

## Protein and Mineral Substances in the Muscular Tissue of a Red Deer (*Cervus elaphus* Linnaeus, 1758) from Uvs Province, Mongolia

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### Abstract

The authors defined the amount of macro and microelements, protein amino-acids, protein group substances, and general protein of the hindquarter muscular tissue of illegally hunted red deer from Turgen district of Uvs province. The content of general protein was 12.3%, and by applying acrylamid gel-electrophoresis method revealed 6-7 kinds of protein fractions. In addition, we found 16-17 kinds of replaceable and irreplaceable amino acids from the muscular tissue and defined their amount. From the ash of muscular tissue we determined 24 elements and made appropriate assessments regarding to them.

**Key words:** Muscular tissue, muscular protein, protein fraction, nutrient value.

### Introduction

The red deer (*Cervus elaphus* Linnaeus, 1758) is the protected mammal species by the Hunting Law of Mongolia.

In the Mongolian traditional medicine from ancient times use medicines prepared from organic substances of diverse animals. The recipe of those medicines include organic substances of several organs as head, brain, bone, meat, skin, milk, stomach, hair, horn and gullet of different animals. For example, the ash of red deer old antlers referred in traditional medicinal scriptures as effective to dry up blood, phlegm and its blood and adipose were used as ingredient of medicine for treatment of helminthose diseases (Baavgai & Boldsaikhan, 1990)

As noted in sutras, Mongolian people use the meat, antlers, penis, testicles, tongue, tail and skin of red deer in medicine, technique, adornment accessory and in fields of industries (Dulamsuren et al., 1989). There are very scarce information on the study of muscular tissue of red deer.

The researchers of the Institute of Animal Husbandry of Mongolia defined the meat calorific values of Altai mountain wild sheep (*Ovis ammon* Linnaeus, 1758), Siberian ibex (*Capra sibirica* Pallas, 1776,) and black-tailed gazelle (*Gazella subgutturosa* Guldenstaedt, 1780) by finding out the respective amounts of meat protein, adipose and investigating ash of them (Chernova, 1964, 1965).

The meat of red deer is regarded as an excellent food due to its contamination of different nourishment substances. Some researchers mentioned that besides of fat and protein the deer meat contains vitamins of B group and various mineral substances (Pieve, 1972; Sillespie, 1960; Pavlovskiy & Palmin, 1975).

Different ingredient compounds of meat depend on the presence of muscular tissue, adipose and other kinds tissues. Muscular tissue is one of the important parts, which form the meat, and it performs various functions. It decreases the coagulation of blood, which circulate via blood vessels by spending a lot of energy and from stable resource of nourishment and energy needed for metabolism, when animal makes movements (Dulamsuren et al., 1989). Therefore, it appeared to be necessary to make research work on muscular tissue of the red deer.

### Material and Methods

We used the muscular tissue sample of a red deer, which was illegally hunted by poachers in the territory of Turgen district, Uvs province in February of 2002, as the research material. The study is carried out by the statement of Natural Environment Protection Association of Uvs province. The hindquarter muscular tissue has the slight coagulation of blood on its external surface, and was in good frozen condition with brownish

red color and fresh smell.

The protein of muscular tissue was determined by Ganning method, the protein fraction is examined by 15% of acrylamid gel-electrophoresis, paper chromatographic method for identification of the amount of amino acids and by evaporation method for amount of macro and microelements, respectively.

## Results

The amount of protein in the red deer hindquarter muscular tissue was defined by its general nitrogen presence, in 4-5 times, and the average amount was equal to 12.3%. The comparative data of the amount of red deer hindquarter muscular tissue protein with that of wild sheep, Siberian ibex and black-tailed gazelle is shown in Table 1.

Table 1. Comparative data of muscular tissue protein amount of four mammal species (%)

Mammal species	Amount of protein	Sources
Wild sheep	21.61	Chernova, 1984, 1985
Siberian ibex	20.59	
Black-tailed gazelle	19.19	
Red deer	12.3	Present data

As shown in Table 1, the amount of protein of the red deer muscular tissue is lower than that of

other mammal species, which were hunted in the period of October and November. The reason could be probably explained that in our research we used red deer meat, hunted in February, when the amount of protein in its flesh might be decreased due to the winter period's scarce nourishment availability.

Concerning the protein fractions of red deer hindquarter muscular tissue, we found of 6-7 major protein fractions, which shown in Figure 1.

As for the protein fractions' spreading image, we found other protein fractions besides of muscular tissue sarcoplasm and myofibrill proteins. We used proteins with different molecular mass within 14.4-94 kDa as controlling criteria.

According to international standard, the myosin has 208.000 molecular mass and  $\beta$ -galactosidase - 119.000, bovine serum albumin - 34.000, ovalbumin average - 51.000, carbonic anhydrase - 34.400, soybean trypsin inhibitor - 28.000, lysozyme - 20.000 and aprotinin - 7.000 molecular masses, respectively.

The muscular tissue contains following basic protein fractions as myogen of 20%, which is sarcolemm protein, globulin X of 20%, myofibrillic myosin of 35%, actin of 15% and other proteins of 10%, respectively (Pavlovsky & Palmin, 1975). Other proteins, which we found in red deer muscular tissue sample probably could be sarcolemmic and nucleus proteins.

The amount of replaceable and irreplaceable amino acids, found in the muscular tissue of red

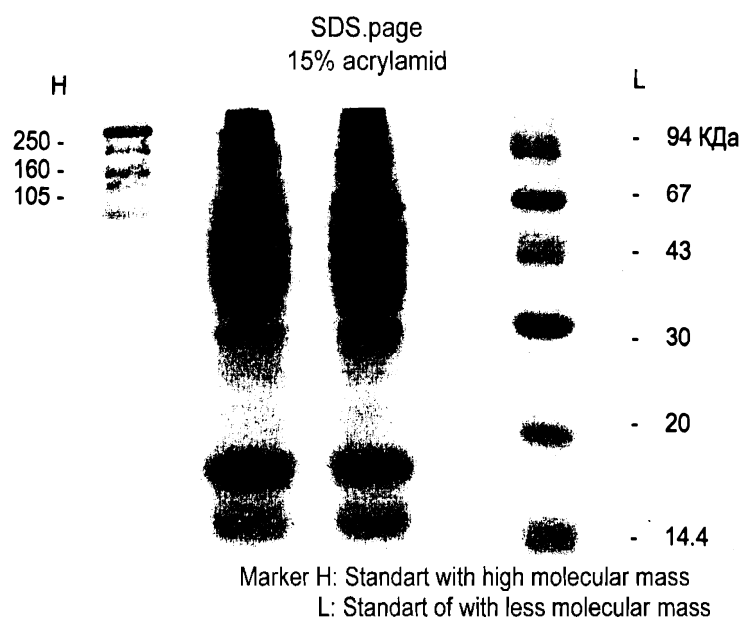


Fig. 1. Protein fractions of hindquarter muscular tissue of red deer

deer is shown in Table 2.

Twenty-four macro and microelements are

The authors are revealed the presence of 5 macroelements with amount ranging 0.04>1 and a

Table 2. Amount of protein amino acids in the tissue of red deer (%)

Replaceable amino acids	Amount	Irreplaceable amino acids	Amount
Alanine	6.2	Valine	3.6
Glycine	2.3	Leucine+Isoleucine	13.6
Proline	1.9	Phenylalanine	4.8
Serine	4.4	Tyrosine	3.8
Threonine	5.6	Methionine	3.4
Cysteine	0.9	Lysine	10.2
Arginine	6.2		
Histidine	2.6		
Aspartic acid	9.4		
Glutamic acid	20.9		
Total	60.4	Total	39.4

detected in the ash of muscular tissue, and calculated ration of them is shown on Table 3.

Table 3. Amount of macro and microelements in the muscular tissue of red deer

Macro and microelements	Amount of contents (%)
Na	++
Ca	>1
P	>1
Ba	0.04
Mg	>1
Mn	0.03
Zn	0.01
Cu	0.007
Si	>1
Al	>1
Fe	0.7
Cr	0.0005
Ni	0.001
Ti	0.05
V	0.003
Mo	0.0001
W	0.07
Sn	0.0001
Pb	0.0005
Ag	0.0001
Zr	0.001
Be	0.0001
Vb	0.0002
Y	0.002

number of microelements with amount of 0.0001-0.07%. The mineral substances are the constituent elements of muscular fibre's structural composition and they contribute active role in intercellular metabolism, presenting in the compound of intercellular fluid.

## Conclusion

Though the content of protein in the muscular tissue of red deer is lower than that of the beef and other wild animal meat, it is proved to have the quality of nutritional value about 39.4% according to essential amino acids.

The fact of the presence of 5 macroelements and 19 microelements in the muscular tissue of red deer, provides supporting point to suppose that those elements are contribute good effects to activate enzymic system, blood buffer and protein formation inside of muscular tissue cell. But if we continue further investigations on muscular tissues, antlers, penis and testicles of this species of animal then, probably we could witness an interesting phenomena.

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### References

- Baavgai Ch. & Boldsaikhan B. 1990. Mongolian Traditional Medicine. Ulaanbaatar. 336 pp.
- Bithevskiy Sh. & Tersenov O.A. 1994. Biochemistry for Doctors. Uralskiy Rabochiy, Ekaterinburg, p. 177-179.
- Chernova E.G. 1964. The meat chemical composition of wild sheep and Siberian ibex. *Proceedings of the Research Institute of Animal Husbandry* 11-12: 34-39.
- Chernova E.G. 1965. The meat chemical composition of black-tailed gazella. *Proceedings of the Research Institute of Animal Husbandry* 13: 60-69.
- Sillespie E.L. 1960. The Science of Meat and Meat Products. San Francisco and London. p. 183-190
- Dulamtsere S, Tsendjav D. & Avirmed D. 1989. Fauna of the Mongolian Peoples Republic. T. 2. Mammals. State Publishers, Ulaanbaatar. p. 49-61.
- Pavlovskiy P.E & Palmin V.V. 1975. Biochemistry of Meat and Meat Products. Pishepromizdat, Moscow, p. 7-54.
- Piev Y.V. 1972. Biological Role of Molybdenum. Nauka, Moscow, 226 pp.

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