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Organoleptic Indicators and Chemical Composition of Horse Meat.

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ABSTRACT

This paper represents the results of visual inspection, organoleptic and chemical composition determination of horse meat sampled from different settlements, which are situated around the Semipalatinsk nuclear test site (SNTS). These settlements belong to different zones of radiation risk. The results showed that the organoleptic and chemical characteristics of meat sampled from the distant settlements to the SNTS have good sensory properties and nutritive value than those which sampled from the near to SNTS border area.
Keywords: horse, meat, Semipalatinsk nuclear test site, chemical composition.

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INTRODUCTION

Food safety is a complex and multifold problem that is international in scope and affect each people and population group. Ensuring the quality and safety of food products is high priority and urgent issue of the food security of the Republic of Kazakhstan.

Milk, milk products, bakery, meat and meat products are the most consumable food products in Kazakhstan. In 2014 meat consumption per capita in Kazakhstan had increased by 1.6 times comparing with 2000 [1].

Meat and meat products are the main source of nutrients, including protein, fat, minerals – iron, potassium, magnesium, sodium, zinc, phosphorous, iodine *et.c.*; vitamins - thiamine, riboflavin, pyridoxine, choline, nicotinic and pantothenic acids, tocopherols and other types of vitamin B group. [2, 3]. According to WHO, the rational rate of meat consumption for human is 81kg per year. [4, 5].

Horse breeding is a native occupation of Kazakh people, which hand down from generation to generation. Nowadays, 98% of horses are housing for meat production (annually 93 000 ton of horse meat) [6]. The primarily benefit of horse meat is that it contains complete protein, perfectly balanced in amino acids. Through this the horse meat is widely regarded as dietary meat. Horse meat digestion in the human body is 8 times faster than beef one.

Environment contamination is negatively affecting to the sensory and biochemical characteristics of meat and meat products. All this can lead to lowering the biological and nutritional value of food and aftermath human diseases. After-effect of the SNTS activity had a negative role to the environment, including food safety [7, 8]

The Semipalatinsk nuclear test site (SNTS) has been contaminated by radionuclides mainly as a result of atmospheric, aboveground and underground nuclear tests that were carried out over 40 years from 1949 to 1989. Soviet Union conducted 456 nuclear explosions at SNTS, including 116 aboveground and 340 underground explosions [9]. This led to radioactive contamination not only inside the test site but also outside, where people live.

In these areas, vegetation that grows on the fields and meadows is the main source of radionuclides contamination transfer to animals and, therefore of course, meat and milk. A cattle can consume the vegetation over a large area (up to 160 m2) and about 1 % of the Cs and the Sr consumed during the day are removed from the body through the milk [10]. Contamination of water and food products derived from farmed animals can represent a major source of radiation exposure to humans [11, 12].

The aim of this work was to study the organoleptic and chemical composition of horse meat sampled from the different areas of East Kazakhstan and adjacent to the Semipalatinsk nuclear test site.

MATERIALS AND METHODS

Horse meat was sampled from 8 settlements, which located near the SNTS. A description of the sampling locations is provided below. In accordance with the law of the Republic of Kazakhstan (from the 18th of December, 1992) “About social protection of citizens suffering from the consequences of nuclear testing in the Semipalatinsk Nuclear Test Site” adjacent territories belong to different zones of radiation risks.

1. Bodene village – belong to the zone of extreme radiation risk, located 120 km from Semey city and 25 km from the SNTS border.
2. Sarapan village – belong to the zone of extreme radiation risk, located 130 km from Semey city and 10 km from the SNTS border.
3. Begen village – belong to the zone of maximum radiation risk, located 125 km from Semey city and 70 km from the SNTS border.
4. Abraly village – belong to the zone of extreme radiation risk, located 120 km from Semey city and 25 km from the SNTS border.
5. Semey city – belong to the zone of high radiation risk, located 90 km from the SNTS border.

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6. Kyikashkan village – belong to the zone of high radiation risk, located 240 km from Semey city and 90 km from the SNTS border and 100 km from Karaganda city.
7. Zhantike village – belong to the zone of minimum radiation risk, located 60 km from Semey city and 680 km from the SNTS border.
8. Akku village – belong to the zone of minimum radiation risk, located 235 km from Semey city and 120 km from the SNTS border, and 100 km from Pavlodar city.

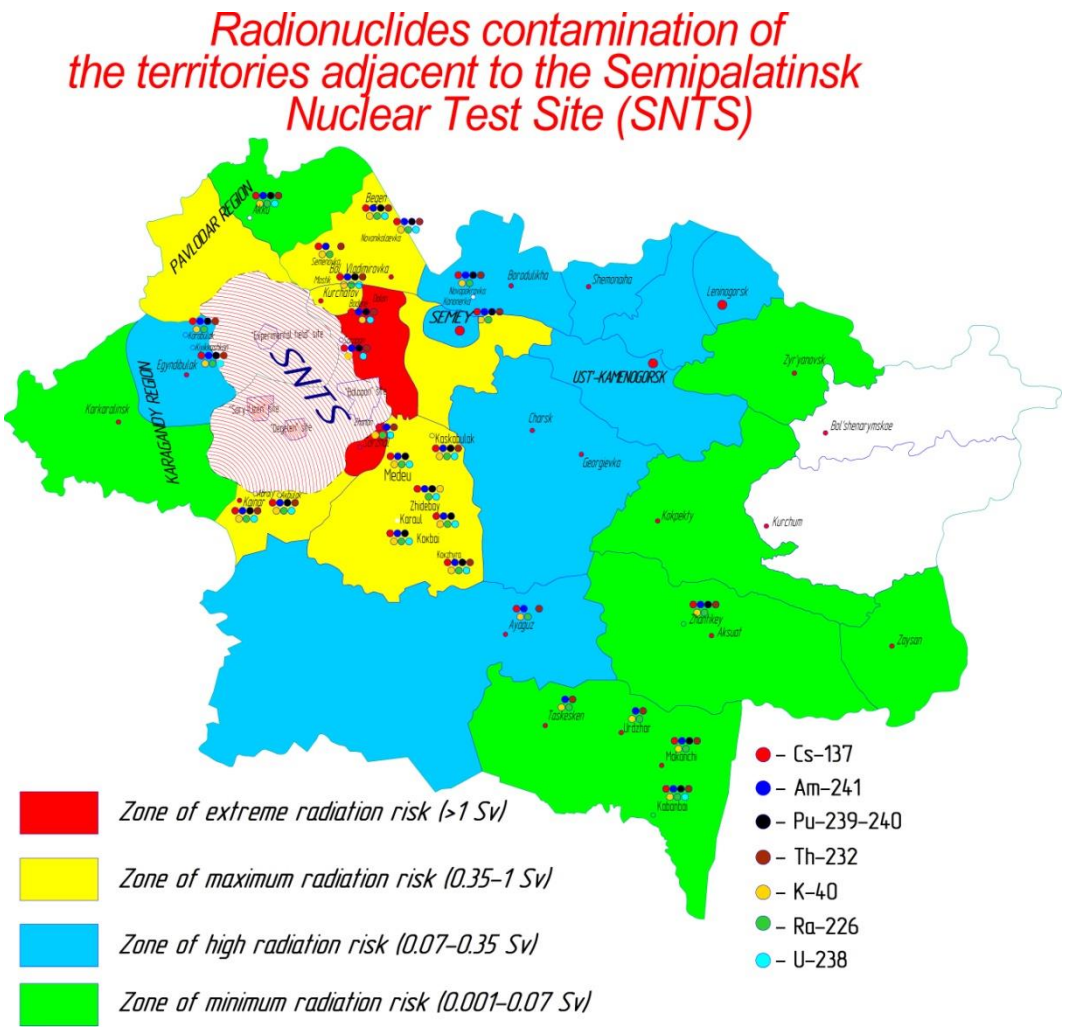

Fig.1: Zone of radiation risk of East Kazakhstan with respect to the SNTS

For studying the meat freshness 200g of meat was cut from the animal carcasses, particularly between the fourth and fifth neck bone; from the shoulder and toproun d.

Sensory and physical and chemical indicators were determined by national standard GOST 7269-79 “Meat. Methods of sampling and organoleptic methods of freshness test”, GOST 23392-78 “Meat. Methods for chemical and microscopic analysis of freshness”, GOST 9959-91 “Meat products. General conditions of organoleptical assessment”.

RESULTS AND DISCUSSION

Visual inspection of horse meat sampled from the zone of minimal radiation risk showed that the condition of the slaughtering place is rough, blood-soaked; bleeding degree is good, without blood in muscles and blood vessels; the minute vessels under the pleura and peritoneum are not illuminated; with none hypostases; lymph nodes without changes, with light gray color at section place.

Color of meat is red, dense consistence, with superficial drying crust and specific smell. The meat surface does not leave the wet spot on the filter paper. The fat color is white with the yellowish shade, has a specific smell and soft and elastic consistence. The tendons are elastic and firm texture, the surface of joints is smooth and bright.

The slaughtering place of the horse meat from the zone of maximal radiation risk is clean cut, slightly blood-soaked, bleeding degree is good, the vessels from pleura and peritoneum side are low illuminated, with none hypostases, lymph nodes within normal limits.

Color of meat is red, soft consistence, with superficial drying crust and specific to this animal smell. The meat surface leaves the wet spot on the filter paper. The fat color is light with the specific smell and soft consistence. The tendons are soft, less dense; the surface of joints is matt color.

In the horse meat from the zone of high radiation risk the slaughtering place is rough, low blood soaked, bleeding degree is satisfactory, the vessels from pleura and peritoneum side are illuminated, with none hypostases, lymph nodes are hyperemic.

Color of meat is red, soft consistence with superficial drying crust and specific to this animal smell. The meat is slightly wet and leaves the wet spot on the filter paper. The fat color is light-yellow with the specific smell and soft consistence. The tendons are soft, the surface of joints is matt color (table 1).

Table 1: Sensory characteristic of horse meat

Indicator	Zone of MinRR	Zone of MaxRR	Zone of HRR	Zone of ERR
Color	red	red	red	dark red
Flavor	specific	specific	specific	specific
Texture	dense	dense	dense	less dense
Fat condition	White color, specific flavor, elastic, soft texture	light color, specific flavor, elastic texture	light yellow color specific flavor, soft texture	yellow color specific flavor, soft texture
Cutting place	rough, heavy blood soaked	rough, heavy blood soaked	rough, slightly blood soaked	rough, blood soaked
Bleeding rate	good	good	satisfactory	satisfactory
Broth transparence	transparent, pure	transparent, pure	turbid with impurities	turbid with flakes
Broth odor	flavory	flavory	with specific smell	with specific smell

Chemical composition and nutrition value of horse meat

According to the results of chemical composition the moisture content of muscular tissue sampled from the zone of extreme radiation risk were between 74,1 and 74,3 g, and here the protein content were 18,5 and 18,7 g (table 2); from the zone of maximum radiation risk the moisture content was 73.5-73.6 g and fat content was 6.6 g.

Horse meat sampled from the zone high radiation risk had the amount of moisture - 73,7 g, fat - 7,4 g, ash - 0,9 g, and protein content was 18,0 g. High protein content was determined in the sample from the zone of minimum radiation risk 19.0 g, here the moisture was 72.9 g, fat – 7.2 g and ash – 0.9 g.

Table 2: Chemical composition of horse meat

Sampling area	Moisture	Fat	Ash	Protein
FAO scale	64,5	16,0	0,9	18,6
Bodene	74,1	6,3	1,1	18,5

Sarapan	74,3	5,9	1,1	18,7
Begen	73,5	6,1	0,9	19,5
Abraly	73,6	6,6	0,9	18,9
Semey	73,5	6,7	1,0	19,8
Kyikashkan	73,7	7,4	0,9	18,0
Zhantike	73,8	6,4	1,0	18,9
Akku	72,9	7,2	0,9	19,1

The difference on moisture and protein content in comparison with FAO scale for Bodene is: the moisture is 9,6 g more, the protein is 0,1 g less; for Sarapan village: the moisture is 9,8 g more, the protein is 0,1 g more; for Begen village: moisture is 9 g more, the protein is 0,9 g more; for the village of Abraly the moisture is 9,1 g more, the protein is 0,3 g more; for Semey: the moisture is 9 g more, the protein is 0,2 g more; for Kyikashkan village: the moisture is 9,2 g more, the protein is 0,6 g less; for Zhantike: the moisture is 9,32 g more, the protein is 0,3 g more; for Akky: the moisture is 8,4 g more, the protein is 0,5 g more.

CONCLUSION

Based on the research findings, the horse meat's sensory and chemical composition depends on the ecological situation of the area. Thus, the meat samples from the far away area to the SNTS have more good sensory and chemical composition comparing with the samples from the adjacent areas to SNTS.

REFERENCES

[1] Kakimov A.K., Yessimbekov Z.S., Kabulov B.B., Bepeyeva A.Y. Functional meat food developing prospects. LLC "MAP", Almaty, 2016. 53p.
[2] Toldra F., Milagro R. Trends in Food Science & Technology. 2011; 22: 517-522.
[3] Ranken M.D. Handbook of meat product technology. Blackwell Science Ltd. 2000. 245p.
[4] Brewer, M. S. Meat Science, 2012; 91: 385-395.
[5] Okuskhanova E., Assenova B., Rebezov M., Yessimbekov Z., Kulushtayeva B., Zinina O., Stuart M. Pakistan Journal of Nutrition. 2016; 15 (3): 217-222.
[6] http://www.kazpravda.kz/articles/view/zaprosi-na-temi-dnya/
[7] Cherepin Y.S. Proceeding of international conference "Radioactivity at nuclear explosions". Moscow, 2000, 92-100.
[8] Duyssembaev S., Serikova A., Iminova D., Omargalieva N., Ibragimov N. RJPBCS. 2016; 7 (4): 1268-1273.
[9] Howard B.J., Semioschkina N., Voigt G., Mukusheva M., Clifford J., Radiat. Environ. Biophys. 2004; 43: 285–292.
[10] Howard, B.J., Beresford, N.A., Barnett, C.I., Fesenko, S., J. Environ. Radioact. 2009; 100: 263-273.
[11] Kakimov A., Yessimbekov Z., Kakimova Z., Bepeyeva Z., Stuart M., Environ. Sci. Poll. Res. 2016; 23 (5): 4931-4937.
[12] Duyssembaev, S., Lozowicka, B., Serikova, A., Iminova, D., Okuskhanova, E., Yessimbekov, Z., & Kaczynski, P. Polish J. Environ. Stud. 2014; 23(6): 1983-1993.