BREED AND GENDER DEPENDENCY OF BLOOD TYPE IN DOGS

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Abstract. The aim of the study was to develop the methodology for determining the blood type of dogs by using Alvedia‘s rapid tests. The study involved 82 dogs. Selected from 1 to 9 years of age, healthy, timely vaccinated, overweight, untreated, good condition, weighing at least 25 kg, non-tick-borne and non-blood transfusion, good tempered dogs.

The results of this study showed that among dog blood donors in “Santaka” veterinary clinic most common dog breeds are: Bernese mountain dog, chow-chow, Labrador retrievers, and German shepherds. The majority of blood donors are females (56%) and the most common dog blood type is DEA1.1 + positive (71%). Bernese mountain dog, Labrador retriever, German shepherd, golden retriever, Staffordshire terrier, long-haired collie breeds and mixed breed dogs are characterized by DEA1.1 + positive blood type, chow-chow breed dogs – DEA1.1- negative blood type. Our purpose was to determine the amount and breed of blood donor dogs, the distribution of blood types DEA1.1 according to breeds and gender.

Keywords: dog, blood, dog blood types, (DEA).1.1.

Introduction. Dogs are one of the most popular pet pets. In some parts of the world there are: Romania 4.1 million, France 7.4 million, Argentina 9.2 million, India 10.2 million, Philippines 11.6 million, Japan 12 million, Russia 15 million, China 27.4 million. Brazil 35.7 million and in the United States are 75.8 million dogs (Oishimaya, 2017).

Anyone who maintains or agrees to take care of a pet's house is responsible for his health and well-being (Kessler, 2010). In order to ensure the proper health status of a pets, it is particularly important to keep track of its health determinants. Are important to determined animal weight measurements, blood morphological and biochemical parameters, age and blood group (Day et al., 2012).

This is done for the purpose of animal welfare, not only to ensure that the donor is healthy, but also to help the host keep the health of the pet and to prevent the disease in a timely manner (Vet. Kraujo bankas, 2017).

Although in different literature sources of blood can be found from different numbers of blood groups and types, but only seven groups of blood are internationally recognized (Hohenhaus, 2004) and only six blood groups are most often recognizable (Shojai, 2016). Canine blood types are classified by the dog erythrocyte antigen (DEA) system based on red blood cells surface antigens (Kisielewicz et al., 2014). The most recognizable the blood groups of dogs is DEA-1.1, DEA-1.2, DEA-3, DEA-4, DEA-5 ir DEA-7 (Shojai, 2016).

Most blood group systems in dogs are thought to be simple 2 allele systems with a positive and negative blood type (Acierno et al., 2014). DEA 1 system contains 2 or more alleles: DEA 1.1, DEA 1.2, and possibly A3 (also referred to as DEA 1.3) (Kessler et al., 2010). DEA1.1 blood group affects 42-71.2% of dogs depending on country and dog breeds (Kisielewicz et al., 2014). According to Ann E. Hohenhaus, the DEA1.3 group of dogs is described only in Australia, most commonly in the German Shepherd breed, DEA1.2 - among the Australian dogs – Dingo (Hohenhaus, 2004).

Some dog breeds are more often to have a DEA1.1 positive or negative blood type (Shojai, 2016). Dog blood type DEA1.1 is the most prevalent in the boxer, Irish vultures, German Shepherd, Doberman and Pit Bull blood and DEA1.1 + is most commonly found in golden retrievers and labradors (Shojai, 2016).

According to Japanese studies, more than 60% of local glamor and acai dogs have DEA3 blood groups, and also established that the English Setters, White Bulls and Shillips usually have a DEA3 Negative Blood Group (Hohenhaus, 2004). Greyhound with DEA3 blood type, blood type is usually positive (Shojai, 2016). Studies in Australia, that were do with 122 dogs, showed that no one of them haven't DEA3 blood groups (Hohenhaus, 2004).

DEA 4 is a two allele system (Hohenhaus, 2004). This system has one antigen and a zero phenotype. Mostly universal blood donors DEA 1.1, 1.2, 3,5 ir 7 are negative, but DEA4 universal blood type is positive (Kisielewicz et al., 2014). The term "universal donor" means dogs containing a blood group that does not have antigens on the surface of the red blood cells that may cause reactions to the recipient.

The blood group DEA5 of dogs is relatively rare, except United States greyhounds breeds and Japanese breed dogs (Day et al., 2012). The prevalence of common populations, including pure-bred and broodstock dogs, is 10-15% (Day et al., 2012). Dogs in the blood group DEA6 and DEA8 no longer exist (Hohenhaus, 2004).

The DEA7 blood group has a different system than

most blood groups. The DEA7 system consists of two antigens, DEA7 and DEA7 ', and a zero phenotype (Day et al., 2012). DEA7 was found from 8% to 45% of the United States dogs (Vap, 2010). The aim of the study was to develop the methodology for determining the blood type of dogs by using Alvedia's rapid tests, to determine the amount and breed of blood donor dogs, the distribution of blood types DEA1.1 according to breeds and gender.

Material and methods

The study was involved by 71 dogs donor. The experiment was performed with 8 different breeds and mixed breed dogs. In whole experiment was - 65 breed dogs and 6 mixed breed dogs. Most representatives of the dog donor were following varieties: Bernese Mountain Dog, chow chow, Labrador retrievers and German shepherds. Selected from 1 to 9 years of age, healthy, timely vaccinated, overweight, untreated, good condition, weighing at least 25 kg, non-tick-borne and non-blood transfusion, good tempered dogs. Before the donation should be examined in dog blood donor morphological parameters, biochemical parameters (Margaret, 2004; Almagor, 2001), verify that the dog is not infected with blood parasites, assessed the overall condition of the animal, determined by blood type, and only then comes the turn to blood procedure. (Wardrop, 2016). To determine the types of blood were using a test strips ALVEDIA® France.

First test was removed from the package, on the test records should be written the dog's name and the date of the investigation. Using strip from the tube (which are with anticoagulant) was taken 10 µl of blood. The same reagent is mixed with the same strip for 7 seconds. After mixing the reagent, a blood type test is opened and inserted into the stand. We are waiting for 2 minutes until revealed one or two red stripes. If one strain emerges - the dog's blood type is negative (DEA1.1-), with 2 strips highlighted - the dog's blood type is positive (DEA1.1+) (Vap, 2010).

Statistical analysis test was conducted using IBM SPSS 22 version, statistical significance level chosen 5% ($\alpha = 0.05$).

Describe statistics by breed and blood type is presented in table 1, descriptive statistics by breed, blood type and gender is presented in Table 2. The mean comparison of blood type by breed has been conducted with ANOVA Post-hoc test by using Duncan statistics. The post-hoc test was not possible by gender due to too small sample size – there are groups with no observations. The same letters represent similar groups.

Results and discussion

In the Dog Donor Database were registered 71 dogs. From them: Argentine dogs- 4, Golden retrievers- 6, Bernese Mountain Dogs- 18, Chow Chow dogs- 11, Long-haired moved- 4, Labrador Retrievers- 8, Mixed Breeds- 6, Staffordshire Terriers- 6, German Shepherds-8. Percentage data are given in Figure 1. From all blood donors of dogs were 41 females (58%) and 30 males (42%).

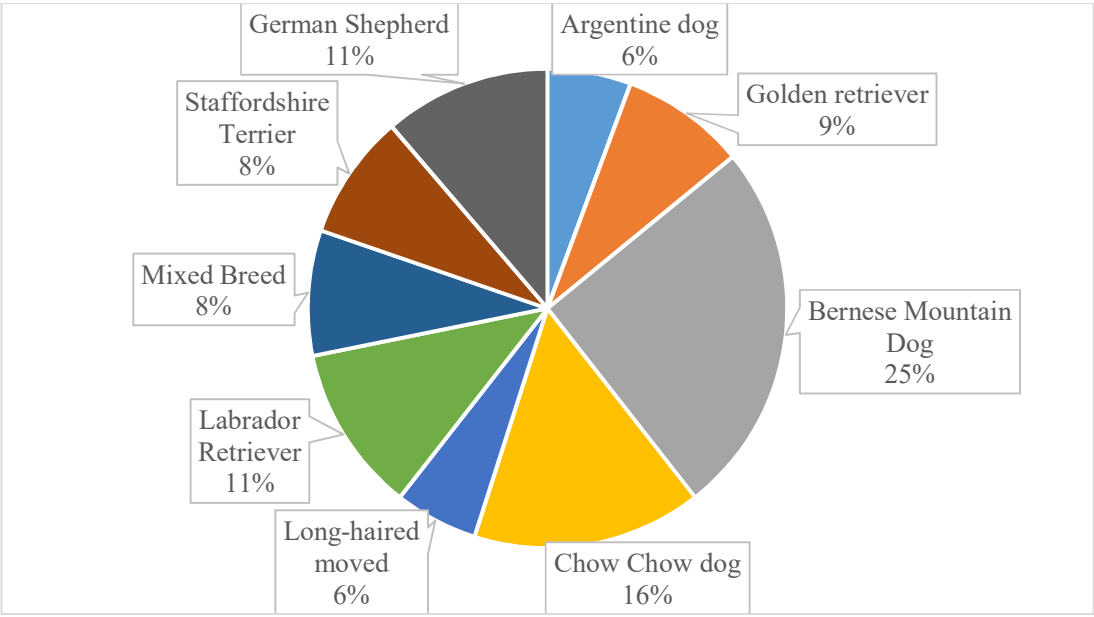

Figure 1. **Distribution of dog blood donors by breed**

Analysing the literature we found information about one experiment which was conducted in Lithuania in 2013, there was investigated distribution of dog blood types by breed. The result of experiment showed that among the German shepherd dogs breeds were widespread DEA 1.1-negative blood types, established 26 (76%) from 34 this dogs breeds (Altunok, 2001; Mundim, 2001). For Bernese Mountain Dog investigate DEA 1.1+ positive blood type, which have all 27 (100%) breeders (Altunok, 2001).

Between chow chow breed widspread DEA 1.1-negative blood type, which also established for all 9 (100%) this breeds dogs (Altunok, 2001).

Dog blood donation DEA1.1 + and DEA1.1- distribution of blood type by breed is presented in Table 1. In our experiment when analysing direffents dogs breeds donation we was determinate that all 100% Bernese Mountain dogs blood type were positive (DEA1.1+). The major part 91% of the chow chow breed's dogs have negative blood group DEA1.1 and just 9% of dogs have positive (DEA 1.1+). From Labradors retrivers dogs 87,5% of them blood type is positive (DEA1.1+) and just 12,5% of dogs have negative blood group DEA1.1. The same results were with German Shepherd dogs breeds like Labradors retriver dogs (positive - 87,5% DEA1.1+ and 12,5% - negative DEA1.1. Positive blood type (DEA1.1+) were deteriminated for - 83% of Mixed breeds dogs and 17% - negative DEA1.1.

Table 1. **Dog blood donation DEA1.1 + and DEA1.1- distribution of blood type by breeds**

Dogs breeds	DEA1.1+	DEA1.1-	Total of the same breed of dogs
Argentine dog	0[b]	4[b]	4
Golden retriever	4[a]	2[a]	6
Bernese Mountain Dog	18[a]	0[a]	18
Chow Chow dog	1[b]	10[b]	11
Long-haired moved	3[a]	1[a]	4
Labrador Retriever	7[a]	1[a]	8
Mixed Breed	5[a]	1[a]	6
Staffordshire Terrier	4[a]	2[a]	6
German Shepherd	7[a]	1[a]	8

Dog blood donors DEA1.1+ and DEA1.1- blood types distribution of blood type by gender and variety is presented in Table 2. Analyzing distribution blood types between males and female dogs, we are seeing that most of females dogs with positive blood type DEA1.1+ belongs to Bernese Moutain breed dogs. From all this breed dogs 61% females and 39% males have positive blood type DEA1.1+.

Table 2. **Dog blood donors DEA1.1+ and DEA1.1- blood types distribution by gender and variety**

Dog breed	Females		Males	
	DEA1.1+	DEA1.1-	DEA1.1+	DEA1.1-
Argentine dog	-	2	-	2
Golden retriever	3	1	1	1
Bernese Mountain Dog	11	-	7	-
Chow Chow dog	-	8	1	2
Long-haired moved	1	-	2	1
Labrador Retriever	6	1	1	-
Mixed Breed	1	-	4	1
Staffordshire Terrier	-	-	4	2
German Shepherd	6	1	1	-

During the study from Chow chow breed dogs 73% females and 18% males have negative blood type DEA1.1- , and only 9% male have negative DEA1.1- dogs blood types. Labradors retrivers and Germans Shepherds breeds blood types and gender distribution are the same. These two breeds varieties was 75% of females and 12,5% of males in each. All of them have positive type of blood DEA1.1+, except 12,5% male who had negative blood type DEA1.1-.

There is some literature about research, which were examined the genotype and genetic frequency of genes in different dogs breeds in Japanese. The dogs were tested by 5 groups and blood typing systems: DEA1, DEA3, DEA6, D ir J1. There were 15 different breeds: 3 Japanese breeds (akita, shiba inu and mixed breeds), 12 of Europe and American breeds (afghan kurt, biglie, boxer, coli, english pointer, german shepherd, tuftspic, malta bison, shalit, chich tzu and yorkshire terrier). By DEA1 system 60% of german shepherd had DEA1.1- negative blood type. Positive blood type DEA1.1+ had not been established for any dog of the cole breed. All cole breed dogs 100% had negative blood type DEA1.1- (Ejima et. al., 1986).

Conclusions

The results of this study showed that among dog blood donors, “Santaka” veterinary clinic most common dog breeds are: Bernese mountain dog (25%), chow-chow (16%), Labrador retrievers (11%), and German shepherds (11%). The majority of blood donors are females (58%) and the most common dog blood type is DEA1.1 + positive (69%). Bernese mountain dog, Labrador retriever, German shepherd, golden retriever, Staffordshire terrier, long-haired collie breeds and mixed breed dogs are characterized by DEA1.1 + positive blood type, chow-chow breed dogs – DEA1.1- negative blood type.

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