

# Xenotransfusion of Canine Blood to a Cat

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## ABSTRACT

A one-month old male, 0.5 kg kitten was presented with a chief complaint of extreme weakness and lethargy. Physical examination findings included severe hypothermia, bradycardia, dehydration, cachexia and severe flea infestation. Packed cell volume (PCV) revealed severe anemia (13%) and total plasma protein (TPP) was 8.5 g/dL. The cause of anemia was probably due to blood loss as a result of severe flea infestation and possible *Mycoplasma hemofelis* infection. Since there was no significant improvement after several hours of supportive treatment consisting of antibiotics and heating, and due to financial constraints that did not allow the purchase of a feline packed cells unit, the kitten was transfused with 5 mls of canine packed red blood cells over a period of one hour. No acute or late transfusion responses were noted during two weeks of observation. Blood samples taken during hospitalization did not show evidence of hemolysis or icterus. The kitten's packed cell volume increased and there was no evidence of any detrimental effects due to the canine blood transfusion. The cat recovered in a couple of days, maintained normal body temperature and was able to feed on its own. It was discharged after two weeks of monitoring in good physical condition and health.

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**Keywords:** Canine blood, xenotransfusion, feline, treatment.

## INTRODUCTION

Transfusion therapy in veterinary medicine has advanced in recent years. Blood typing in both dogs and cats and the use of blood components have greatly enhanced the ability to improve the treatment of animals (1).

Xenotransfusion is the transfusion of blood of a donor animal species to a recipient animal of another species. Xenotransfusion of animal blood to humans has been made as early as the 17<sup>th</sup> century and since then, many reports of xenotransfusion have been described, some with favorable outcomes, while others with fatal consequences (1). At present, many medical studies are being performed aiming to use animal blood in humans (1).

Xenotransfusion, and use of blood components across species in veterinary medicine are quite common. For example, human albumin and oxyglobin, a commercial oxygen carrier based on bovine hemoglobin are commonly used in dogs

and cats (2, 3). The use of canine blood products in cats has been described (2-4), mostly when compatible feline blood products and other commercial alternatives (e.g. oxyglobin) are unavailable or due to owners' financial constraints.

The aim of this report is to describe a case where canine packed red blood cells were infused to an anemic cat in an emergency situation.

## CASE REPORT

A one month old intact male, stray domestic shorthair kitten weighing 0.5 kg was presented shortly after it was found. On physical examination, the cat was extremely weak, lethargic, hypothermic (rectal temperature < 32 °C, bradycardic (heart rate 100 bpm)) and dehydrated (estimated at 10-12%). The mucus membranes were tacky and pale. A purulent right ocular discharge was evident. The kitten was heavily infested with fleas.

The packed cell volume (PCV) was 13% and total plasma protein (TPP), measure by refractometry was 8.5 g/dL (Table 1). Whole blood glucose concentration was 200 mg/dL. Examination of a stained blood smear showed mature neutrophils with no cytoplasmic toxicity, bland monocytes, moderate hypochromia, moderate anisocytosis and mild polychromasia.

The kitten was initially treated with intravenous 0.9% saline (Teva Medical, Ashdod, Israel), topical Fipronil spray (Frontline, Merial, France) to eradicate the flea infestation and was placed on a heating pad. After 8 hours the cat was still 6–8% dehydrated and its PCV and TPP had decreased to 8% and 6 g/dL, respectively. The kitten was still very lethargic, tachypneic and non-ambulatory. Since the cat was still dehydrated it was assumed that the PCV was expected to decrease further with continuing IV fluid therapy and therefore a packed red blood cells transfusion was deemed necessary. Due to the cat owner's financial constraints feline packed red blood cells could not be administered, and therefore, xenotransfusion with canine packed red cells was offered, and the owners elected to use this option. Crossmatching with the canine blood was not performed prior to the transfusion, because the cat, although very weak, was very aggressive, and obtaining a blood sample for the procedure would have required sedation which was deemed undesirable due to his condition. The cat received 10 mL/kg of canine packed red blood cells over a period of one hour. Further treatment included doxycycline (Medimarket, Netanya, Israel; 5mg/kg SID), iron-dextran 10 mg/kg (Ozzano Emilia, Bologna, Italy) IM, vitamin B<sub>12</sub> (Bedodeka, Teva Pharmaceutical, Petach-Tikva, Israel; 0.25 mg SQ) and multivitamins (Duphafrol Multi, Fort Dodge Veterinaria S.A. Spain 0.2 ml SQ), was also dispensed.

The post-transfusion PCV had increased the PCV to 21%, and the post-transfusion TPP was 8.0 g/dL. Twelve hours post-presentation and approximately four hours after transfusion, the cat was able to maintain normal body temperature without the use of a heating pad and ate voluntarily. The kitten was still 6% dehydrated. Two days post presentation IV fluid therapy was discontinued. The cat ate and drank willingly, and over the next 12 days in hospitalization it progressively gained weight. Eight days post-presentation the PCV was 28%. No evidence of hemolysis or icterus was seen in the sera. On day 14, the kitten was deemed healthy, and was discharged. In a follow-up phone call two months later the owners reported that the cat appeared normal.

**Table 1:** Packed cell volume and total plasma protein at presentation and during hospitalization in a kitten transfused with canine packed red blood cells.

Time	Packed cell volume (%)	Total plasma protein (g/dL)	Dehydration status and comments
Reference interval	25-46%	5.5-7.7 g/dl	
Day 1 (presentation)	13	8.5	10-12%
Day 1, 8 hrs post presentation	8	6.0	8%
Day 1, 12 hrs post presentation	21	8.0	4 hrs post-transfusion of 5 mL of canine packed cells
Day 2	23	8.0	
Day 3	25	6.5	
Day 4	23	7.0	
Day 6	28	6.2	

## DISCUSSION

Blood and blood components transfusions in cats, is complicated due to the high prevalence of naturally-occurring autoantibodies against feline red cell antigens in the recipients and in contrast to dogs, often inducing severe hemolysis and adverse transfusion reactions (5). This is especially important in Israel, where type-B and AB blood groups account for almost 30% of the total cat population (6). Therefore, transfusion of feline blood and its products in cats requires prior blood typing or crossmatching of the donor and recipient, and preferentially both, as transfusion reactions in cats have been described in cases when AB compatible transfusion were carried out, such as in cases when other naturally-occurring autoantibodies exist (e.g. against the *mik* antigen) (5).

Studies have shown that cats do not exhibit naturally-occurring antibodies against canine erythrocytes (2, 4). In most cases, pre-transfusion compatibility testing to canine blood did not show evidence of hemolysis or agglutination, while in a small number of cases minor positive cross-match was evident. In the latter cases a packed red blood cells rather than whole blood transfusion would be a better option (2). Moreover, immediate transfusion reactions in cats transfused with canine blood were not recorded following the first transfusion. In most reports, the transfused cats improved clinically (2).

There are several benefits of canine to feline blood transfusions. The first is easier access to blood products as canine blood is often available from an accessible donor. The second is that there is no need for AB blood typing, which

is not available in most veterinary clinics. The third benefit is that canine blood product may serve as a feasible option for cats with “rare” blood types such as AB where blood is not always available. Another possible advantage is that such transfusions may carry less risk of disease transfer to the recipient. There is also a theoretical benefit of transfusing canine packed red blood cells to a cat suffering from severe immune mediated hemolytic anemia as cat’s anti-RBC antibodies would not recognize the canine erythrocytes and therefore not cause hemolysis of the transfused canine RBC’s. It is noteworthy, that there is no report in the literature of canine to feline transfusion for the treatment of feline immune mediated hemolytic anemia.

Of course, there are potential disadvantages of transfusing cats with canine blood. The main disadvantage is that antibodies to donor canine erythrocytes are detected in the feline recipient’s serum after 4-7 days following the first transfusion. These antibodies will usually lead to destruction of the donor erythrocytes, and a late hemolytic reaction (4). These account for the very short (approximately four days) lifespan of canine erythrocytes in a cat’s circulation in comparison to 30 days of matched feline transfused erythrocytes (2). Moreover, a second transfusion of canine blood to cats, administered later than 7-8 days after the first canine blood transfusion, will probably result in an anaphylactic reaction which is fatal in most cases (2, 4). Another possible risk of xenotransfusion is facilitating a pathogen to jump across species, especially single-stranded RNA viruses, due to their high mutation rate, facilitating their adaptation to the new

host (7). This has not been reported as a result of xenotransfusion in animals but should be considered.

In conclusion, this report described a case of xenotransfusion of canine packed red blood cells to a kitten, which had led to clinical improvement without adverse transfusion-related reactions. This therapeutic option should be elected cautiously, after considering the beneficial and deleterious effects to the recipient, and the availability of compatible feline blood or hemoglobin replacement preparations, and the owners’ financial constraints.

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