

# CANINE & FELINE PACKED RED BLOOD CELLS



SaBB Veterinary Clinic and Laboratory Dubai

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[www.smallanimalbloodbank.com](http://www.smallanimalbloodbank.com)

## Description

Whole blood centrifuged and most of the plasma removed. This component increases the oxygen carrying capacity by increasing the circulating red blood cell mass.

## Contents

Erythrocytes, leukocytes, non-viable platelets and a small volume of plasma (10-15% of the original volume). **Platelets and white blood cells in stored blood are NOT viable.**

## Indications

pRBCs are indicated when blood volume is normal (normal total protein) but the animal requires oxygen carrying capacity. Symptomatic anaemia in presence of normovolaemia without clotting factor deficits

- Anaemia (regenerative and non-regenerative)
  - o Defined as a deficiency of RBCs or hemoglobin (Hb).
  - o HCT of 15% to 18% may be a reasonable trigger guideline
  - o Hemolytic anaemias - IMHA, haemoparasites, toxicity...
  - o Hemorrhagic anaemias
  - o Anaemias due to kidney failure or bone marrow disorders
  - o Surgeries - prior correction of anaemia or when large intraoperative blood loss is expected
    - Used to ensure a minimum PCV of 28% in critical patients or patients undergoing anaesthesia.
    - o During or after resuscitation, to allow for increased oxygenation capacity.
- Acute hemorrhages: can be combined with plasma, synthetic colloid or crystalloid solutions.
- May be used to help restore blood volume following significant hypovolemia without significant red cell mass deficit\*
- Active bleeding due to the deficiency in clotting factors\*
  - o fresh frozen plasma must also be administered
  - o Component therapy (use of pRBC and FFP together) can be used to replace significant blood loss if the patient's platelet count is adequate and a WB donor is not available.
- Patients with anaemia and thrombocytopenia:
  - o Treat with pRBC until PCV is 35% before transfusing platelets.
- Bleeding\*

- A decrease of 15% in PCV increases bleeding time by 60%, regardless of platelet count. Erythrocytes stimulate the production of thromboxanes and ADP. The increase of the PCV displaces the platelets to the periphery of the vessels and increases the interaction with the vascular endothelium.
- Animals with low volume or poor contractility
  - Anaemia caused by lack of production (lack of erythropoietin, aplastic anaemia) or a destructive process (hemolysis)
    - may require a higher Hb to maintain DO<sub>2</sub>.
    - DO<sub>2</sub> = cardiac output x oxygen content of blood (CaO<sub>2</sub>)  

$$CaO_2 = [(PaO_2 \times 0.003) + (SaO_2 \times Hb \times 1.34)]$$

$$CO = \text{stroke volume} \times \text{heart rate}$$

## Contraindications

- If pharmaceutically treatable anaemias and if the clinical condition of the patient permits sufficient time for these agents to promote erythropoiesis.
- Do not use pRBC to correct clotting or platelet deficiencies.
- Use ONLY 0.9% Saline. Simultaneous use is only required for concomitant rapid volume expansion
  - Flush catheters before and after the transfusion
  - Calcium containing fluids such as Hartmann's solution must NEVER be used with blood products
- Do not administer parenteral medications at the same time or same line
- Gently shake the contents of each bag of blood beforehand.
- Do not use any blood bag that is damaged, has visible clots or is discolored due to hemolysis.
- Use the unit within 24 hours after opening it. Store the unit in the refrigerator between transfusions.

## Side effects and Hazards

Blood typing prior to administration should be standard procedure and cross matching will be required if a transfusion has been given more than 4 days previously. Despite blood typing and crossmatching, the animal may experience adverse reactions (reported up to 29%)

- Ammonia levels can increase in stored red cell products
  - Hence use with caution in dogs with known liver disease
- Disease transmission, bacteremia or endotoxemia, and hemolytic transfusion reactions are similar to those for WB.
- Allergic reactions, circulatory overload and metabolic complications are lower because of removal of plasma
- It is unlikely that any side effects of the mannitol would be observed.
- Increased body temperature was the most common transfusion reaction.
  - pRBCs are also less likely to cause febrile non-haemolytic transfusion reactions.

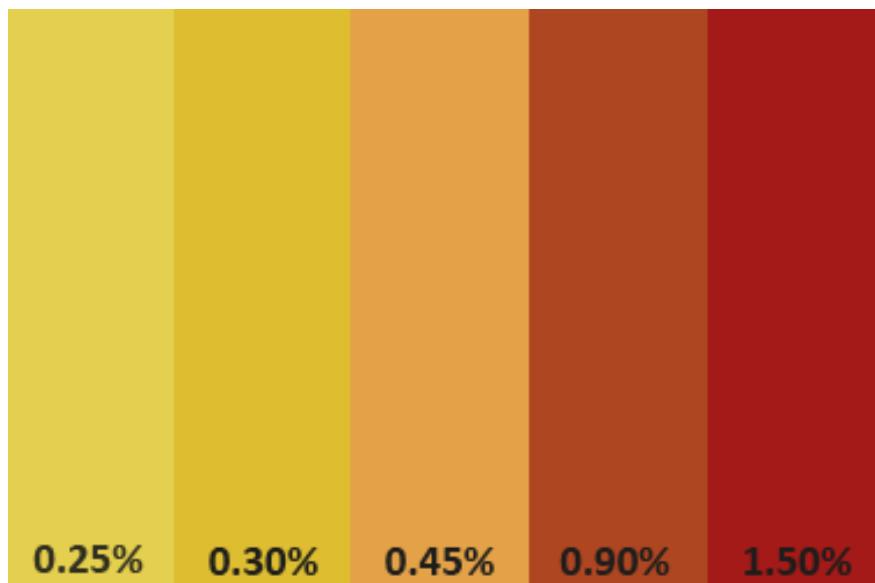
## Precautions

- Warm gently to room temperature or body temperature (37°C) using a water bath. Water must be monitored using a thermometer as it must not go above 37°C.
- Protect the unit in a plastic zip lock bag
- Always use product with a filter (Do not reuse them)
- Infusion pumps are not recommended (unless specified by the manufacturer)

- In order to achieve maximum shelf life
  - o Refrigerated pRBC should be mixed by gentle inversion several times each week to be evenly exposed to and bathed in the nutrient solution, during storage
- Re-suspension with 0.9% NaCl to decrease viscosity is no longer required as the nutrient solution has been added
- Any red cells remaining in the bag or syringe 4 hours after breach or withdrawal into a syringe (and remaining at room temperature) must be discarded. Blood units can be separated into smaller volumes if the time over which they are to be given will exceed 4 hours
- The refrigerated shelf life is (at 1-6C):
  - o CPD and SAGM: approx.. 42 days
- Units may only be at room temperature for 30min before needing to be placed back into cold storage if not used.
- Before use, measure the % of hemolysis
  - o If hemolysis > 1%, the PRBC unit should not be used.

**Qualitative method of evaluation:**

  - Shake the PRBC unit gently;
  - Transfer a sample of the PRBC to a microhematocrit capillary tube (after rejecting the first 5 ml);
  - Centrifuge the capillary tube at 5000 rpm for 10 minutes;
  - Evaluate the color of the supernatant (Consult color scale).



## Administration

- pRBC units
  - o of the DEA I- group may be used in DEA I- or DEA I+ patients, even after the second transfusion (since they do not induce the formation of Ab against this Ag)
  - o DEA I+ units should only be used in DEA I+ patients.
- **FOR CATS**, typing prior is MANDATORY
  - o pRBC should only be transfused from the same blood group.
- CROSSMATCH even if the above criteria are met in canines. In felines it is strongly recommended even on the first transfusion

- The intravenous catheter to be used should be placed no earlier than 24 hours prior
- Filters should be used
- Refrigerated units must sit at room temperature for 30 minutes or be warmed to avoid hypothermia and arrhythmias
- Perform a PCV check before and 3-4h after transfusion to evaluate response
- The preferred site for transfusion is intravenous
  - o Alternate sites for very young or compromised animals are intraperitoneal and intramedullary (trochanteric fossa of the femur is location of choice).

## Dosage

- The dose of pRBC can be calculated as listed for WB
  - o This extra fluid volume (Nutrient solution) should not be included when determining the volume for transfusion, but must be considered as part of the patient's total fluid requirement
  - o In an emergency, pRBC can be given at up to shock rates

### Quick Guide:

- 1ml/kg pRBC can raise the PCV by 1%
  - o 10 ml/kg PRBC increases the PCV by 7-8%, which corresponds to a therapeutic unit.
- Amount to be transfused (mL) =  $(PCV_{desired} - PCV_{current}) / PCV_{donor} \times \text{blood volume (ml/kg)} \times Wt (kg)$   
→[Blood volume: dog = 88 ml/kg ; Cat = 66 ml/kg]
- Transfusion should not last more than 4 hours
- Target PCV is usually +10% than the current recipient PCV
  - o Generally, it should be 25-30% in dogs and 20-25% in cats.

## Infusion Rates

Due to the wide range of infusion rates, close monitoring of the patient is essential to determine the most appropriate rate. This may be adjusted throughout the transfusion.

If the volume transfused exceeds 20 ml/kg/day, serum calcium should be monitored. Hypocalcemia may cause arrhythmias hence ECG and serum calcium values monitoring is recommended

- Initial rate: 0.5-1.0 ml/kg/h over a 30 minute period (Monitor for transfusion reaction)
  - o After that:
    - Normovolemic dogs: 5-10ml/kg/h for 1-2 hours
    - Normovolemic cats: 3-5ml/kg/h for 2-3 hours
- Hypovolemic patients up to a max of 22 ml/kg/h
- High risk patients (circulatory compromise, heart or renal failure, hypotension): 0.9-2ml/kg/h
  - o starting with the slowest rate and gradually increasing
- For acute needs, patients can usually tolerate transfusion given at 4-6 ml/minute.

The volume of pRBC generally transfused should not exceed 1.35- 2.25ml/kg given once or twice daily and not more than 4.5 ml/kg over a 24 hour period for normovolemic animals.