically the young Yakut horse meat aged 6 months. For the last five years the average meat consumption amounts for 48 kg per year, relative density of horse-flesh makes 70 %.

Improvement of people's living conditions includes also considerable improvement of food quality. The problem of nutrition is important, being one of the basic programs of rehabilitation of the population in regions of high technogenic and anthropogenic loading. In order to increase the product manufacture for rehabilitation appointment, to create new kinds of medical, dietary and baby food it is necessary to expand raw zones and process new kinds of raw meat products. Considerably the influence of foodstuff depends on its raw content and properties. The meat content has accurate specific and pedigree features. Besides, the meat content is influenced by dwelling conditions, structure and properties of consumed forages [1].

MATERIALS AND METHODS

The research conducted by us comprised the basis of this work within the accredited Yakut republican vet-test laboratory in 2009-2010.

61 muscular tissue samples of the young Yakut horse aged 6-7 months from Srednekolymsky, Eveno-Bytantajsky, Njurbinsky, Mountain, Ust-Aldan and Ojmjakonsky regions of the Republic Sakha (Yakutia) were analyzed in this work.

Meat sampling was carried out according to NATIONAL STANDARDS 9959-91, 7269-79 "Meat. Sampling methods, organoleptic methods of flesh estimation", and also "Rules of veterinary survey of lethal animals and vet-sanitary examination of meat and meat products" (1998).

Horse-flesh and meat products should correspond to requirements of sanitary-and-hygienic norms for food raw products and foodstuff, adopted by the Ministry of Health of the Russian Federation (medical and biologic, 1999), and a level of heavy metal concentration should be controlled according to sanitary rules (maximum permissible concentration, 1986).

The heavy metal compound, amino acids, pesticides and vitamins in the young Yakut horse muscular tissue (NATIONAL STANDARDS 30178-96) were determined by the atom-absorption spectrum photometric method (AAS) on the analyzer "Spectrum-5". The samples prepared with optimal solution-concentrate for AAS was carried out in the autoclave "Ankon-AT" (MI 2221-92).

RESULTS AND DISCUSSION

As a result of the quantitative analysis conducted we established that in foals' muscular tissue from Srednekolymsky region the maximum concentration limit indicators on cadmium exceeded on 0,25 mg/kg, Njurbinsky region being higher on 0,09 mg/kg. The lead and cadmium content in animal muscular tissue from Gorniy region was above MCL on 1,08 and 0,06 mg/kg accordingly.

The higher concentration of zinc was 33,78 mg/kg and ferrous was 37,66 mg/kg in the young Yakut horse of Ojmjakonsky region as compared with other investigated tests. The high content of copper in the meat from Ojmjakonsky region (1,47 mg/kg) was revealed as well.

Concentrations Zn, Cu, Fe and Mn in the investigated tests of meat didn't exceed maximum concentration limit (2.3.2.560-96.) and correspond to hygienic requirements. In the investigated samples of meat no pesticides were revealed.

Our researches confirm the findings of the sanitary-and-hygienic monitoring lab in the Center of hygiene and epidemiology in the Republic Sakha (Yakutia). In 1995-2001 more than 150 tests of local horse meat (horse-flesh) production were investigated. According to the results of the laboratory researches the content of heavy metals in horse-flesh and its production varies in following limits: copper of 0,57-3,54 mg/kg – 4,03 mg/kg, zinc of 15,42 – 18,33 mg/kg, lead of 0,05-0,09 mg/kg, cadmium less than 0,0025 mg/kg wasn't revealed, arsenic of 0,05 mg/kg was not revealed, mercury of 0,0005 mg/kg was not revealed. So the content of heavy metal salts in samples of local manufactured horse meat and meat products weren't revealed or do not reach (don't exceed) maximum concentration limit level according to SanPin of 3/2/1078-) 1 «Hygienic requirements of foodstuff safety and food value».

Estimations of amino acid (Table 2) and vitamin content (Table 3) in horse-flesh from Ojmjakonsky region testify to higher food value of the samples studied.

THE CONCLUSION

According to the studied data on the concentration of heavy metals in the young Yakut horse muscular tissue we have come to conclusion that background indicators of toxic elements in meat are subject to the local natural-climatic, fodder and ecological conditions of the territory of animal husbandry.

The studies showed that the young horse meat from Eveno-Bytantajsky, Ust-Aldansky and Ojmjakonsky regions has been considered ecologically valuable. The Yakut foal's meat from Ojmjakonsky region appeared to have fuller value by its amino-acid and vitamin content.

The table 1. The content of toxic elements in the young Yakut horse meat in the territory of

Republic Sakha (Yakutia).

Regions	Content of toxic elements mg/kg					
	Lead	Cadmium	Zinc	Copper	Ferric oxide	GXCG (a,b,y-isomers)
Srednekolymsky and	0,342	0,309	10,49	1,36	11,55	0
Eveno-Bytantajsky	0,090	0,018	12,68	0,83	8,97	0
Njurbinsky	0,060	0,010	11,33	0,80	11,40	0
Gorniy	0,063	0,148	13,93	1,60	14,47	0
Ust-Aldansky	1,580	0,056	14,13	1,11	7,03	0
Ojmjakonsky	0,310	0,020	33,78	1,47	37,66	0
Max. San Insp	0,50	0,05	70,0	5,0	50,0	-

Table 2. Таблица 2. Amino-acid content of the young Yakut horse meat of ojmjakonsky population, % (n=10)

Arginin	Lizin	Tirozin	Fenilalanin	Lejtsin	Metionin
10,02	8,89	7,27	7,32	22,39	2,92
Valin	Prolin	Treonin	Serin	Alanin	Glitsin
5,61	6,79	5,1	4,36	7,25	5,96

Table 3. Vitamin content of the young Yakut horse meat of ojmjakonsky population, % (n=10)

A, мг/кг	D, mkg/100g	B6, mg/kg	B12, mkg/kg	Biotin, mkg/100g	Niazin mg/100g
3,34	2,13	3,45	4,68	3,85	4,47
B3, mg/kg	B2, mg/kg	B1, mg/kg	Bc, mkg/100g	E, mg/kg	
4,52	1,43	3,68	5,35	4,34	

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