

VETERINARSKI ARHIV 78 (2), 141-147, 2008

Blood groups, haematology and clinicochemical indicators in indigenous breeds of dog. I. Croatian sheepdog

Damir Žubčić^{1*}, Ljiljana Bedrica¹, Damjan Gračner¹, Ivica Harapin¹,
Mijo Fury², and Jasna Jeremić³

¹*Clinic for Internal Diseases, Faculty of Veterinary Medicine, University of Zagreb, Zagreb, Croatia*

²*Veterinary Station Županja*

³*State Institute for Nature Protection, Zagreb, Croatia*

ŽUBČIĆ, D., LJ. BEDRICA, D. GRAČNER, I. HARAPIN, M. FURY, J. JEREMIĆ:
Blood groups, haematology and clinicochemical indicators in indigenous breeds of dog. I. Croatian sheepdogs. Vet. arhiv 78, 141-147, 2008.

ABSTRACT

The research involved 95 pure breed Croatian sheepdogs, 48 females and 47 males ranging in age from 1 to 12 years. Blood samples were taken to establish certain biochemical indicators (urea, creatinine, total proteins, glucose, total bilirubin, AST, ALT, alkaline phosphatase, creatine kinase, amylase, Ca, P). No changes were observed through comparison of average values. Blood samples of 30 dogs, from that group, also were taken to establish blood group DEA (Dog Erythrocyte Antigen) 1.1. and standard haemogram. In 27 dogs (90.0%) the blood group DEA 1.1., was found, which is a significantly higher percentage than in all investigations to date. It was observed that the average values of all haematological indicators were within physiological parameters.

Key words: blood group, Croatian sheepdog, haemogram, biochemical indicators

Introduction

The Croatian sheepdog is an indigenous Croatian dog, and according to credible data, was bred and used by Croatian tribes in their former historical homeland, and brought with them to their new homeland some 13 centuries ago. This animal has proved to be an exceptionally useful working dog, not only with sheep but with all animals found in rural homesteads (ROHR, 1960).

As the thousand-year tradition of extensive livestock breeding is rapidly giving way to intensive breeding, the Croatian sheepdog is losing its primary role. Increasingly, the dog is moving from its natural habitat into urban environments, which inevitably leads to

*Contact address:

Prof. Dr. Damir Žubčić, Clinic for Internal Diseases, Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, 10000 Zagreb, Croatia, Phone: +385 1 2390 347; Fax: +385 1 2441 390; E-mail: dzubcic@vef.hr

changes - as in its function so, consequently, in its physical and psychological constitution (ROHR, 1950; ROHR, 1953; ROHR, 1954; ORBAN, 1958). Some authors (ROMIĆ, 1977; FURY, 2002) have researched certain biochemical, diagnostically significant parameters in the blood serum of the Croatian sheepdog found in the areas of Đakovo and Županja. Our efforts have focussed on expanding this research to establishing blood groups, something that has not been undertaken in Croatia to date.

The available literature tells us that the haematological and biochemical values in blood of various breeds are not dissimilar to blood groups in individual breeds. However, certain differences do exist.

So far only ROMIĆ (1977) has set haematological parameters for Croatian sheepdog. Some of the biochemical indicators in the blood serum of Croatian sheepdog have been defined by FURY (2002).

Eleven different blood groups comprising eight types (FELDMAN, 1993) have been identified in dogs. Initially, blood groups were designated by letters (Am B, C, D, E, F, G, K, L, M, N, Tr, o, He), but today blood groups in dogs are designated by the DEA system (Dog Erythrocyte Antigen) - DEA 1 to DEA 8 (KOHN et al., 1998; FELDMAN, 1993). Blood group DEA 1 has two sub-groups: DEA 1.1. and DEA 1.2. (KOHN et al., 1998). SWISHER and YOUNG (1961) determined the percentage of blood group DEA 1.1. in 332 cross-breeds, arriving at 44.6%. SWISHER et al. (1973) established the presence of blood group DEA 1.1. in 40% of tested dogs. SUZUKI et al. (1975) tested 61 dogs and established that 36% of them possessed blood group DEA 1.1. The percentage of the same DEA 1.1. blood group investigated by WRIESENDORP et al. (1976) was 37% in cross-breeds, 43.4% in beagles and 29% in retrievers. EJIMA et al. (1986) tested 224 dogs in order to establish blood groups and found that 33% had the same blood group. Two-thirds of dogs tested were mongrels. KOHN et al., (1998) tested a group of 88 dogs and found that 52% of them also had blood group DEA 1.1.

GIGER et al. (1995), and KOHN et al. (1998), offer an interesting item of information, whereby the variations in the percentage of blood group DEA 1.1. could be due to geographical differences.

Materials and methods

Blood samples from 95 adult Croatian sheepdogs: 48 females and 47 males ranging from 1 to 12 years of age were taken to establish biochemical profiles in serum for kidneys (urea, creatinine), liver (total proteins, total bilirubin, AST - aspartate aminotransferase, ALT - alanine aminotransferase), pancreas (glucose in blood, amylase), bones (calcium, phosphorus, alkaline phosphatase) and muscles (creatine kinase).

Research on blood groups and haematology involved 30 pure-bred Croatian sheepdogs: 21 females and 9 males ranging from 2 to 12 years of age.

All dogs had blood samples taken from the blood vessel *v. cephalica antebrachii* into sub-pressurised tests tubes containing anticoagulant in order to perform a complete blood test and to establish blood groups.

Test tubes containing a gel were used for determining biochemical parameters in blood serum. Haematological indicators were determined by using the haematological Coulter Counter; biochemical results were obtained using Olympus AV 400 apparatus, and blood group DEA 1.1. on the basis of the serological agglutination test RapidVet®-H (Canine DEA 1.1.) (Agrolabo Products, Switzerland). Concurrently with the defining blood group, the autoagglutination reaction and its intensity were also established.

Results

Table 1. Presence of blood group DEA 1.1 expressed in percentages

	DEA 1.1. negative	DEA 1.1. positive	Total
Number	3 (10%)	27 (90%)	30 (100%)

Table 2. Intensity of positive reaction to blood group DEA 1.1.

Intensity of positive reaction	1+	2+	3+	Total
Number of dogs	4 (14.81%)	4 (14.81%)	19 (70.37%)	27 (100%)

Of the 30 Croatian sheepdogs three animals were DEA 1.1. negative - two males and 1 female (10%), while the remaining 27 dogs (90%) were DEA 1.1. positive (Table 1). Table 2 shows that of the 27 Croatian sheepdogs with a positive reaction 4 (14.81%) manifested a low intensity reaction, denoted by 1+; four dogs had a medium high intensity reaction, (2+), while 19 dogs (70.37%) manifested intensity reaction 3+.

Table 3. Results of statistical processing of all haematological indicators (n = 30)

	M	SD	Min	Max	Median	Mode
Erythrocytes 10 ¹² /L	6.7	0.97	4.87	9.01	6.76	N/D
Haemoglobin g/L	162.73	0.97	116.0	189.0	170	184
Haematocrit (PCV)	51.36	6.68	33.50	59.8	52.10	55.90
MCV fL	81.33	10.45	73	130	79.5	74
Leucocytes 10 ⁹ /L	14.67	3.22	9.55	22.56	14.12	13.07
- eosinophilic	0.06	0.0584	0	0.24	0.04	0.02
- non-segment	0.07	0.0424	0	0.16	0.07	0.08
- segment	0.55	0.1888	0.22	0.94	0.54	0.56
- lymphocytes	0.26	0.1426	0	0.5	0.25	0.42
- monocytes	0.03	0.0361	0	0.12	0.02	0
Sed. 1 (15 min)	0.30	0.7022	0	3	0	0
Sed. 2 (30 min)	0.83	1.3667	0	5	0	0
Sed. 3 (60 min)	2.63	2.2512	0	8	2.00	1
Sed. 4 (120 min)	5.20	5.0704	0	25	4.5	6

Table 4. Results of the statistical processing of all biochemical indicators (n = 95)

	M	SD	Min	Max	Median	Mode
Urea mmol/L	5.2	1.87	1.9	8.4	4.8	4.2
Creatinine μmol/L	84.43	25.68	33	144	88	88
Total protein g/L	61.11	6.85	42	84	61	58
Glucose mmol/L	4.13	0.62	2.8	5.4	4.2	4.2
Total bilirubin μ/mol/L	2.27	1.46	0.1	5.1	2.4	0.4
AST IU	24.82	8.93	11	48	23	22
ALT IU	22.53	9.2	7	44	22	22
APIU	55.62	23.3	10	122	54	48
CK IU	30.72	9.93	16	88	30	22
Amylase IU	1307.96	246.96	626	1842	1282	998
Ca mmol/L	2.50	0.27	1.92	3.76	2.46	2.46
P mmol/L	1.30	0.18	0.98	1.98	1.28	1.22

As with haematological indicators, all average values of investigated biochemical parameters were found to be within the values accepted as physiological (Table 3 and 4)

Discussion

Of a total of 30 investigated blood samples, the blood group DEA 1.1. was found in 27 (90%) of them. The given percentage of this blood group is considerably higher in relation to data published to date. The presence of blood group 1.1. in dogs has been researched by a relatively small number of authors, and results obtained so far are disparate. Thus, SWISHER and YOUNG (1961) tested 332 dogs of various breeds for the presence of blood group DEA 1.1. and established the group in 44.6% of animals, SUZUKI et al. (1975) carried out tests in 61 dogs and found that 36% had blood group DEA 1.1.

A small number of authors researched the percentage of blood group DEA 1.1. within specific dog breeds. WRIESENDORP et al. (1976) found positive DEA1.1. in 43.4% of beagles, 29% of retrievers and 37% of cross-breeds. GIGER (1991) and KOHN et al. (1998) claim that the percentage incidence blood group DEA 1.1. can also be influenced by an insufficient number of dogs tested, as well as by selection within individual breeds, i.e. possible inbreeding.

Our findings could be the result of inbreeding and a more pronounced homozygosity in that particular property. There is also the possibility that due to the fact that in the last 40 years different methods of blood group testing have been used, their results are difficult to correlate.

In comparing the average values for haematological indicators in blood of Croatian sheepdog and the referential values (SHALM et al., 2000), no changes were observed. Similar results were obtained by ROMIĆ (1977) in his research of haematological parameters in Croatian sheepdog. If one bears in mind that blood samples were taken in December, and that the majority of dogs live outdoors, it is possible that leucocytes were increased due to infection of the upper respiratory passages, which is a frequent occurrence in winter.

Comparison of the average values of the investigated biochemical parameters with the referential values (KANEKO et. al., 1997) also did not yield any different findings. When observing all the individual values it can be noticed that the gap between the lowest and the highest values has narrowed in relation to the referential values we use.

It can therefore be said that the values represent the breed characteristics of the Croatian sheepdog, and can be used by clinicians in their assessment of the health of individual organs or organ systems.

In conclusion, the established percentage of blood group DEA 1.1. in the tested dogs was 90%, which is a higher incidence than given in the literature published to date.

Comparison of average values of haematological indicators in the blood of Croatian sheepdogs against the referential values does not indicate changes. Comparison between the average values of investigated biochemical parameters and the referential values does point to certain shifts. Although the values found are within the standard range, a visible narrowing of the gap separating the observed lowest and highest statistical values is apparent. Those values represent the breed characteristics of the Croatian sheepdog, and can be used by clinicians in their assessment of the health of individual organs and organ systems.

References

- EJIMA, J., K. KUROKAWA, S. IKEMOTO (1986): Phenotype and gene frequency of red blood cell groups in dogs of various breeds reared in Japan. *Jpn. J. Vet. Sci.* 48, 363-368.
- FELDMAN, B. F. (1993): Practical blood banking and practical transfusion medicine for the small animal practitioner. Blacksburg, Companion Animal Blood Bank, Virginia Maryland Regional College of Veterinary Medicine, vol. II, 3-10.
- FURY, M. (2002): Hrvatski ovčar - istraživanja dijagnostički značajnih biokemijskih pokazatelja u krvnom serumu. Znanstveni magistarski rad, Zagreb.
- GIGER, U. (1991): Purified hemoglobin used as a blood substrate in the treatment of parasite - induced anemias in dogs. *J. Vet. Intern. Med.* 5, 140.
- GIGER, U., C. J., GELENS, M. B. CALLAN, D. A. OAKLEY (1995): An acute hemolytic transfusion reaction caused by dog erythrocyte antigen 1.1. incompatibility in a previously sensitized dog. *J. Am. Vet. Med. Assoc.* 206, 1358-1362.
- KANEKO, J. J., J. W. HARVEY, M. L. BRUSS (1997): *Clinical Biochemistry of Domestic Animals*, 5th ed., Academic Press, San Diego, London, Boston, New York, Sydney, Tokyo, Toronto.
- KOHN, B., S. REITERMEYER, U. GIGER (1998): Bestimmung der Blutgruppe DEA 1.1. und deren Bedeutung beim Hund. *Kleiner praxis* 43, 77-86.
- ORBAN, R. (1958): Hrvatski ovčarski pas. Osvrt na dosadašnji rad oko standardizacije te pasmine. *Moj pas* 10-12. , Zagreb.
- ROHR, O. (1950): Naš autohtoni hrvatski ovčarski pas. *Mali stočar*, Zagreb.
- ROHR, O. (1953): Hrvatski ovčarski pas. I kongr. biologa FNRJ, Zagreb.
- ROHR, O. (1954): Standard hrvatskog ovčarskog psa. *Moj pas*, Zagreb.
- ROHR, O. (1960): Prilog poznavanju hrvatskog ovčara. *Veterinaria IX.* 2. Sarajevo.
- ROMIĆ, S. (1977): Hrvatski ovčar. *Moj pas*, Zagreb
- SCHALM, O. W., N. C. JAIN, E. J. CAROLL (2000): *Veterinary Hematology*, 5th ed. Lea and Febiger, Philadelphia.
- SUZUKI, Y., C. STORMONT, B. G. MORRIS (1975): New antibodies in dog blood groups. *Transplantant Proc.* 7, 365-367.
- SWISHER, S. N., K. BULL, J. BOWDLER (1973): Canine erythrocyte antigens. *Tissue Antigens* 3, 164-165.

D. Žubčić et al.: Blood groups, haematology and clinicochemical indicators in Croatian sheepdog

SWISHER, S. N., L. E. YOUNG (1961): The blood group system of dogs. *Physiol. Rev.* (Baltimore) 41, 495-520.

WRIESENDORP, H. M., E. D. ALBERT, J. W. TEMPELTON (1976): Joint report of the second international workshop on canine immunogenetics. *Transplantant. Proc.* 8, 289-314.

Received: 14 June 2006

Accepted: 3 March 2008

ŽUBČIĆ, D., L.J. BEDRICA, D. GRAČNER, I. HARAPIN, M. FURY, J. JEREMIĆ:
Krvne grupe, hematološki i biokemijski pokazatelji u autohtonih pasmina pasa. I.
Hrvatski ovčar. *Vet. arhiv* 78, 141-147, 2008.

SAŽETAK

U uzorcima krvi 95 pasa hrvatskih ovčara, 48 ženki i 47 mužjaka u dobi od jedne do 12 godina istraženi su neki biokemijski pokazatelji (ureja, kreatinin, ukupne bjelančevine, glukoza, ukupni bilirubin, AST, ALT, alkalna fosfataza, kreatinska kinaza, amilaza, Ca, P). Vrijednosti biokemijskih pokazatelja bile su unutar fizioloških granica. U 30 pasa iz te skupine također je određivana krvna grupa (DEA, engl. Dog Erythrocyte Antigen) 1.1. i standardni hemogram. U 27 pasa (90%) utvrđena je krvna grupa DEA1.1., što je značajno više od do sada objavljenih rezultata. Vrijednosti hematoloških pokazatelja bile su unutar fizioloških granica.

Cljučne riječi: krvne grupe, hrvatski ovčar, hemogram, biokemijski pokazatelji
