

Preliminary Analysis of Some Biochemical Parameters in Blood Serum of Young Wild Boars (*Sus Scrofa L.*) from Farms in Bosnia and Herzegovina

Amir ZAHIROVIC¹, Zehra GILIC^{2*}, Nasir SINANOVIC³

¹Department of Internal Diseases, Veterinary Faculty University of Sarajevo, Bosnia and Herzegovina

²Sector for Official Control, Traceability, Risk Management and Risk Communication, Food Safety Agency of Bosnia and Herzegovina

³Department of Ambulatory Service Veterinary Faculty University of Sarajevo, Bosnia and Herzegovina

*Corresponding Author: Zehra GILIC Sector for Official Control, Traceability, Risk Management and Risk Communication, Food Safety Agency of Bosnia and Herzegovina
e-mail: zehra.gilic@gmail.com

Geliş Tarihi / Received: 17.08.2012

ABSTRACT

Wild boars are present in the country as game freely living in the nature, but in a controlled breeding as well, for the purposes of training hunting dogs. Monitoring the health status of animals is important both from the clinical and epidemiological stand points. Studies of the health status of wildlife in Bosnia and Herzegovina are very rare, and we do not know any earlier information on the study of biochemical parameters of blood of these animals in our country. Our aim was not only to establish starting results but also to affirm similar research. The study was conducted on two farms with 23 and 16 young wild boars. The animals were in good health condition and housed in a controlled, enclosed part of the natural habitat. After fixing and restraint of animals, blood was sampled from *V. auricularis magna* into vacutainers, without anticoagulant. The serum values of the following biochemical parameters were determined: potassium, sodium, calcium, urea, creatinine, alanine aminotransferase and alkaline phosphatase. The differences as regards activities of certain parameters were evidenced among farms as well as in comparison with the results obtained by other authors. These and other studies aiming the protection of game health are important steps toward understanding the pathology and the pathological physiology of these animals. This research may be considered a pioneering step in that direction for Bosnia and Herzegovina and should be continued in order to reach the most credible results with an aim of improving the protection of health of wild but also of the domestic animals and humans.

Key Words: Blood serum, wild boars, biochemical parameters

ÖZET

BOSNA HERSEK ÇİFTLİKLERİNDEKİ GENÇ YABAN DOMUZLARININ (*SUS SCROFA L.*) KAN SERUMLARINDA BAZI BİYOKİMYASAL PARAMETRELERİN ÖN ANALİZİ

Yaban domuzları, doğada serbestçe yaşayan av olarak kırlarda bulunmakta, ancak kontrollü olarak da av köpeklerinin eğitimi amacı ile yetiştirilmektedir. Hayvanların sağlık durumlarının izlenmesi klinik ve epidemiyolojik noktalardan her ikisi açısından önemlidir. Bosna Hersek'te yaban hayatı sağlık durumlarına ait çalışmalar çok azdır ve biz ülkemizde bu hayvanların kanlarının biyokimyasal parametreleri üzerine yapılmış çalışmalara ait herhangi önceki

bir bilgiye sahip değiliz. Amacımız sadece başlangıç sonuçlarını ortaya koymak değil, aynı zamanda benzer çalışmaları da teyit etmek idi. Bu çalışma 23 ve 16 genç yaban domuzu bulunan 2 çiftlikte yapılmıştır. Hayvanlar sağlıklı, iyi kondüsyona sahipti ve doğal habitatlarından ayrılan alanda kontrol altında çiftliklerde bulunuyorlardı. Hayvanların bağlanma ve sabitlenmesi sonrası kan, *V. auricularis magna*'dan antikoagulan içermeyen tüplere alınarak örneklendi. Aşağıda yer alan biyokimyasal parametrelerin serum değerleri tespit edilmiştir: Potasyum, sodyum, kalsiyum, üre, kreatinin, alanin aminotransferaz ve alkali fosfataz. Belirli parametrelerle ilgili aktivitelerin farklılıkları, çiftliklerin yanısıra diğer yazarlar tarafından elde edilen sonuçlar ile de karşılaştırılarak ortaya konuldu. Yaban hayatını korumayı amaçlayan bu ve diğer çalışmalar, bu hayvanların patolojisi ve patolojik fizyolojisinin anlamaya yönelik önemli aşamalarıdır. Bu araştırma Bosna Hersek için bu yönde öncü bir aşama olarak kabul edilebilir ve yaban sağlığı yanında evcil hayvan ve insan sağlığının korunması ve geliştirilmesi amacıyla en güvenilir sonuçlara ulaşmak için benzer çalışmaların yapılmasına devam edilmelidir.

Anahtar Sözcükler: Kan serumu, yaban domuzu, biyokimyasal parametreler

Introduction

Similar to other countries in Europe wild boar (*Sus scrofa L.*) is widespread game animal in Bosnia and Herzegovina. The wild boar health management is important from clinical, epizootiological, but also from the aspect of hunting and economics. The definition of these reasons can be emphasized through the necessity of preserving the good quality populaton which is capable to survive in the environmental conditions prevailing in that habitat. Yet, wild boars may represent a reservoir of pathogens of infectious and parasitic diseases. The epizootiological significance is very important due to the possibility of the transmission of these diseases onto domestic animals and humans.

The components of health management are complex and related, the examination of biochemical parameters in blood serum certainly being one of them. Videlicet, at the occurence of the disease in wild boars, it is necessary to know the physiological limits of all hematological and biochemical parameters because they are an important factor in the proper and effective diagnostics of the disease, as well as in the approach to prevention of occurence and spread of infectious, parasitic or internal diseases.

According to our knowledge, similar researches had not been done in our country, nevertheless the available literature indicate that certain studies had been conducted in the neighbouring, (Harapin et al., 2003; Tušek et al., 1994; Vitić et al., 1994), as well as in other

foreign countries (López-Olvera et al., 2006; Shender et al., 2002; Williamson and Pelton, 1975). In relation with the health management of wild boars in Europe, there have been a number of serological and histopathologic researches as a part of health management (Dekkers and Elbers, 2000; Hubalek et al., 2002; Wolkers et al., 1994; Župančić et al., 2002).

In compliance with the above mentioned facts, these preliminary tests were intended to determine some elementary physiological limits of certain biochemical parameters in the blood serum of young wild boars in two controlled breeding farms. Furthermore, our aim was to compare the obtained findings in the two observed breeding farms and also to compare the established mean values with those of other authors, as well as with standard values of the measured parameters in domestic pigs.

Given that these were the first researches in BiH, the aim of this study was to determine the initial results, as well as promote similar research on the health status of wildlife in BiH, which has recently become the practice in the world.

Materials and Methods

The researches were done on 37 young wild boars of both sexes in two breeding farms in BiH, body weight 15-30 kg. At the breeding farm A 21 animal of both sexes, body weight range 20-30 kg, were examined and at the breeding farm B 16 young wild boars of both sexes, body weight 15-20 kg were examined. At

both breeding farms the boars were in good health, showing no clinical symptoms of the diseases. They were kept in a fenced area, as a part of their natural habitat where there were high quality living conditions. After physical restraint of the animals by confining them in a temporary paddock, then standard fixing, the blood samples were taken from vena auricularis magna. Prior to blood collection, the skin was wetted with alcohol in order to make the vein more visible. The blood was placed in vacutainers "BD Vacutainer" with anti-coagulant, which were brought to laboratories of the Faculty of Veterinary Medicine in Sarajevo. The biochemical parameters (potassium, sodium, calcium, urea, creatinine, alanine aminotransferase and alkaline phosphatase)

were established spectrophotometrically on the analyzer Vet test 8008, IDEXX Series II.

The obtained results were statistically analyzed (descriptive statistics and t-test) by means of Microsoft Excel computer program.

Results

The results are presented in tables in the way that the Table 1 shows aggregate values of biochemical parameters of both breeding farms, including the elementary parameters of descriptive statistics, while the Table 2 shows the values per each breeding farm, including the comparison of mean values of the parameters between the breeding farms.

Table 1. The Aggregate values of biochemical parameters of young boars of both breeding farms, including the elementary parameters of descriptive statistics (n=37).

Tablo 1. Çiftliklerdeki genç yaban domuzlarına ait biyokimyasal parametrelere ilişkin tanımlayıcı istatistik temel parametreleri (n=37).

| Parameter | X | Min-Max | SD | Sx |
|---------------------|--------|---------------|-------|------|
| K (mmol/l) | 5.58 | 3.90-6.90 | 0.71 | 0.12 |
| Na (mmol/l) | 132.11 | 102.00-166.00 | 12.34 | 2.03 |
| Ca (mmol/l) | 2.52 | 1.90-3.50 | 0.37 | 0.06 |
| Urea (mmol/l) | 3.61 | 1.30-10.70 | 0.37 | 0.06 |
| Creatinine (µmol/l) | 107.49 | 88.00-142.00 | 13.10 | 2.15 |
| ALT (u/l) | 155.97 | 98.00-212.00 | 26.19 | 4.31 |
| ALKP (u/l) | 100.68 | 57.00-133.00 | 17.26 | 2.84 |

Table 2. The values per each breeding farm, including the comparison of mean values of the parameters between the breeding farms.

Tablo 2. Çiftlikler arası incelenen parametrelere ait ortalama değerlerinin karşılaştırılması.

| Parameter | Breeding farm A (n=21) | | | Breeding farm B (n=16) | | |
|----------------------|------------------------|---------------|------|------------------------|---------------|------|
| | X | Min- Max. | Sx | X | Min-Max. | Sx |
| K (mmol/l) | 5.90* | 5.10-6.90 | 0.11 | 5.16 | 3.90-6.30 | 0.18 |
| Na (mmol/l) | 129.00 | 120.00-139.00 | 1.10 | 136.19 | 102.00-166.00 | 4.33 |
| Ca (mmol/l) | 2.43 | 2.10-2.89 | 0.04 | 2.64 | 1.90-3.50 | 0.13 |
| Urea (mmol/l) | 3.24 | 1.90-5.20 | 0.20 | 3.90 | 1.30-10.70 | 0.42 |
| Creatininen (µmol/l) | 105.81 | 95.00-128.00 | 2.09 | 109.69 | 88.00-142.00 | 4.19 |
| ALT (u/l) | 158.81 | 120.00-204.00 | 4.46 | 152.25 | 98.00-212.00 | 8.15 |
| ALKP (u/l) | 109.62* | 87.00-133.00 | 2.78 | 88.94 | 57.00-112.00 | 3.87 |

*statistically significant difference (P<0.05) of values between two breeding farms.

Discussion

The mineralograms for potassium, sodium and calcium show the declining tendency of the minimum value and the increasing tendency of the maximum value. Unlike those of potassium, the mean values of sodium and calcium show no significant statistical differences between the two breeding farms. The established lower value for potassium at the farm B (5.16 mmol/l) showed a broader extent between the established minimum and maximum values as compared with young wild boars at the farm B. We emphasize this fact because the young wild boars in question were kept in the same area as the grown animals, but with slightly more enriched nourishment. However, the established values were considerably lower in comparison with the results reached in Spain, where the authors registered the values for potassium 15.5 mmol/l and for sodium 162.8 mmol/l (López-Olvera et al., 2006). Analyzing the results of certain biochemical parameters of young wild boars, Shender et al. (2002), established the values for calcium which are approximate to ours (2.54 mmol/l), but those for sodium were higher than ours (146.7 mmol/l).

In comparison with the values for domestic pigs, the established values for potassium and calcium can be considered as reference values, while the value for potassium which was established in our research, was lower in comparison with the values for domestic pigs (Siegmund, 1998). The mean value of urea was 3.61 mmol/l and the comparison did not show statistically significant differences between the observed breeding farms. A case of an extremely high level of this parameter in blood was registered at the farm B (10.70 mmol/l); although the affected animal did not show clinical symptoms of the disease, the significant deviation of the value of urea of that individual indicated a possible pathological disorder in the organism. The case was registered at the farm B, where there was a higher mean value established, as compared with the farm A.

The mean values of urea of young wild boars which were the subject of our

examination, were below those examined by Shender et al. (2002) (5.31 mmol/l), López-Olvera et al. (2006) (5.18 mmol/l), while a lower value was registered by Harapin et al. (2003) (2.43 mmol/l) in Croatia.

The established mean value of urea, as well as the values established by the authors quoted herein, are in compliance with reference values of urea in blood of domestic pigs (2.90-8.80 mmol/l).

The established mean value of creatinine was 105.81 $\mu\text{mol/l}$. Although there were significant differences between the farms, a considerably broader range of individual values was apparent. Nevertheless, all established values for creatinine are within reference values of domestic pigs (44.30-165.00 $\mu\text{mol/l}$). Values lower than ours were established by researchers in Texas (88.40 mmol/l) (Shender et al., 2002) and Spain (128.18 mmol/l) (López-Olvera et al., 2006). Values higher than ours, which are also above the uppermost reference limit for domestic pigs, were registered by the researchers in Croatia (216.46 $\mu\text{mol/l}$) (Harapin et al., 2003).

Analyzing the enzymes which were examined in blood serum of wild boars, we can notice the biggest deviations as compared with the reference values of domestic pigs, with a broad range of variation among the examined pigs at the both farms.

Apparently, there are considerable differences in intensity of the deviations, depending on the particular enzyme.

The lowest activity values for alanine transpherase (ALT) are not within the uppermost physiological limit for this enzyme in domestic pigs, and the uppermost established values show the activity which are five times more intensive than the uppermost reference level in domestic pigs.

The mean value of activity for ALT are three times bigger than the uppermost physiological value mentioned in relation with domestic pigs (Friendship et al., 1984; Kaneko et al., 1997; Siegmund, 1998). The approximate values for wild boars (153.69 u/l) were

established by Harapin et al. (2003). However, the values established by some other researchers show a considerably lower level of activity of this enzyme, which is within the reference limits for domestic pigs (López - Olvera et al., 2003; Shedner et al., 2002; Williamson and Pelton, 1975). Statistically, the differences between the established mean values are not significant, though the range of value at the farm B is broader and with a high upper limit (212.00 mmol/l).

The mean value for alkaline phosphatase (ALKP) was 100.98 u/l with average for the farm A 109.62 u/l, the farm B 88.94 u/l. Although the established values between the farms show statistically significant differences ($P < 0,05$), the obtained values are within the reference values for domestic pigs. However, the results which we established during our research are above the average result of the activity of this enzyme which was established by Harapin et al. 2003 (45.62 mmol/l), yet the results obtained by this author are also within the reference values for domestic pigs. Our results of the ALKP activity are lower than those for young wild boars which were established by Shender et al. (2002) and López-Olvera (2006).

The evident differences related to the activity of certain parameters between the farms, as well as the results obtained by other authors should be sought for in the age of our pigs, their exposure to stress related to human manipulation and hunting dog training, as well as to unbalanced nourishment, which is related to food found within the habitat and the supplementary nutrition by men.

However, the obtained values present the initial basis for further study, actual values related to stress and unbalanced nourishment of wild animals as a continuous occurrence throughout their life cycle. In regard to the above mentioned life conditions, the complex and variable elements related to the way of life of wild animals, the broad value range of certain parameters are only to be expected.

As we emphasized in the introduction, the comparison with other results obtained in BiH

was not possible because there is no apparent evidence that any similar researches had been done.

Conclusion

The wild boar is a widespread wild animal species in BiH and it is very important to stress that it is often bred in the controlled conditions. Any research in the field of breeding and health protection is an important step toward understanding the pathology and the pathological physiology of these animals.

In addition to determining the average values of these parameters and certain quantitative analysis, the objective was also to compare them with reference values for domestic pigs.

Also, according to our knowledge, this research may be considered a pioneering step in that direction, and should be continued in order to reach the most credible results aiming to improve the health protection of wild animals, but also of domestic animals and humans.

REFERENCES

- Dekkers, L.J., Elbers, A.R., 2000.** Serosurveillance of notifiable veterinary diseases in wild boar in the Netherlands. *Tijdschr Diergeneeskd* 125 (1), 2-4.
- Friendship, R.M., Lumsden, M.J., McMillan, I., Wilson, M.R., 1984.** Hematology and biochemistry reference values Ontario swine. *Canadian Journal of Comparative Medicine* 48, 390-393.
- Harapin, I., Bedrica, L.J., Hahn, V., Šoštarić, D., Gračner, D., 2003.** Haematological and biochemical values in blood of wild boar (*Sus scrofa ferus*). *Veterinarski Arhiv* 73, 333-343.
- Hubalek, Z., Tremil, F., Juricova, Z., Hunady, M., Halouzka, J., Janik, V., Bill, D., 2002.** Serological survey of the wild boar for tularemia and brucellosis in South Moravia, Czech Republic. *Veterinarni Medicina* 47 (2-3), 30-66.
- Kaneko, J.J., Harvey, M.L., Bruss, M.L., 1997.** *Clinical Biochemistry of Domestic Animals*, 5th ed., Academic press, London.
- López-Olvera, J.R., Höfle Vicente, J., Fernández-de-Mera, G.I., Gortázar, C., 2006.** Effects of parasitic helminths and ivermectin treatment on

- clinical parameters in the European wild boar (*Sus scrofa*). Parasitology Research 98 (6), 582-587.
- Shender, L.A., Botzler, R.G., George, T.L., 2002.** Analysis of serum and whole blood values in relation to helminth and ectoparasitic infections of feral pigs in Texas. Journal of Wildlife Diseases 38 (2), 385-394.
- Siegmund, O.H., 1998.** The Merck Veterinary Manual 7th ed. National Publishing Inc., Philadelphia.
- Tušek, T., Mihelić, D., Firšt, L., Janicki, Z., Opančar, D., 1994.** Komparativni prikaz crvene krvne slike divlje i domaće europske svinje. Veterinarska Medicina 25, 81-84.
- Vitić, J., Tosić, L., Stevanović, J., 1994.** Comparative studies of the serum lipoproteins and lipids in domestic swine and wild boar. Acta Veterinaria 44, 49-56.
- Williamson, M.J., Pelton, M.R., 1975.** Some biochemical parameters of serum of european wild hogs. Proceedings of the 29th annual conference of the Southeastern Associations of Game and Fish Commissioners 29, 672-679.
- Wolkers, J., Wensing, T., Groot Bruinderink, G.W., Schonewille, J.T., 1994.** Lungworm and stomach worm infection in relation to body fat reserves and blood composition in wild boar (*Sus scrofa*). Veterinary Quarterly, 16 (4), 193-195.
- Župančić, Z., Jukić, B., Lojkić, M., Čač, Z., Jemeršić, L., Starešina, V., 2002.** Prevalence of antibodies to classical swine fever, Aujeszky's disease, porcine reproductive and respirator syndrome, and bovine viral diarrhoea viruses in wild boar in Croatia. Journal of Veterinary Medicine B 49, 253-256.