

Prevalence of dog erythrocyte antigen (DEA) I amongst the dog blood donors at Tamil Nadu Veterinary and Animal Sciences Animal blood bank (TABB), India

Abstract

The identification of dog blood groups has universally gained momentum during the past few years. Canine blood groups are identified based on surface antigens of the erythrocytes and there are more than eight canine blood groups identified till date. Amongst these blood groups, the identification of the highly immunogenic Dog Erythrocyte Antigen (DEA) 1.1 in dogs has gained importance and momentum in India during the recent years to ensure safe blood transfusion. A one year retrospective study was conducted in the registered 125 dog blood donors at the TANUVAS Animal Blood Bank, Chennai, India during the period from January 2010 to January 2011 wherein about 125 blood donor dogs of various dog breeds brought to TANUVAS Animal Blood Bank at the Madras Veterinary College as blood donors were screened and typed for the presence of Dog Erythrocyte Antigen 1.1 using the monoclonal antibody kit. The prevalence of DEA1.1 was significantly higher (61.6%) when compared to the world wide distribution (42 to 46%) concluding that the random blood transfusions for the anemic dogs in India have a higher potential of sensitization reaction during the first transfusion and a greater risk of hemolytic reactions on the subsequent transfusions.

Keywords: blood groups, dog erythrocytic antigen, blood transfusions

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Baranidharan GR, Prathaban S, Nambi AP, Dhanan Jaya Rao, George Lubas, Anyela Andrea Valentin Medina

Department of Veterinary Clinical Medicine, Tamil Nadu Veterinary and Animal Sciences University, India

Correspondence: Baranidharan GR, Blood Bank Officer- TANUVAS Animal Blood Bank, Madras Veterinary College, India, Chennai-600 007, Email grbvvet@gmail.com

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Introduction

Most dogs do not have natural DEA antibodies but are eventually sensitized to the first incompatible transfusion. The knowledge of the canine blood groups, immunogenicity and incompatibility is clinically useful in authenticating safe transfusions without much adverse reactions more significantly mandatory and useful during repeated transfusions. Compared to the western countries the determination of the blood group antigens in dogs using DEA typing kits or Anti- sera are considerably minimal because of seldom repeated transfusions to the same recipient dog. But eventually the use of dog blood products and multiple transfusions are gaining momentum at institutional levels and referral clinics in our country.

Till date, there have been various groups and theories that define a universal dog blood donor. It has been reported that the universal dog blood donor should be negative for DEA 1.1, DEA 1.2, DEA 3, DEA 5, DEA 7, and positive for DEA 4, wherein the typing kits are commercially in accessible thought the world except for certain countries. In all practical aspects, the dog which has the absence of the highly antigenic DEA 1.1 is considered to be a safe donor worldwide by many institutional groups.

An international standardization committee has designated the dog erythrocyte antigen (DEA) system where the dogs are either positive (+) or negative (-) for most of the DEAs, the DEA 1 system contains 2 or more alleles, i.e., DEA 1.1, DEA 1.2, and possibly A3 and RBCs from individual dogs may express the genes of only one of the alleles or none of them.

Canine blood group antigens are inherited according to an independent autosomal dominant model. Only the DEA 1 group

occurs as a multiple allele with DEA 1.1 dominant over DEA 1.2 (i.e. DEA 1.1 and 1.2 cannot both be phenotypically present).¹

The aim of the study was to describe the occurrence of DEA 1 amongst the registered dog blood donors at the TANUVAS Animal Blood Bank, Chennai, India

Methodology

Around 125 blood donor dogs of various dog breeds brought to the Madras Veterinary College, Chennai were typed for the DEA 1.1 blood groups. (About two ml of the venous whole blood was collected from the cephalic vein, stored at 4°C and tested within 24 hours. All samples were tested for saline agglutination tests to rule out auto agglutination. Blood typing was done with the *Alvedia Lab* DEA 1.1 Kit, France, with one drop of whole blood added to the 3 drops of DEA buffer into the typing kit well and the membrane was placed on to the well to read the results after two to four minutes. This In house kit is based on the system of migration of red blood cells on a membrane previously treated with a buffer and incorporated with a monoclonal antibody highly specific to the Dog Erythrocytic Antigen 1.1. The positive DEA 1.1 RBC's are retained by this antibody showing a red line on the mid portion of this membrane.

Materials and methods

One-hundred twenty-five blood donor dogs brought to the Madras Veterinary College, Chennai were typed for the DEA 1 blood group during the period of time ranging from January 2010-2011. All samples were tested in saline agglutination test to rule-out auto agglutination phenomena. The positive samples were excluded from further investigations.

Blood typing was carried-out with the *Alvedia Lab* DEA 1 Kit, France. This in-house kit is based on the migration of red blood cells on a membrane previously treated with a buffer and incorporated with a monoclonal antibody highly specific to the Dog Erythrocyte Antigen 1. The positive DEA 1 erythrocytes are captured by this antibody and a red line on the mid portion of this membrane is showed.

Table 1 Results of DEA 1.1 positive in the random dog blood donor population is 61.6%.

Breed	No. dogs total (125)	No. dogs DEA positive(77)		No. dogs DEA negative(48)	
		N. males	N. females	N. males	N. females
German Sheperd	12	5	3	2	2
Dobermann	10	4	4	1	1
Rotweiler	8	2	3	1	2
Neo Mastiff	1	0	0	0	0
Great Danes	9	3	2	3	2
Golden Retriever	9	2	4	1	2
Dalmation	6	2	1	1	2
Non Descript	26	9	7	4	6
Labrador Retriever	44	12	14	8	10
Total	125	39	38	21	27

Discussion

The prevalence of the clinically significant DEA 1.1 antigen worldwide is recognized as 53.4-65.2%

In 1995, Giger et al.³ reported an acute hemolytic transfusion reaction in a clinical case, caused by a mismatched transfusion to a DEA 1 negative dog previously sensitized against DEA 1.1 blood group. The documented clinical case emphasized the importance of canine blood type DEA 1.1 concerning to blood transfusion incompatibility. Also, it supported the recommended practice of cross-matching dogs, particularly prior to a second transfusion, and the use of blood donors, which are DEA 1.1 negative.

In 1996, Hale⁴ described a prevalence of 63.5% for DEA 1.1 positive mongrel dogs, while 1.2% was DEA 1.2 positive. Also, they found that 43.5% of German shepherd dogs were DEA 1.1 positive and only 4% were DEA 1.2 positive.

Van der Merwea et al.⁵ reported that the overall prevalence of DEA 1.1 was 47%. Prevalence was 47% in purebred dogs and 48% in mongrels. Distinct breed differences were noted with less than 20% of German shepherd dogs and Boxers and greater than 75% of Rottweilers, Great Danes, St Bernards and Dalmations testing DEA 1.1 positive in South Africa. Further the frequency of DEA 1.1 in this population of dogs in the northern part of South Africa was similar to frequencies reported in dog populations elsewhere.

Arikan et al.⁶ reported that of the 198 dogs, 61.1% had DEA 1.1 positive reactions and approximately one fourth of dogs (23.2%) were positive for DEA 3. All dogs (100%) were positive for DEA 4. Prevalence of DEA 5 and 7 positive dogs was 55.5% and 71.7% respectively.

Kessler et al.⁷ reported that in dogs, the lack of alloantibodies that occur naturally and are clinically relevant may preclude the need for having extended type-specific blood available for a first transfusion. But, Since there is a risk of sensitization with the presence of antibodies that can appear within 4-14 days, in DEA 1 negative dogs

Results

About 60% of the dogs that were accompanied by the owners were single time donors, whereas 35 % of the dog blood donors donated whole blood at least two times and 15 % of the donors had donated three times during a one year period (Table 1).

who received blood from DEA 1 positive dogs following the first transfusion,¹¹⁻¹⁴ blood typing to identify the presence of DEA 1 and the cross-match to establish full compatibility should be performed before each transfusion.^{2,19,20}

Conclusion

The obtained results of DEA 1.1 system in the random dog blood donor population in India is 61.6% which proves higher than that of 42 to 46% as reported worldwide by the western countries. The statistical chi-square test resulted in 2.412*, where p= 0.0342, which accentuates the significance of the donor dog breed involved.

The possibility of recipient dogs with DEA 1 groups to receive DEA 1 positive blood is more in India than reported by the western countries which means that the potential risk of sensitization for the first transfusion is more likely and the risks of Acute hemolytic reaction is even more likely for multiple transfusions with the random DEA 1 positive blood. Because of the DEA 1 blood groups represents the most immunogenic blood group, it is mandatory for even non institutional or primary and secondary veterinary practice in India to carry out blood typing to identify the presence of DEA 1 antigen and the major and minor cross-match before each transfusion.

Also, DEA typing should be carried out in the Indian native dog breeds to determine the breeds that have high prevalence of negative group to the DEA system to ensure safe transfusions.

Ethical approvals

The studies were carried out in accordance with the Guidelines laid down by the International Animal Ethics Committee or Institutional ethics committee and in accordance with local laws and regulations and proper consent from the clients.

Conflict of interest

The authors declare that there is no conflict of interests.

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