

DEA Typing in Dogs and its Importance in Veterinary Transfusion Medicine

Riyaz A. Bhat¹, Syed Taifa², Tamanna Ashraf³, Sharjeel A. Wani⁴, Mohd I.
Yattoo⁵, Mehak Nisar⁶, Ovais S. Shah⁷, Oveas R. Parray⁸

^{1,2,3,4,5,6}Division of Veterinary Medicine,

Faculty of Veterinary Sciences & Animal Husbandry,

SKUAST-K, Shuhama, Kashmir, (India)

ABSTRACT

Blood transfusion is a life saving procedure to treat symptoms of anemia caused by various diseases (like immune mediated anaemia, haemoprotezoans, gastrointestinal parasites, chronic renal failure, etc), surgery, toxicity, or trauma if done scientifically. But before going for a blood transfusion, the donor and recipient should be blood typed (i.e., blood group should be determined) to avoid the sensitization of recipient blood for next transfusions. Canine blood group antigens are inherited according to an independent autosomal dominant mode. There are 8 major blood groups in the dog, labelled as DEA (dog erythrocyte antigen) 1 to 8. Only the DEA 1 group occurs as a multiple allele with DEA 1.1 dominant over DEA 1.2. DEA 1.1 and DEA 1.2 are the most important antigens with high antigenicity and the most antigenic are DEA type 1.1 and DEA 4, and DEA 4 has the prevalence of approximately 98%. No pre-formed antibodies exist against DEA 1.1 or 1.2, so cross matching is not important for the first transfusion but blood typing is important.

Key words: blood transfusion, blood typing, DEA 1.1, dog, dog erythrocyte antigen,

I. INTRODUCTION

Blood transfusions if safely done can save a number of animal lives; patients in need may either die due to unavailability of blood, or may recover from a variety of illnesses, moreso, many a times animal can be managed till the procedures being applied during their course of illness. Blood transfusion has been practiced for centuries, saving life of human beings and animal. Richard Lower, first time in the history in 1665 transfused the blood in a dog [1]. Later with the advances in the veterinary transfusion medicine after 1950, blood transfusion became more popular in animals [2, 3]. Now-a-days the veterinary medicine has not only recognized many blood groups in canines, but also understood what exactly happens to an animal when a blood from donor to patient is administered, and it has revolutionized how we can be certain that we are providing the right therapy for our patients. It may sound unimportant, but transfusion medicine all starts with a blood type and it is important to perform blood typing before the start of blood transfusion to avoid incompatibility problems [4, 5]. Blood groups are classified on the basis of antigens present on the surface of erythrocytes and these antigens which are species-specific play an important role in inducing immune-mediated reaction. These reactions can

cause complications which can sometimes be fatal while transfusing blood from different blood groups especially during second or more transfusions. These antigens induce production of antibodies when animals get exposed via blood transfusion, transplacental exposure or in the case of neonatal isoerythrolysis, through colostrum. Antigens coupled with platelets, leukocytes and plasma proteins may also induce immune mediated reactions in recipient animals during transfusion [6]. From a veterinarian point of view, these are the antigens (blood groups) to which the veterinary practitioner should be always aware.

II. BLOOD GROUPS

More than 13 canine blood groups have been recognised but only 8 DEA (dog erythrocyte antigen) types are recognized as international standards [7, 8, 9]. Currently 6 DEA can be routinely identified in blood typing schemes, namely DEA 1.1, 1.2, 3, 4, 5, and 7 [10]. Canine blood group antigens are inherited according to an independent autosomal dominant mode [11]. 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) [11]. DEA 1.1 and DEA 1.2. Dogs can be positive for either (not both) DEA 1.1 or 1.2 or are negative for both. DEA 1.3 has been described in German shepherd dogs in Australia [8]. Among the different blood types in dogs DEA 4 and DEA 6 antigen is present in approximately 98% of dogs. Any of these DEA blood groups may stimulate an immune response in a recipient during transfusion, but DEA 1.1 antibody-antigen interactions results in acute hemolytic transfusion reactions [10]. The DEA 3, 5 and 7 blood groups can cause delayed transfusion reactions in dogs lacking these antigens but are previously sensitized to these antigens [10, 12, 13]. Other than DEA blood types, Dal is another blood type commonly known in dalmatian dogs [14]. The prevalence of DEA 1.1 has been reported by several authors from various countries as 66.7% [15], 61% [5], 51.3% [16], 47% [17], 44.6% [18], 36% [19] and 32% [20]. In Indian little work has been done on the blood typing in dogs, Bhat *et al.*, 2017 [21], has reported the prevalence of 78% of DEA 1 blood group from Punjab state, in which 52% were of DEA 1.1 type, while 26% of the animals were of DEA 1.2 type and 21% of tested dogs negative for DEA 1 system.

III. IMPORTANCE OF BLOOD TYPING

In dogs, naturally occurring alloantibodies are of lesser clinical significance whereas in cats it is very important clinically [8,9]. DEA 1.1 and DEA 1.2 are the most important antigens with high antigenicity and the most antigenic is DEA type is DEA 1.1 and DEA 4 [16, 17]. Since the prevalence of DEA 4 blood is around 98 % in the canine population, thereby it poses non-significant during the blood transfusion. As no pre-formed antibodies exist against DEA 1.1 or 1.2, so cross matching is not important in the first transfusion but a first transfusion with DEA 1-positive blood in a negative recipient will not result in a transfusion reaction [18] but will sensitize the recipient for the next transfusion, so blood typing should be performed always as explained below:

If a patient's blood type is DEA 1.1 negative and we give it blood that is DEA 1.1 positive, they will develop antibodies to DEA 1.1. If the patient needs a second transfusion later on and we give it blood that is DEA 1.1 positive again, they can at worst have an anaphylactic reaction to the DEA 1 or will have a delayed transfusion reaction, completely negating the transfusion. So far India is concerned, Bhat et al., 2017 [21] has reported that the probability of DEA 1 negative dog to receive DEA 1.1 positive blood in a first random transfusion is 10.92% (sensitization). Later on if the same dog receives a second transfusion, it will have 5.68% chances of receiving DEA 1.1 positive blood, which can lead to an acute hemolytic transfusion reaction.

So prior to the transfusion in dogs blood typing should be done to avoid the future hemolytic consequences. It is better to use universal donor blood in emergencies when we can't do blood typing in recipient so as to avoid the sensitization in recipient. A dog is considered a universal donor when it is negative for DEA 1.1, 1.2, 3, 5, 7 and positive for DEA 4 [6,13,22].

IV. CONCLUSION

Transfusion medicine is a lifesaving modality in case of emergency or critically ill animals. Now-a-days blood products are becoming readily available and transfusions can be performed in veterinary clinics easily in developed countries. The correct use of transfusion medicine should balance potential risks which are associated with blood transfusions. DEA 1.1 mismatches can cause life-threatening transfusion reactions in sensitized dogs. DEA 1.1 and DEA 1.2 are the most important antigens with high antigenicity and the most antigenic is DEA type is DEA 1.1 and DEA 4. About 50% of dogs are DEA 1.1 positive, so typing for this antigen before blood transfusion is highly recommended. Use of universal donors is recommended to minimize potential sensitization of the recipient and improve the odds of identifying compatible donors during emergencies.

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