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Blood groups and haematology indicators in Croatian indigenous breeds of dog. II Dalmatian dog

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ABSTRACT

The aim of this research was to establish the blood groups as well as haematology indicators in one of Croatia's indigenous breeds, Dalmatian dogs. 40 healthy dogs were examined. The ages ranged from 2 months to 12 years. Blood samples were taken from all animals in order to determine blood group DEA (Dog Erythrocyte Antigen) 1.1. and a standard haemogram. In 38 dogs (95%) the DEA 1.1. blood group was found. The findings obtained indicate that the incidence of DEA 1.1. blood group among Dalmatian dogs was higher than in other dog breed but this data included data about other Croatian indigenous breeds. The average haematology indicators were not within canine physiological standards because the haemoglobin concentration as well as levels of haematocrit and MCV were higher than reference values. The obtained data completes our present day understandings of the specificity of these physiological values in Dalmatian dogs.

Key words: DEA 1.1., blood groups, Dalmatian dog, haematology indicators

Introduction

The Dalmatian dog is an indigenous Croatian dog. According to current credible data the Dalmatian dog probably originated from the region of Ilyria, where Dalmati tribes were living (the north-western region of the Adriatic Sea coast) (ŠPOLJARIĆ, 2008).

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Blood groups in dogs are defined through the DEA (Dog Erythrocyte Antigen) system - DEA 1 to DEA 8 (FELDMAN, 1993; KOHN et al., 1998). Blood group DEA 1 is comprised of three subgroups: DEA 1.1., DEA 1.2. (KOHN et al., 1998) and DEA 1.3. (HALE, 1995). Clinically significant blood groups in dogs are DEA 1.1., DEA 1.2. and DEA 7. There is universal agreement that the DEA 1.1 blood type can cause significant transfusion reactions (BEDRICA et al., 2003; DELUCA et al., 2006).

A few authors have reported about the prevalence of DEA 1.1. in the dog population. SWISHER and YOUNG (1961) established that 44.6% out of 332 examined crossbreed dogs had the DEA 1.1. blood group. According to SWISHER et al. (1973) 40% of tested dogs had also blood group DEA 1.1. SUZUKI et al. (1975) focused on establishing the prevalence of DEA 1.1. blood group among 61 dogs, finding it to be 36%. The DEA 1.1. present in blood groups in animals tested by WRIESENDORP et al. (1976) was found to be 37% in mongrels, 43.4% in beagles, and 29% in retrievers. Out of 224 dogs (two-thirds were mongrels) blood groups were determined by EJIMA et al. (1986), and the group DEA 1.1. was found in 33% of animals. KOHN et al. (1998) tested for DEA 1.1. blood group in 88 dogs and established 52% of them had DEA 1.1. VAN DER MERWE et al. (2002) established the existence of significant differences between individual breeds of dog. The highest percentage of DEA 1.1. blood group (78%) was found in Rottweilers, and the lowest in Hounds (0%). DELUCA et al. (2006) established that the DEA 1.1. blood group was found in 54% of dogs tested.

In Croatian indigenous breeds a high prevalence of DEA 1.1. in tested dogs was established. Of all tested Croatian sheepdogs, 90% were DEA 1.1. positive (ŽUBČIĆ et al., 2008) as well as 66.7% Istrian pointers (GRAČNER et al., 2007). GIGER et al. (1995) and KOHN et al. (1998) offer an interesting thesis, whereby the frequency of the DEA 1.1. blood group could be linked to geographical differences.

The high prevalence of the DEA 1.1. blood group was established in Istrian pointers in previous research (GRAČNER et al., 2007), so it could be interesting to determine the prevalence of DEA 1.1. blood group in its near kin, the Dalmatian dog. Blood group determination in Dalmatian dogs is also important due to its particular importance in transfusion in veterinary practice.

Materials and methods

Forty healthy Dalmatian dogs were submitted to test, and they were divided into two groups. In the first group there were 20 females and in the second group there were 20 males, aged from 2 months to 12 years.

Prior to taking blood samples, all tested dogs were clinically examined. Blood samples from v. cephalica antebrachii were taken from all dogs into test tubes (Vacutainer Systems, Belliver Industrial Estate, Plymouth, UK) containing the EDTA anticoagulant in

order to establish a complete blood test. Haematology indicators were obtained through the haematology counter Baker System Serrono 9120 CP (Serrono-Baker Diagnostic, Inc, Allentown, Pennsylvania, USA), while the DEA 1.1. blood group was determined on the basis of the serological agglutination test RapidVet®-H (canine DEA 1.1.) (Agrolabo products, Switzerland). In the course of establishing the blood group, the reaction of autoagglutination and the intensity of agglutination reaction were also determined.

Reaction intensity was determined in dogs who were tested and were positive.

Results of the research were analysed by the Student *t*-test statistic method (StatSoft, Statistica 7.0, 1984-2005).

Results

Out of the 40 Dalmatian dogs tested, two (5%) were DEA 1.1. negative, while the remaining 38 (95%) were DEA 1.1. positive (Table 1).

Table 1. Range of blood group DEA 1.1., shown in number and percentages (n = 40)

	DEA 1.1. negative	DEA 1.1. positive	Total
Number of dogs	2 (5%)	38 (95%)	40 (100%)

The autoagglutination reaction was negative in all of the tested dogs.

The results are presented in Table 2: out of the 38 Dalmatian dogs that reacted positively to blood group DEA 1.1., seven of them (18%) demonstrated a low reaction intensity (1+), 11 dogs (29%) had a medium strong reaction intensity (2+), and in 20 animals (53%) reaction intensity was 3+.

Table 2. Range of intensity of positive reaction to blood group DEA 1.1. (n = 38)

Intensity of positive reaction	1+	2+	3+	Total
Number of dogs	7 (18%)	11 (29%)	20 (53%)	38 (100%)

Despite the fact that average values of most haematology indicators were found to be within the reference ranges (Table 3), the mean values for the haemoglobin concentration (188.4750 g/L), haematocrit (64.6675%) and MCV (84.2250 fL) were higher in comparison to normal reference values.

Statistical analysis of haematology indicators based on sex was carried out separately (Tables 4 and 5). Comparing the values between Tables 4 and 5, no statistically significant differences were determined between mean values.

Table 3. Results of statistical processing of all haematology indicators (n = 40)

	Mean	Min	Max	SD	SEM
Erythrocytes 10^{12}/L	7.7980	6.0630	9.5150	1.05196	0.166329
Haemoglobin g/L	188.4750	119.0000	243.0000	29.81824	4.714678
Haematocrit (PCV)%	64.6675	49.6000	80.7000	10.73653	1.697594
MCV (fL)	84.2250	78.0000	103.0000	5.87689	0.929218
Leukocytes 10^{9}/L	13.4000	8.2630	19.4570	2.96014	0.468039
- eosinophils%	0.0305	0.0000	0.0800	0.02631	0.004159
- nonsegmented neutrophils%	0.0655	0.0000	0.1600	0.04391	0.006943
- segmented neutrophils%	0.5848	0.2000	0.7800	0.12564	0.019865
- lymphocytes%	0.2633	0.1100	0.5400	0.08541	0.013504
- monocytes%	0.0380	0.0000	0.0600	0.02115	0.003344

Table 4. Statistically analysed haematology indicators of male haemograms (n = 20)

	Mean	Min	Max	SD	SEM
Erythrocytes 10^{12}/L	7.5809	6.0630	8.9080	0.97223	0.217397
Haemoglobin g/L	185.6000	119.0000	243.0000	32.14343	7.187489
Haematocrit (PCV)%	63.9150	50.0000	77.4000	10.06941	2.251587
MCV (fL)	85.1500	78.0000	99.0000	5.36337	1.199287
Leukocytes 10^{9}/L	14.0099	8.2630	19.4570	3.14548	0.703351
- eosinophils%	0.0305	0.0000	0.0700	0.02625	0.005870
- non segmented neutrophils%	0.0650	0.0000	0.1600	0.04583	0.010247
- segmented neutrophils%	0.5900	0.2000	0.7800	0.12439	0.027815
- lymphocytes%	0.2535	0.1100	0.4400	0.08375	0.018726
- monocytes%	0.0340	0.0000	0.0600	0.02162	0.004834

Table 5. Statistically analysed haematology indicators of female haemograms (n = 20)

	Mean	Min	Max	SD	SEM
Erythrocytes 10^{12}/L	8.0150	6.1770	9.5150	1.10773	0.247697
Haemoglobin g/L	191.3500	147.0000	229.0000	27.82894	6.222741
Haematocrit (PCV)%	65.4200	49.6000	80.7000	11.57705	2.588706
MCV (fL)	83.3000	78.0000	103.0000	6.35030	1.419970
Leukocytes 10^{9}/L	12.7902	8.3390	17.9990	2.70352	0.604525
- eosinophils%	0.0305	0.0000	0.0800	0.02704	0.006047
- non segmented neutrophils%	0.0660	0.0000	0.1600	0.04309	0.009635
- segmented neutrophils%	0.5795	0.2000	0.7800	0.12988	0.029041
- lymphocytes%	0.2730	0.1600	0.5400	0.08808	0.019696
- monocytes%	0.0420	0.0000	0.0600	0.02042	0.004565

Discussion

Out of 40 tested blood samples of Dalmatian dogs, the blood group DEA 1.1. was established in 38 (95%). The given percentage of the presence of this blood group is higher in comparison with the data relating to others provided in the literature to date. For example, in pure breed dogs, WRIESENDORP et al. (1976) found that 43.4% of beagles and 29% of retrievers had the DEA 1.1. blood group. The DEA 1.1. blood group was also found in 78% of tested Rottweilers (VAN DER MERWE et al., 2002).

GIGER (1991) and KOHN et al. (1998) mentioned that the frequency of the DEA 1.1. blood group can be influenced by the selection process within individual breeds, or rather, by possible interbreeding, as well as by the number of tested dogs. It was presumed that the DEA 1.1. blood group could be connected to geographical differences (GIGER et al., 1995; KOHN et al., 1998) .

This could be the main reason why the prevalence of DEA 1.1. blood group was higher among Croatian indigenous dog breeds, as well as in Dalmatian dogs.

In prior research a high prevalence of the DEA 1.1. blood group was established among Istrian pointers (GRAČNER et al., 2007). The results showing a high prevalence of the DEA 1.1. blood group in Dalmatian dogs could also contribute to the theory of their common origin (BAUER, 1994).

The high prevalence of 2+ and 3+ scores in the range of intensity of positive agglutination reaction indicated good detection of the DEA 1.1. blood group with the RapidVet®-H test (canine DEA 1.1.).

Thus, the high prevalence of the DEA 1.1. blood group in Dalmatian dogs, decreased possible risk of a transfusion reaction if the recipient is particularly a Dalmatian dog.

The average values of most haematology indicators in tested dogs were found to be within the given reference ranges, but the mean values for the haemoglobin concentration (188.4750 g/L), haematocrit (64.6675%) and MCV (84.2250 fL) were higher than normal reference values, that were 120-180g/L for haemoglobin, haematocrit 37-55% and MCV 60-77 fL (MEINKOTH and CLINKENBEARD, 2000).

A condition that could be associated with the haematology changes mentioned above is dehydration (HASLER and GIGER, 2000), but the physical examinations of tested Dalmatian dogs showed that they were healthy and they were not dehydrated at the time of examination.

On the other hand, excitement, apprehension or fright could cause the smooth muscle in the spleen to contract, expelling the stored red cells into the circulation (KERR, 2002). Moreover, breed differences are found in blood values, particularly in red cells parameters. Certain breeds of dogs such as greyhounds and dachshunds for example, tend to have high RBC, haemoglobin, and PCV values, which may sometimes exceed the

normal range provided for the species (JAIN, 1993; HASLER and GIGER, 2000; MEINKOTH and CLINKENBEARD, 2000). Data obtained in this paper also completes the current understanding of the specificity of these physiological values in Dalmatian dogs.

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SAŽETAK

Cilj ovoga istraživanja bio je utvrditi krvne grupe i hematološke pokazatelje u jedne od hrvatskih autohtonih pasmina pasa, u dalmatinskog psa. Istraženo je 40 zdravih pasa u dobi od dva mjeseca do dvanaest godina. U svih je istraživanih životinja uzorkovana krv te je utvrđeno da 38 pasa (95%) ima krvnu grupu DEA (Dog Erythrocyte Antigen) 1.1. što je više nego u drugih pasmina pasa, ali i više nego u ostalih hrvatskih autohtonih pasmina. Određeni hematološki pokazatelji također su viši od referentnih vrijednosti, a to se prvenstveno odnosi na koncentraciju hemoglobina, razinu hematokrita kao i na prosječni obujam eritrocita. Rezultati upotpunjuju dosadašnje spoznaje o posebnostima određenih fizioloških vrijednosti u dalmatinskog psa.

Ključne riječi: DEA 1.1., krvne grupe, dalmatinski pas, hematološki pokazatelji