Stored PRBC Unit Quality

Background

Packed Red Blood Cells (PRBC) undergo changes during storage at 2-6°C. The changes are minimised through processing techniques, addition of SAGM nutrient solution and correct on-site product management.

The changes that occur in stored PRBC include an increase in lactate and potassium; and a decrease in 2,3 diphosphoglycerate (2,3 DPG) and adenosine triphosphate (ATP). There are also morphological changes to the red cells that result from oxidative stress. There is an increasing amount of veterinary interest in the safety of transfusing older PRBC because the level of haemolysis, and concentration of free haemoglobin, increases over time. Current evidence shows there is no overall increase in morbidity and mortality when older units are transfused but there may be a higher incidence of febrile non-haemolytic transfusion reactions. A 2020 study (Rodrigues et al) supported this reporting transfusion of PRBC units stored for up to 21 days increased recipient PCV without causing any harm. However, there is evidence to support the use of younger units in dogs with pre-existing haemolysis. The ACVIM recommends using red cell units less than 7 – 10 days of age (Swann et al, 2019).

The maximum acceptable level of haemolysis for a unit to be transfused in humans is 0.8% in Europe and 1% in the USA. A 2018 study of canine PRBC (Ferreira et al) recommended that all units over 35 days old were checked for haemolysis to ensure levels were <1% before administration. Therefore, Pet Blood Bank recommend veterinary practices check haemolysis of PRBC units over 35 days old immediately prior to use.

Checking for haemolysis

Thoroughly mix the unit and, using sterile technique, take a 5ml sample of PRBC using a need free access spike and place the sample into a suitable tube. Do not use one of the attached segments (aliquots) as these are not representative of the haemolysis in the PRBC unit. Measure PCV and total haemoglobin (Hb) of the PRBC sample. Total Hb can be measured using a Hemocue whole blood Hb analyser. Centrifuge the sample to pellet the red cells and remove the supernatant (plasma / SAGM solution) to a second tube. Free Hb in the supernatant can be measured using a Hemocue plasma / low Hb device). The % haemolysis is calculated using the formula below:

% haemolysis = supernatant Hb g/dL × (100 – PCV) / total Hb g/dL

Units with ≥ 1% haemolysis should be discarded.

Alternatively, evaluate the colour of the supernatant using the Pet Blood Bank Haemolysis Colour Chart.

- PRBC units with a supernatant with colour 1 - 5 are suitable for use.
- **PRBC units with a supernatant with colour 6 - 10 are not suitable for use and should be discarded.**

All Pet Blood Bank PRBC units have an expiry date of 42 days from the collection date. This is the date when the product is no longer safe to use and should be discarded.

References

Ferreira, RRF, et al. (2018) 'In vitro hemolysis of stored units of canine packed red blood cells', *Journal of Veterinary Emergency and Critical Care*, Vol. 28, No. 6, pp. 512 – 517

Rodrigues, RR, et al. (2020) 'Evaluation of hematologic, biochemical, and blood gas variables in stored canine packed red blood cells, and the impact of storage time on blood recipients', *Veterinary Clinical Pathology*, Vol. 49, No. 2, pp.198 - 208

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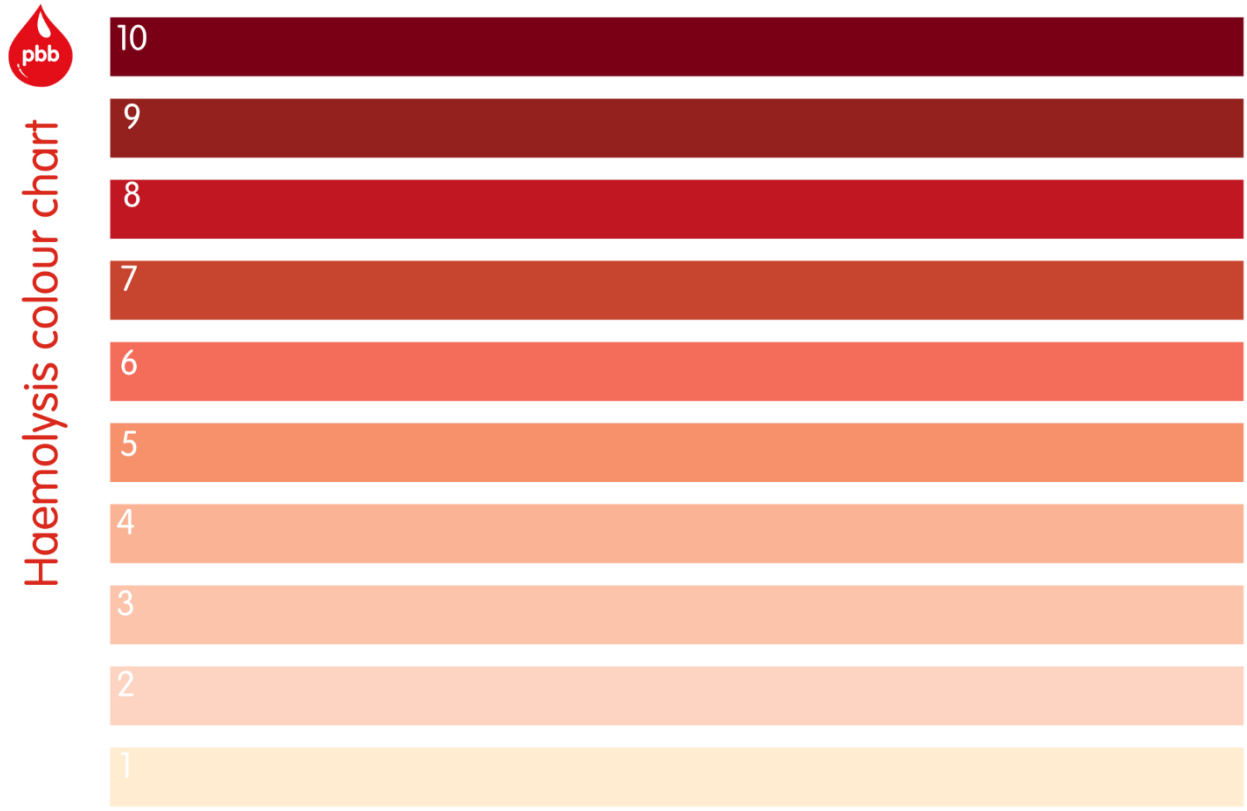
Swann, JW, et al. (2019) ACVIM consensus statement on the treatment of immune-mediated hemolytic anemia in dogs', *Journal of Veterinary Internal Medicine*, Vol. 33, pp. 1141 – 1172



1-5 PRBC unit suitable for use
6-10 PRBC unit NOT suitable for use