

Blood transfusion in veterinary practice

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A simple form of transplantation, though within the immediate reach of veterinarians, usually never carried out, because of the difficulty in getting the required anti coagulants and donors. But now it is high time to start such treatment procedures in the field.

Blood Groups in animals

Cattle : Cattle possess '11' blood group systems. A, B, C, F, J, L, M, R', S, Z and T of which 'B' and 'J' are of greatest importance. The 'B' group is very complex with over 60 different antigens. So this is even used for individual animal identification and parentage studies but it makes generally impossible to obtain absolutely identical blood from any two unrelated cattle. There are both 'J' negative and 'J' positive cattle and transfusion of 'J' positive cattle and transfusion of 'J' positive redicells to J negative recipient may result in transfusion reaction.

Dog : The dog has eight different blood groups identified as Dog Erythrocyte Antigens (DEA). The different blood groups are (common name in the bracket) DEA 1.1(A₁), DEA 1.2(A₂), DEA 3 (B), DEA 4 (C), DEA 5 (D), DEA 6 (F), DEA 7 (Tr) and DEA 8 (He)

Horses : Possess seven internationally recognized blood group systems which include 32 antigens (factors). They are A, C, D, K, P, Q and U.

Sheep : The blood groups of sheep resemble those of cattle. They have seven blood groups A, B, C, D, M, R and X. The ovine equivalent of bovine B is termed B. It is relatively complex containing at least 52 different alleles.

Goat : Five blood groups A, B, C, M and J are recognized in goats.

Pigs : Fifteen blood group systems have been identified by the letters A, B, C, D, E, F, G, H, I, J, K, L, M, N and O. The A system contains two antigens A and O. A and O like J in cattle is a soluble antigen. Transfusion of A positive blood to a negative animal may cause transient collapse and Haemoglobinuria.

Cats : Only one major blood group system, the AB system has been reported. Cats may be either A, B or AB. Transfusion of A group blood to B group recipient may result in transfusion reaction due to the presence of iso antibodies. So cross matching is essential in cats.

Chicken : They have at least 12 different blood group systems with multiple alleles.

Transfusion

Blood transfusion is indicated in acute and chronic loss of whole blood, different types of anaemia, coagulopathies such as thrombocytopenia, Vit. K. Antagonists, Haemophilia or Disseminated intra vascular coagulation also in cases of severe hypoproteinaemia.

Cross matching

Because of the rare presence of allo or isoantibodies in animals (Human being has got preformed antibodies like 'A' group having 'B' antibody) first transfusion can be done without cross matching. The blood from the same animal can be transfused again only before the development of antibodies for the first transfusion. Otherwise blood from a different donor should be used. However it is more safe to do cross matching before transfusion. This can be done in a nearby lab.

1. Major Cross match

Cross matching donor RBC with recipient serum or plasma

2. Minor Cross match

Cross matching recipient RBC with donor serum or plasma.

To obtain suspension of RBC, 0.5 ml of blood is taken in a test tube containing 10 ml NSS, tube is gently shaken to wash the RBC, the supernatant fluid is poured off after centrifuging and fresh saline is added to make 2% or 3% suspension.

Plasma is separated by centrifuging an anticoagulant added blood sample.

In compatibility is seen as either haemolysis or agglutination when mixed sample is incubated for 15-30 minutes at room temperature. The result must be

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checked microscopically also. Major cross match should be always compatible and minor is important when large amount of plasma is transfused.

Under field conditions cross matching can be done by placing a drop of anticoagulant on a slide. Then put one drop each of recipient's and donor's blood to it. Gently mix and after a few minutes observe directly, under a magnifying lens or under a microscope for the presence of clumping or haemolysis.

Anticoagulant used

1. Sodium Citrate : - 10 ml of a 3.85% solution to each 100 ml of blood collected.

2. Heparin (20-30 mg/ 500 ml of blood)

3. Acid citrate Dextrose solution - a (ACD-A)

Containing - Citric Acid - 7.3 g
Sodium citrate - 22.0g
Dextrose - 24.5 g
per litre of solution.

Dose : 15 ml/100 ml of blood collected.

4. ACD formula B

Containing - Citric Acid - 4.4 g
Sod Citrate - 13.2g
Glucose - 14.7g
per litre of solution.

Dose - 25 ml/100 ml of blood collected.

5. CPD - Better initial survival as well as longer red cell half life is observed when a citrate phosphate dextrose solution is used.

It contains - Citric Acid - 3.2g
Sod. Citrate - 25.8 g
: Glucose - 25.0 g
· $\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$ - 2.18 g
per litre of solution

Dose - 14 ml/100 ml of blood.

If sodium citrate or Heparin is used, collected blood must be transfused immediately as there is no energy source for RBCs. Also anticoagulant effect of heparin is neutralized by antiheparin and thrombo plastic materials released from cellular elements of blood.

For field we these solutions can be prepared in the hospitals or ACD bottles (cost-approx-Rs.35/-) are available in medi-

cal shops and surgical shops containing 75 ml of solution for collecting 300 ml of blood. Transfusion bags are also available.

Collection of Blood

Blood can be collected at the rate of 10-15 ml/kg body wt from healthy animals. Usually collected from jugular vein of both dogs and large animals. For collection, donor sets (a tube with needles attached at both ends) are available in the field.

Components of Transfusion

Whole blood, packed red blood cells, platelet rich plasma or leukocytes.

Preservation

Whole blood, packed red cells - at 4-6°C

Plasma - 20°C

Whole blood can be stored for 3 wks when ADC is used and 4 wks when CPD is used.

Cold blood should be brought to body temp before transfusion.

Dosage of Transfusion

Normally 10-15 ml/kg body weight

A formula usually used based on PCV is

$$V = [W \times (D - P) / T] \times 90$$

V = Volume of blood needed in ml

W = Patient's weight (Kg)

D = Desired PCV, P = Patient's PCV

T = Transfusion PCV

In dogs post transfusion PCV of 25-30% is the goal.

For administration transfusion sets are available with nylon net filters, which prevents infusion of clots.

Rate : Blood should be administered very slowly, especially first portion of transfusion.

Cattle - 120 drops/minute

Horse - 70 drops/minute

Dogs - 10 ml/Kg/hr

(In anaemic animals less than 10 ml/kg/hr)

Route : Sites for the I/V transfusion of fluids. In small puppies and kitten blood is administered to the medullary canal of femur.

A 20 gauge 1"-1.5' needle is used. Needle directed to the trochanteric fossa and passed through the cortical and trabecular bone in to the medullary cavity.

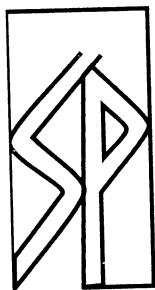
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Transfusion Reactions

Transfusion of blood must be stopped if there is sign of reaction. The signs are hiccough, urticarial eruptions, circulatory shock with hypotension, bradycardia, and apnea. Sweating, salivation, lacrimation, diarrhoea, vomiting, Haemoglobinnria, fever and convulsions. Followed by second stage of reaction like hypertension, cardiac arrhythmia, increased heart and respiratory rate.

Prevention of reactions

Diphenhydramisne can be administrated 0.5 mg/kg I/M - 15 mts prior to transfusion. Glucocorticoids like Dexamethasone and antihistamines like chlorpheniramine maleate can be administered. Transfusion reaction can be treated with adrenaline hydrochloride (4-5 ml of 1 in 1000 solution I/M) or 0.2-0.5 I/V in large animals) In case of haemoglobinuria diuretics can also be given.



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