Stored PRBC Unit Quality

Packed red blood cells undergo many changes during refrigerated storage which are collectively referred to as storage lesions. We reduce the occurrence of these changes with the processing techniques we use and with the anticoagulant and red cell nutrient solutions we add. These changes can be further minimised with correct on-site product management.

The changes that occur in stored red cell units include an increase in lactate and potassium and a decrease in 2,3 diphosphoglycerate (2,3 DPG) and adenosine triphosphate (ATP), as well as morphological changes to the red cells resulting from oxidative stress. These changes are, in most cases, regarded as clinically insignificant in human transfusions as most recipients will reverse or compensate for the changes.

There is an increasing amount of veterinary interest in the safety of transfusing older red cell units on the basis that the levels of haemolysis increase over time in stored units and increased concentrations of free haemoglobin. Current evidence shows there is no overall increase in morbidity and mortality when older units are transfused, although there may be a higher incidence of febrile non-haemolytic transfusion reactions. A 2020 study (Rodrigues et al) supports this reporting transfusion of PRBC units stored for up to 21 days increased recipient PCV without causing any harm. There is, however, 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. Practices may consider performing some quality control of older stored red cell units immediately prior to use. 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.

This should be done using approximately a 5ml sample of blood taken directly from the unit after thorough mixing and not using one of the attached segments (aliquots) as these are not representative of the haemolysis in the unit. Sample procurement must be carried out using sterile technique to prevent contaminating the unit and with wide bore access to prevent any increase in haemolysis (needless access spike). The sample should be placed in a tube to allow for PCV and haemoglobin analysis.

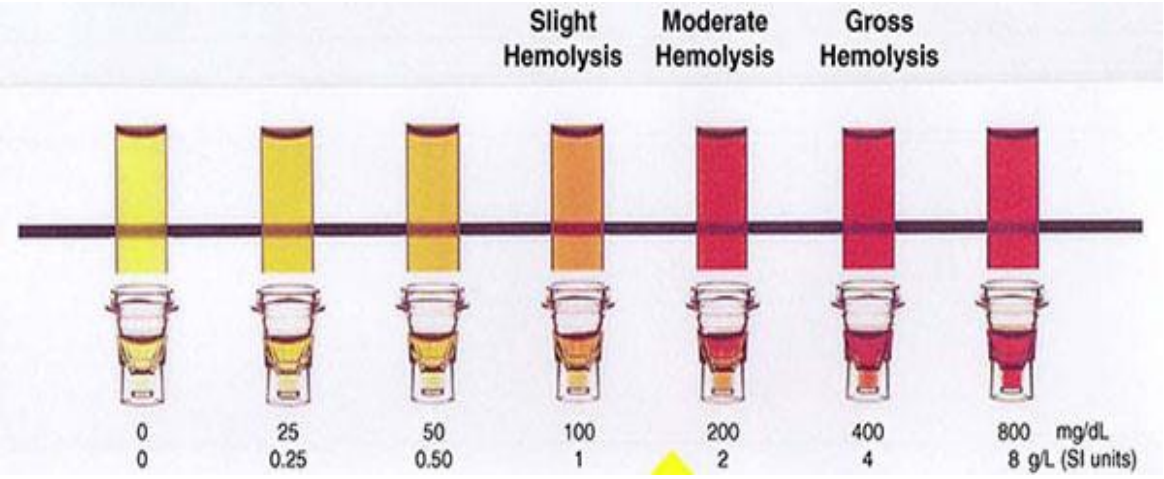
After measurement of the PCV and total Hb, the sample should be spun to separate the plasma/red cell nutrient from the red cells. The supernatant should then be removed to another test tube, and the Hb measured using an appropriately sensitive device (e.g. Hemocue Plasma/Low Hb device).

The haemolysis percentage is calculated using the formula below:

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

Units calculated to have a 1% or greater percentage of haemolysis should be discarded.

Alternatively, a visual haemolysis score may be used to evaluate the level of colour change in spun plasma. When using this scale, units demonstrating a haemolysis level of 1/100 or above should be discarded.



All Pet Blood Bank red cell units have an expiry date which is 42 days from the collection date. This is the date on which the **product should be discarded** and is no longer safe to transfuse.

References

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Swann, J. W., Garden, O. A., Fellman, C. L., Glanemann, B., Goggs, R., Levine, D. N., Mackin, A. J. and Whitley, N. T. (2019) ACVIM consensus statement on the treatment of immune-mediated hemolytic anemia in dogs', *Journal of Veterinary Internal Medicine*, Vol. 33, pp. 1141 - 1172