Some of the frequently used biochemical values of serum and plasma in three different populations of Anatolian shepherd dog

V. ALTUNOK, M. MADEN, M. NIZAMLIOGLU and I. TOGAN

Summary

The biochemical values serum albumin, total cholesterol, magnesium (Mg), calcium (Ca), inorganic phosphorus (Pi), sodium (Na), potassium (K) in serum (n1 = 38) and zinc (Zn) and copper (Cu) in plasma (n2 = 74) were determined in individuals of Anatolian shepherd dog (Asd) which is the most preferred dog in Anatolia as a guard dog of flocks. Individuals from both sexes were collected from three different farms (sites). Comparative studies showed that (i) there were no significant differences between the values of the two sexes except for Ca, (ii) there were significant (P < 0.05-0.001) differences between the values of sites in Pi, Na, Zn and Cu. When the results of the present study was considered together with the previous ones carried on other breeds or on dogs generally, it was observed Na in Asd is in the lower limit of the observed range.

In the present study, the frequently used biochemical values (albumin : 3.20 ± 0.08 g/dl, total cholesterol: 4.08 ± 0.19 mmol/l, Mg : 1.01 ± 0.01 mmol/l, Ca : 2.59 ± 0.21 mmol/l, Pi : 1.49 ± 0.10 mmol/l, Na : 139.27 ± 1.40 mmol/l, K : 4.35 ± 0.07 mmol/l, Zn : 16.73 ± 0.81 µmol/l, Cu : 8.27 ± 0.37 µmol/l) were presented in Asd. Among these, total cholesterol, Mg, Ca, Pi, Zn and Cu values were reported for the first time in this breed. Furthermore, it was shown that in setting the standards for a breed it was necessary to consider possible differences between the populations of the breed.

Key-words : Anatolian shepherd dog - albumin - total cholesterol - Mg, Ca, Pi, Na, K, Zn and Cu.

Introduction

Anatolian shepherd dog (Asd) which is recognised by Federal Cynologique Internationale (F.C.I.) with the standard number 331 [4, 8] has been the most preferred dog by shepherds in Anatolia. Besides their high sensitivity for hearing and smelling, their strength, courage, loyalty and intelligence make them to be exceptionally talented in guarding flocks. Because of these virtues of these dogs some individuals were taken to US and England in the first half of the last century. In the last few decades interest in this dog has been increasing. Fun clubs have been established in US, England, Holland, Germany, France and Belgium. Due to their high endurance of extremes of heat and cold Asd has been started to be used as a guard of flocks in Australia, US and some African countries. Today Asd are bred in US and many European countries especially, England, France, Italy, Switzerland, Germany, Belgium, Holland and Finland [4, 6].

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RÉSUMÉ

Étude, dans trois populations différentes de chiens de berger d’Anatolie, de certaines valeurs biochimiques fréquemment recherchées dans le sérum et le plasma. Par V. ALTUNOK, M. MADEN, M. NIZAMLIOGLU et I. TOGAN.

Les valeurs biochimiques de la sérum albumine, du cholestérol total, du magnésium (Mg), du calcium (Ca), du phosphore inorganique (Pi), du sodium (Na), du potassium (K) dans le sérum (n1 = 38) et du zinc (Zn) et du cuivre (Cu) dans le plasma (n2 = 74) ont été déterminées chez le chien berger d’Anatolie qui est le chien de garde de troupeaux préféré dans cette région.

Des individus des deux sexes ont été rassemblés dans trois fermes différentes.

Il apparaît, dans cette étude, que le chien berger d’Anatolie a un taux de Na bas par rapport à d’autres espèces étudiées précédemment.

Dans cette étude, les valeurs biochimiques ont été établies pour le chien berger d’Anatolie : albumine : 3.20 ± 0.08 g/dl, cholestérol total : 4.08 ± 0.19 mmol/l, Mg : 1.01 ± 0.01 mmol/l, Ca : 2.59 ± 0.21 mmol/l, Pi : 1.49 ± 0.10 mmol/l, Na : 139.27 ± 1.40 mmol/l, K : 4.35 ± 0.07 mmol/l, Zn : 16.73 ± 0.81 µmol/l, Cu : 8.27 ± 0.37 µmol/l.

Il est à noter que les valeurs concernant le cholestérol total, les Mg, Ca, Pi, Zn et Cu sont publiées pour la première fois dans cette race. Il apparaît également que les normes obtenues pour une race doivent tenir compte des variations au sein de la population.

MOTS-CLÉS : chien de berger d’Anatolie - albumine - cholestérol total - Mg, Ca, Pi, Na, K, Zn, Cu.
When biochemical analysis are combined with complete physical examination, and history of patient, they may assist the veterinarian in arriving at a final diagnosis, evaluating the prognosis, and following the efficiency of the therapy [7]. For this purpose, for example JENSEN and AAES [11] and MATSUZAWA et al [16] determined the values of the clinical parameters in healthy dogs. In different breeds some parameters were found to be different from each other significantly [19]. Although, due to environmental and genetic factors, one may expect to observe differences in different populations of the same breed there were no study examining the degree of interpopulational differences of the breeds.

In the present study, reference values of serum albumin, total cholesterol, Mg, Ca, Pi, Na, K, and plasma Zn and Cu will be determined for Asd. Furthermore, differences of these parameters will be examined with respect to different sexes and populations. Thereby, it is believed that the result will help (i) To determine the standards of some biochemical parameters for this valuable but less known breed, (ii) To understand the range of interpopulational differences of the parameters in a dog breed, (iii) To search for the differences present between the Asd and other breeds of dogs.

Materials and methods

In this study, based on criteria given by F.C.I. [8] and by BORG [4], pure breed dogs were selected. They were healthy dogs between 1-8 years. Samples of blood were obtained from three breeding farms. The sites of the farms are shown in figure 1. Capital letters on the map of figure 1 refer to different farms and collection sites. The full names for each of the collection site is as follows : A-Veterinary Faculty of Selçuk University Research and Application Unit, B-Sivas the collection site is as follows : A-Veterinary Faculty of Selçuk University Research and Application Unit, B-Sivas Ulas Farm of the Directorate of Agricultural Enterprises, B3 Sivas Kangal Farm of the District Government, C-Gemlik Military School of Veterinary and the Educational Command Centre. Gemlik Military School of Veterinary and the Educational Command Centre was established in 1975 and was the oldest among the farms.

Blood samples were collected from each dog in the morning (after 12 hours fasting) by puncture of a cephalic vein in tubes having EDTA as anticoagulant. Serum and plasma were separated by centrifugation (3000 rpm, 15 minutes), were stored at -20 °C and analysed within 3 months after collection. In tables I distribution of the sample sizes for serum and plasma subsamples with respect to the sites and sexes were given.

From the serum : albumin, total cholesterol, Mg, Ca, Pi levels were determined by test kits (Bioactive Diagnostic) with the help of spectrophotometer (Shimadzu-UV) and the serum Na and K levels were observed by flame photometry (JENWAY PFP7). From plasma samples concentrations of Cu and Zn were measured by atomic absorption spectroscopy (Buck Scientific Modem 200A) as were done by STRASSER et all [23] were analysed in special tubes to avoid interferences.

Mean values obtained for the populations and subpopulations were evaluated by Two-way ANOVA [21] with the help of SPSS package program [22]. Furthermore, pairwise comparison of the means were made with the help of Duncan’s multiple range test [21, 22]. The significance level was 0.05. Equality of the two means were tested by t-test [21].

Results

Grand means and standard errors of all parameters based on sites and sexes were given in Table II. There were no significant differences between the two sexes of the dogs for any of the parameters examine in the study.

There were significant differences in four parameters : Pi (P < 0.05), Na (P < 0.01), Cu (P < 0.001) and Zn (P < 0.05) with respect to the sites. Duncan’s multiple range test revealed that (Table II) Konya and Sivas were different from each other with respect to Zn. Gemlik being significantly different from Konya in 3 parameters (Pi, Zn, Cu) and similarly, significantly different from Sivas in 3 parameters (Pi, Na, Cu) seemed to be the most different population among the populations examined, based on the parameters employed. Ca values indicated the presence of significant (P < 0.05) sex-site interaction.

Discussion and conclusions

In order to understand the factors contributing to the variation in the values of the measured parameters, first the effect of sex was examined. No significant difference was observed between the values of two sexes in all of the parameters. Similarly, in three of the previous studies no difference between the albumin, Na and K values of the two sexes were observed [2, 16, 25].

For Ca, in the present study there was significant (P < 0.05) sex-site interaction term. This observation can be due to sampling and/or environmental effects. Since the number of observations for each subpopulation of sex were small this observation must be tested in an experiment with a larger number of observations. However, because the members of the breed are quite a few in the farms and the ones owned by the local people can not be reached easily in most of the time, it is not easy to increase the number of observations. For the very same reason differences in the values of the parameters could not be studied in different age groups.

The significant differences in the values of Pi, Na, Zn and Cu in different sites indicated that populations within the breed may exhibit different values from each other. Nutritional and/or other environmental and genetic factors may contribute to these differences. In an early study [3], it was suggested that Gemlik population was harbouring very little genetic variation compared to the other two populations. The result of Duncan’s multiple range test carried in the present study, showed that Gemlik population was more different from other two populations. Perhaps genetic differences were reflected in the values of the parameter. This result suggested that while references for biochemical parameters for a breed were determined, possible differences bet-
ween different populations of the breed must be taken into consideration. If the populations are in different countries and/or in distant geographic regions, estimated means of the parameters can be even more distinctly different.

Results of the present study is in conformity with all of the previous result given for albumin [10, 11, 12, 16, 18], for total cholesterol [14, 16, 20], for Ca [5, 9, 13, 15, 24] and for K [1, 5, 12]. With respect to observed values of Mg, Pi, Zn and Cu some of the previous results such as the results presented by AITKEN and ALLEN [1], KANEKO [13] on Mg, AITKEN and ALLEN [1], KUMAR and RAMAKRISHA [15], SODIKOFF [20], STRASSER et al [23] on Pi, MIESER and SCHULZ [17] on Zn and Cu were in good fit with the present ones. Yet, the very same observed values for Zn and Cu were higher than those presented by STRASSER et al [23] and for Cu only it was lower that reported by KANEKO [13]. Pi value of the present study is lower than those presented by FINCO et al [9] MATSUZAWA et al [16] and TIFTIK et al [24]. Finally, Mg for Asd is higher than those found for German Shepherd and Beagle dogs [23]. Value of the Na obtained in the present study (139.27 ± 1.40 mmol/l) is significantly (P < 0.001) smaller than both of the previously reported values on German Shepherd and Beagle dogs [16, 23]. Furthermore, KALAYCIOGLU et al [12] studied on 10 individuals of Asd and observed a low value (130.2 ± 4.63 mmol/l) in Konya. Na value might be a characteristic biochemical parameter for Asd. This result must be tested by carrying parallel observations in Asd and in other breeds of dogs.

As a conclusion in the present study, standards for some of the biochemical parameters (albumin, total cholesterol, Mg, Ca, Pi, Na, K, Zn, Cu) in Asd were presented. Among these, the values of total cholesterol, Mg, Ca, Pi, Zn and Cu in Asd were reported for the first time in the literature. Because there were significant difference in some of the biochemical parameters between the populations of the Asd, it was concluded that to set the accurate standards for the clinical parameters in dogs, as well as the breeds, the populations within the breeds must be examined. Except Na all of the parameters tested were within the ranges reported in dogs. Na seemed to be in the lower end of the range.

Acknowledgement

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TABLE II. — The mean and standard error of blood serum and plasma values of Asd different sites, sexes, interaction terms and the significance values.

<table>
<thead>
<tr>
<th>SEXES</th>
<th>INTERACTION TERMS</th>
<th>FACTORS</th>
<th>S E R U M</th>
<th>P L A S M A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Albumin (g/dl)</td>
<td>Total cholesterol (mmol/l)</td>
<td>Magnesium (mmol/l)</td>
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<tr>
<td>Konya</td>
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<td>3.00±0.06</td>
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<tr>
<td>Sivas</td>
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</tr>
<tr>
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<td>4.15±0.50</td>
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<tr>
<td>Gemlik</td>
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<tr>
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</tr>
<tr>
<td>P (Significance)</td>
<td>0.39</td>
<td>0.733</td>
<td>0.961</td>
<td>0.015</td>
</tr>
</tbody>
</table>

a, b: The mean values marked with different letters within the same column were significantly (P<0.05) different from each other.