PROTEIN COMPOUNDS OF HORSE MUSCLE DEPENDING ON AGE

Guş Camelia, Cristina Semeniuc, Mihaela A. Rotar, S. Apostu, Gh. Ștețca

University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Mănăștur Str., No. 3-5, cameliagus@yahoo.com

Key words: horse, skeleton muscle, cvadriceps femoris, nucleus acids, sarcoplasmic protein, myofibrilaric protein, conjunctive protein

Abstract: Depending on age was followed in cvadriceps femoris muscle (male horses of 4, 6, 10, 15 and 20 years):

- total proteins and proteic fractions (sarcoplasmic protein, myofibrilar protein, conjunctive protein);
- nucleus acids (RNA and DNA);
- sarcoplasmic proteins:myofibrilar proteins ratio (S/M).

Until 6 years were registered quantitative accumulations of this components. After 6 years, quantitative modifications have registered variations with age.

INTRODUCTION

Depending on age, chemical composition and mammals metabolism, shows large variations from one species to another.

Ontogenetic modifications of skeleton muscle metabolism lead to processes of higher efficiency and promptness, which ensure the energy for the contractile apparatus, which, at its turn evolves to a higher reactivity towards the energy donor, ATP, and to a higher weight on the muscle fiber ensemble [9].

Because the literature is lacking the complete picture of certain biochemical parameters of horse’s muscle, we intended with this paper to follow the evolution of some muscle elements in ontogenetic development.

MATERIAL AND METHOD
Skeleton muscle sections from thigh region (quadriceps femoris muscle) have been sampled from male horses of different ages (4, 6, 10, 15 and 20 years old) and have been immersed in liquid nitrogen for conservation. From these muscles samples have been taken to determine: myofibrilar protein fractions (M), sarcoplasmatic (S) and conjunctive (C), total proteins and nucleic acids RNA and DNA.

The obtained results from 6 samples of *Cvadriceps femoris* muscle for each age category have been performed, statistically processed. The abnormal values have been eliminated. In case of protein fractions has been calculated also sarcoplasmic proteins:myofibrilar proteins ratio (S/M).

RESULTS AND DISCUSSIONS

The content (average values ± standard errors) of protein fractions in skeleton muscle are presented in table 1. The total content (average values ± standard errors) of proteins, nucleic acids in skeleton muscle of horses of different ages there are in table 2. For tables 1 and 2 numbers of individuals/lot were 6. In table 3 is presented the sarcoplasmic proteins: myofibrilar proteins ratio.

Table 1. Protein fractions from muscle, in skeleton muscle (*Cvadriceps femoris*) of horses of different ages

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Protein fractions (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S</td>
</tr>
<tr>
<td>4</td>
<td>42.68 ± 1.12</td>
</tr>
<tr>
<td>6</td>
<td>38.22 ± 1.23</td>
</tr>
<tr>
<td>10</td>
<td>38.55 ± 1.04</td>
</tr>
<tr>
<td>15</td>
<td>47.90 ± 2.34</td>
</tr>
<tr>
<td>20</td>
<td>47.26 ± 0.57</td>
</tr>
</tbody>
</table>

(S – sarcoplasmic, M – myofibrilaric, C – conjunctive)

Table 2. Total proteins (PT), nucleic acids (RNA and DNA) from skeleton muscle of horses of different ages

| Age (years) | PT (mg %) | RNA (mg/g) | DNA (mg/g) |
|-------------|-----------|------------|------------|------------|
|             |           |            |            |            |
Parameters ensemble studied in ontogeny in horse’s muscle show variations depending on age. Thus, muscle at age 4 and 6 years old present an increase in total proteins, followed by a decrease at age 10 and 15 years and a new increase at 20 years old. These modifications are correlated to literature, data which show that in ontogeny the amount of total proteins from muscle is increased [5]. This increase is owed to decrease of water content and of extra-cellular space and contractile device development.

The quantitative modifications of total proteins can be correlated to modifications of nucleic acids, especially with ARN, which increase in 6 years old horse’s muscle and than decrease at older animals.

At mammals, the quantity of nucleic acids linked to proteins, especially ARN, decreases [3, 4] but this diminution is more obvious if extremes stages are compared. At the beginning of ontogeny an enhancement of ARN and ADN is observed, due to protein...
synthesis that take place in this period [6]. These ontogenetic variations of total proteins and nucleic acids (RNA and DNA) are related to an intense enzymatic activity or are directed towards the contractile activity development. This is reflected in our data by myofibrilar fractions growths from 4 to 10 years old, than a decrease is observed, but not under the value of 4 years old.

Since 1953, LAWRIE [1] noted in horse’s muscle an increase of succinate dehydrogenase and cytochrom oxdase activities in the first years of life, afterwards remaining constant. The intensification of these mitochondrial enzymes activity determines an increase in insoluble mitochondrial proteins.

The conclusions resulted from this paper’s data show that the protein fractions from muscle are of the same size order as in cattle at ages of 4, 5 and 20 years old.

The S/M ratio decrease from 0 to 10 years old, than a raise to the same values at 15 and 20 years old because the sarcoplasmatical fraction overcome the values of mitochondrial fractions, which have the tendency to decrease (table 3).

All these ontogenetic modifications within horse’s muscle show his adaptability to sudden efforts, modifications that are evident especially before age of 6. To complete these data further researches are needed.

Table 3. Variation of S / M ratio in skeleton muscle, depending on age

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>S:M ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1.03</td>
</tr>
<tr>
<td>6</td>
<td>0.81</td>
</tr>
<tr>
<td>10</td>
<td>0.77</td>
</tr>
<tr>
<td>15</td>
<td>1.06</td>
</tr>
<tr>
<td>20</td>
<td>1.06</td>
</tr>
</tbody>
</table>

CONCLUSIONS

Up to age of 6, quantitative accumulations of protein parameters of muscle are evident. After this period, quantitative modifications have plus or minus variations with age.

BIBLIOGRAFY

5. Tarr, H.L., 1959, Proceed. XX Annual Biol. Colloq, Oregon, p. 36;