

Assessment of the Distribution of Heavy Metals in Meat Foods of Central Yakutia Inhabitants

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ABSTRACT

This article presents the results of studies assessing the distribution of toxic elements (heavy metals) in the organs and tissues of cattle. So as a special role in human nutrition belongs to the micronutrients involved in the metabolism of the body and often defining health state. It was revealed that the concentration of lead, cadmium, mercury and arsenic in the body of surveyed animals was distributed in descending order: kidney > liver > muscle tissue, and did not exceed the MAC (maximum allowable concentration).

Keywords: heavy metals, muscle tissue, liver, kidneys, concentration, cattle.

INTRODUCTION

The problem of pollution environment and this disturbance in nature is very important. The main threat to environmental pollution is heavy metals.

The study distribution and accumulation of heavy metals in the organism of agricultural animals is important due to the fact that the food of Yakut people associated with the use of considerable quantities of food of animals [11].

The Far North is considered to be one of high-risk areas for the occurrence of many diseases. The great exposure to the organism of Northern people of the development of certain diseases is determined by climate-geographical position. In the northern conditions the cold climate requires a large consumption of energy by the body to sustain life. The products of animals (meat, butter, milk, fish) available and widely spread that contribute to the formation of special type of food Northern people so that is protein-lipid type. Proteins and fats of animals as the source of nutrition and energy are the basis of adaptation to the organism to the severe climatic conditions of the North [1,2].

The aim of work was to estimate the distribution of heavy metals (lead, mercury, cadmium and arsenic) in liver, kidney and muscle tissue of cattle.

MATERIALS AND METHODS

The samples of muscle liver and kidney were taken for research during the slaughter of cattle in Tectur and Nemugu villages of Changelassky region (The Central Yakutia). The selection of these villages was due to the fact that they were located near the federal highway Yakutsk – Nerungri. The content of heavy metals in the samples was determined to atomic

absorption spectrometry «MGA-915»: the level of lead and cadmium in accordance with GOST 30178-96, mercury – GOST 26927 and arsenic – GOST 26930-86 [5, 6, 7].

RESULTS AND DISCUSSION

According to our data the concentration heavy metals (HM) in the examined samples of muscle liver and kidney did not exceed the MPC (maximum permissible concentration) (Table.1).

Table. 1

The concentration HM in muscle tissue and the body of cattle (mg/kg)

Microelements		Muscle tissue	Liver	Kidney
Pb	MPC	0,5	0,6	1,0
	M±m	0,0610±0,0020	0,3400±0,0040	0,6400±0,0160
Cd	MPC	0,05	0,3	1,0
	M±m	0,0020±0,0001	0,0180±0,0001	0,0180±0,0002
Hg	MPC	0,03	0,1	0,2
	M±m	0,0220±0,0020	0,0260±0,0003	0,0220±0,0002
As	MPC	0,1	1,0	1,0
	M±m	0,0790±0,0010	0,0850±0,0010	0,0900±0,0030

From the table. 1 it can be seen that the contents of the lead in the muscle tissue was varied in the range from 0,025 mg / kg to 0,094 mg / kg, cadmium – 0,002 mg / kg to 0,004 mg / kg, of mercury - from 0,012 mg / kg to 0,030 mg / kg, arsenic – 0,06 mg / kg to 0,11 mg / kg. Average values of HM in muscle tissue distributed in descending order: As> Pb> Hg> Cd.

The concentration lead in the liver ranged from 0,20 mg / kg to 0,48 mg / kg, cadmium - 0,010 mg / kg to 0, 016 mg / kg, of mercury - from 0,024 mg / kg to 0,028 mg / kg, arsenic – 0,07 mg / kg to 0,10 mg / kg.

The level of lead in kidney of cattle ranged from 0,24 mg / kg to 0,93 mg / kg, cadmium - from 0,015 mg / kg to 0,021 mg / kg, of mercury - from 0,019 mg / kg to 0,029 mg / kg, arsenic - from 0,03 mg / kg to 0,13 mg / kg.

The concentration of metals in the liver and kidney of cattle can be arranged in the following descending sequence: Pb> As> Hg> Cd.

The content of mercury as in the blood and in the organs of the animals was surveyed actually identical. The concentrations mercury tended to increase in order of increasing muscle< liver < kidney. The middle meaning of cadmium in the liver and kidneys of cattle were 9 times higher than in the muscle tissue.

The concentration in the kidney, Cd was the same as in the liver and the content of Pb in 1.8 times higher than in the liver.

Our results show that HM in organism of animals accumulate in parenchymal organs. It is known that HM comes to animals with forage herbs. The rangeland of soil contamination lound up with anthropogenic load. The main pollutants of the environment in the area are Changelassky region are cement factory, thermal power plant (TPP), and automobile transport.

It is known that 54% of mercury emissions account for coal combustion; 86% of lead emitted into the atmosphere from automobile transport. A certain amount of heavy metals in the environment and delivers agriculture where pesticides are applied and mineral fertilizers, particularly superphosphate contain significant amounts of chromium, cadmium, to cobalt, copper, nickel, vanadium and zinc [3,8].

Yakutia is in continuous permafrost. Its influence is penalized cycle of many substances, including heavy metals (HM), which accumulate in the soil and the food chain may soil - plants - animals ingested that contribute to the development of many diseases [4].

Accumulation of heavy metals in parenchymal organs associated with the circulatory system. Heavy metals are received fodder grasses organism cattle digested in the gastrointestinal tract and via the portal vein to the liver, where there are major metabolic processes and disposal of heavy metals, one of the inducible metallothionein proteins. The accumulation of heavy metals in bovine kidney associated with their excretory functions [10].

Our data indicate that the level of heavy metals in the tissues of cattle Changelassky region area does not exceed the maximum allowable concentrations and fully meets requirements Sanitary 2.3.2.1078 - 01 [9].

CONCLUSION

So, heavy metals, trapped with herbage crops are distributed in the body of cattle lopsided. The lowest concentrations of heavy metals (lead, cadmium, mercury and arsenic) was found in muscle tissue, and the highest - in the kidney. Our results indicate that the concentration of lead, arsenic, mercury and cadmium in the body of animals surveyed distributed in descending order: kidney> liver> muscle.

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