the presence of occult disease (Table II). The results of the six minutes walk test in dogs had demonstrated that stress test could demarcate the dogs with secondary pulmonary hypertension from apparently healthy dogs. The results were consistent with veterinary studies done by Agueldo and Schanilec (loc.cit.) and human studies (Singh, 2007) and 6MWT might constitute an alternative to other tests in that it could evaluate functional capacity in relation with heart disease in a more compassionate and more objective approach. The six minute walk test might have an important future application for evaluating exercise intolerance performance and heart disease because it had great acceptance from the owners and dogs and spontaneous reports were obtained.

Summary

6MWT in apparently healthy dogs and dogs with secondary pulmonary hypertension is placed on record.

Acknowledgement

The authors are thankful to the Dean, Veterinary College and Research Institute, Namakkal for the facilities provided during the study.

References


Effect of Age and Gender on Serum Mineral Profile in Thoroughbred Horses

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Abstract

The present study was carried out to assess the effect of age and sex on serum mineral profile in Thoroughbred horses. This study was focused mainly on levels of macrominerals (Ca, Ca++, P, Na, K and Cl) and microminerals (Cu and Zn) in horse’s serum. The findings revealed that the macro and micro minerals were within normal physiological limits, but potassium (K) and calcium (Ca) levels were higher in male foals while reverse was noted for copper. The level of chloride (Cl) was lower in female foals. The levels of ionized calcium (Ca++) and phosphorus (P) levels were higher in male yearlings and sodium (Na) level was higher in male youngstock. The zinc (Zn) level higher in foals but did not vary between the genders.

Key words: Horses, age, sex, minerals.

Minerals are mainly required for normal functioning of the body. Metalloenzymes, of which essential minerals are constituents and play a both direct and intermediate role in modulating the enzyme activity. For efficient breeding, adequate mineral supplementation in feed is essential because minerals play a role in synthesis of steroid hormones. The present study was undertaken to know the effect of

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age and sex on macro and microminerals and establishing the normal reference values in the Thoroughbred horses.

**Materials and Methods**

One hundred and twenty healthy Thoroughbred horses of both sexes (15 horses/sex) belonging to different age groups (30 horses/group) namely foals (1 week), yearlings (6 months to 1 year of age), young stock (1 to 3 years of age), and adults (3 to 10 years of age) were randomly selected from an organized stud farm in Chennai. All the selected animals were maintained under general dietary schedule, received commercial trace mineralized salt blocks which contain more salt and only a trace of minerals and vitamins for its normal growth and breeding. This study was carried out for one year (June 2014 to May 2015). Blood samples (10 mL) were taken from the jugular vein of all the groups using a 21-gauge needle into the plain vacuum blood tubes, (BD Vacutainer, United Kingdom) were allowed to clot and serum was separated by centrifuging at 1500 rpm for 20 min. Immediately after separation of serum, Ca, Ca$^{++}$, P, Na, K and Cl levels were estimated using an automatic biochemistry analyser (A15 random access analyser) and Cu (10% glycerol) and Zn (5% glycerol) levels were estimated using atomic absorption spectrophotometer.

The data obtained from different parameters were subjected to “two-way ANOVA” using SPSS (Version 16 for windows) statistical software.

**Results and Discussion**

The serum mineral profile of one hundred and twenty Thoroughbred horses were studied and are given in Table I.

The macro and micro minerals of Thoroughbred horses were within normal physiological range, but potassium and calcium (p<0.05) levels were significantly higher in male foals while reverse was noted for copper. The level of chloride level (p<0.01) was significantly lower in female foals. The levels of ionized calcium (p<0.01) and phosphorus levels (p<0.01) were significantly higher in male yearlings and sodium level (p<0.01) was significantly higher in male young stock. The zinc level (p<0.01) was significantly higher in foals but did not vary between the genders.

In the present study, mineral contents like calcium (Ca), phosphorus (P), sodium (Na), potassium (K) and zinc (Zn) levels were found higher in young one than adults which was in correspondence with the report of Gupta et al. (2002) indicated that with increasing the age, levels of these ions decreased, which in turn might be due to their lower requirement or mobilization. When age advanced, these parameters declined more gradually and reached the adult reference values. Macroelements were significantly higher in males when compared to females. There are no much comparable literatures for micro and macro elements in Thoroughbred horses.

Serum calcium (Ca) level was lowest in yearlings and adult which is contrast to the report of Varshney et al. (1993) and Singh et al. (2001). The Ca levels were higher in male as reported by Paden et al. (2014) which is contrast to the Mikniene et al. (2014). Serum ionized calcium (Ca$^{++}$) was gradually increased from 1$^{st}$ week of age to yearling, might be due to consumption of colostrum, which contains higher amount of ionized calcium for its bone development. Then, reduced to normal adult reference values.

In the present study, serum copper (Cu) level in male foals (within 1 week of age) was extremely low and then increased rapidly in youngstock. Serum zinc (Zn) level in male foals (within 1 week of age) was high and then decreased rapidly in youngstock. These findings are in correspondence with the previous reports of Cymbaluk et al. (1986) who reported that when age increased, a significant increase in the serum Cu concentrations and a gradual decrease in the serum Zn concentrations. In contrast with the previous reports of the Okumura et al. (1998), among female horses, serum Cu level was significantly higher than male horses but there was no significant difference between male and females in Zn levels as reported by Okumura et al. (loc.cit.).

**Summary**

Based on the above study, results can be confirmed that age and gender altered the serum macro and micro mineral profile in Thoroughbred horses.
Acknowledgement

The authors acknowledge the help rendered by Chettinad Stud & Agricultural Farm, Chennai-67 for collecting the blood samples and The Dean, Madras veterinary College, Chennai-7 for providing facilities to carry out the research work.

References


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Table I. Effect of age and gender (Mean±SE) on serum mineral profile in Thoroughbred horses

<table>
<thead>
<tr>
<th>Analytes</th>
<th>Female (n=15)</th>
<th>Male (n=15)</th>
<th>Female (n=15)</th>
<th>Male (n=15)</th>
<th>Female (n=15)</th>
<th>Male (n=15)</th>
<th>Female (n=15)</th>
<th>Male (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca (mg/dL)</td>
<td>9.21±0.21</td>
<td>9.78±0.27</td>
<td>8.39±0.30</td>
<td>9.01±0.25</td>
<td>9.01±0.25</td>
<td>9.11±0.44</td>
<td>8.29±0.18</td>
<td>9.12±0.23</td>
</tr>
<tr>
<td>P (mg/dL)</td>
<td>3.58±0.23</td>
<td>4.01±0.34</td>
<td>3.98±0.13</td>
<td>4.13±0.12</td>
<td>3.77±0.11</td>
<td>3.96±0.27</td>
<td>2.78±0.10</td>
<td>3.57±0.19</td>
</tr>
<tr>
<td>Na (mmol/L)</td>
<td>135.4±1.42</td>
<td>135.9±1.63</td>
<td>135.9±1.33</td>
<td>140.8±5.15</td>
<td>136.8±2.19</td>
<td>144.2±2.55</td>
<td>135.8±4.02</td>
<td>140.9±0.93</td>
</tr>
<tr>
<td>K (mmol/L)</td>
<td>4.21±0.05</td>
<td>4.25±0.06</td>
<td>3.86±0.06</td>
<td>4.13±0.13</td>
<td>3.94±0.13</td>
<td>4.22±0.12</td>
<td>4.15±0.16</td>
<td>4.17±0.14</td>
</tr>
<tr>
<td>Cl (mmol/L)</td>
<td>104.1±1.53</td>
<td>111.3±2.36</td>
<td>106.5±3.11</td>
<td>119.8±3.48</td>
<td>108.3±2.57</td>
<td>116.9±1.15</td>
<td>104.9±1.26</td>
<td>115.6±2.34</td>
</tr>
<tr>
<td>Ca++ (mmol/L)</td>
<td>1.46±0.02</td>
<td>1.69±0.03</td>
<td>1.78±0.12</td>
<td>2.00±0.19</td>
<td>1.52±0.07</td>
<td>1.75±0.14</td>
<td>1.42±0.04</td>
<td>1.45±0.01</td>
</tr>
<tr>
<td>Cu (µg/mL)</td>
<td>0.18±0.12</td>
<td>0.04±0.07</td>
<td>1.59±0.05</td>
<td>1.19±0.07</td>
<td>1.60±0.04</td>
<td>1.56±0.03</td>
<td>1.49±0.06</td>
<td>0.51±0.07</td>
</tr>
<tr>
<td>Zn (µg/mL)</td>
<td>0.72±0.03</td>
<td>0.75±0.03</td>
<td>0.38±0.03</td>
<td>0.43±0.03</td>
<td>0.46±0.03</td>
<td>0.41±0.02</td>
<td>0.40±0.02</td>
<td>0.44±0.02</td>
</tr>
</tbody>
</table>

a,b,c denotes significant difference (p<0.05%) among different age groups in a particular parameters in each sex

A,B indicates that particular parameter differs significantly (p<0.05%) in the same age group of both the sex