

Administration of Red Blood Cell Products

(packed and whole blood)

STANDARD OPERATING PROCEDURE



# of Pages	5	Version	1.0
Date of Issue		Date of Last Revision	11/20/2024
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Status			

Introduction (brief overview)

This Standard Operating Procedure (SOP) outlines the guidelines and protocols for the safe and effective administration of red blood cell (RBC) products, including packed RBCs and whole blood, to animals within BluePearl. The purpose of this SOP is to ensure consistency in the administration process, minimize risks associated with blood transfusions, and optimize patient outcomes. Adherence to this SOP is essential for maintaining a high standard of care and ensuring the well-being of patients.

1. **Blood type** ALL patients. DOCUMENT in the medical record as a medical alert in Cornerstone or your hospital EMR for easy future reference.
 - a. More than 50% of dogs are DEA 1 positive. We encourage giving type-specific blood. Also remember a DEA 1 negative dog can receive DEA 1 positive for the 1st transfusion only.
 - b. Some exceptions for dogs, may include the need for immediate blood transfusion due to cardiovascular instability or severe autoagglutination in dogs; however, when time permits, a saline wash prior to blood typing in patients with hemolytic processes is recommended.
 - c. ALWAYS blood type cats. Cats have naturally occurring antibodies that can result in severe or even fatal reactions. They should always be given type-specific blood products.
 - d. If anemic, ensure manufacturer guidelines are followed for the specific blood typing product (e.g. Alvedia, DMS/Rapidvet-H). Spun RBCs are sometimes recommended vs whole blood.
 - e. In hemolytic processes, performing a buffered saline wash at least three times is recommended for most accurate results.
 - f. Ideally, confirm the test result with an additional trained nurse or doctor.
2. **Dedicated intravenous catheter**
 - a. A newly placed IVC is preferable, but this is not required and must be based on assessment of patient's current IVC maintenance and urgency for blood product(s).
 - b. Peripheral is preferred over central. In people, there is some evidence that administration through a central line has been associated with increased risk of emboli and catheter associated blood infections. If needed, however, central lines (lumen/multi-lumen/PICC) can be used on a case-by-case basis and at the doctor's discretion.
 - c. Use the largest bore appropriate for the patient. 18 to 20g is typical for dogs. 20 to 22g is preferred for cats, however, do not delay transfusion in an unstable patient for placement of a larger IVC. 24g catheters and smaller have been associated with increased risk of hemolysis.

3. **No medications should be administered during a transfusion.**
 - a. If unavoidable, injectable medications should be administered through a separate IVC (or port). Never mix chelating agents (i.e. calcium containing fluids/medications such as LRS and calcium gluconate) with blood products.
 - b. Unless otherwise directed by the doctor, remove food and water during transfusion.
4. **No other fluids should be administered during a transfusion.** If continued IV fluid therapy is deemed necessary during a transfusion, avoid LRS as it contains calcium, a chelating agent.
5. **Confirm dose volume** (mL/kg, single unit, double unit) and duration of administration. For pRBC, ~1.5mL/kg raises PCV 1%. For whole blood, ~2mL/kg raises PCV 1%. If >20mL/kg is prescribed, be sure to confirm with the doctor to reduce risk of transfusion associated cardiac overload (TACO).
6. **Choose your product.** Evaluate your inventory and choose the appropriate RBC product.
 - a. Give type-specific RBCs whenever possible to dogs! This is important to responsible usage of blood products.
 - b. ALWAYS give type-specific RBCs to cats.
 - c. Use the product with the nearest expiration date. Some exceptions may include certain conditions such as sepsis, hemolytic anemia, and liver failure at the doctor's discretion.
7. **Inspect the product** for leakage, clots, discoloration, other abnormalities. If you have any concerns, please bring them to the attention of the doctor. If deemed unusable, waste product via [Repleni-Trac](#).
8. **Crossmatch** when indicated.
 - a. Canine: This is not required until 4 days after their 1st transfusion.
 - b. Feline: Although a crossmatch is not required for the 1st transfusion, it should be considered due to the possible presence of the *Mik* or other previously unidentified antigens (e.g. FEA) of currently unknown clinical significance.
 - c. In hemolytic processes, performing a buffered saline wash on recipient cells three times is recommended for most accurate results for manual and/or minor crossmatch tests.
 - d. Follow manufacturer guidelines. Some tests recommend washing the donor cells in specific situations such as longer storage times.
9. **Always log product out using Repleni-Trac.** To ensure you are choosing the correct product, utilize the barcode scanner after product selection.
10. **Do not actively warm** red blood cell products. Heat causes hemolysis.
11. **Limit blood exposure to the air.**
 - a. Oxygen causes hemolysis and increases the risk for bacterial contamination.
 - b. Blood products should ideally remain in a closed system, but if a small volume (e.g. <60 mL) transfusion is deemed necessary based on patient size, use a luer lock blood spike ([Bag Access Spike Clave](#), [Baxter Blood Bag Spike Adapter](#)) for removal OR if supplies are available, transfer bags and [aluminum sealing clips](#). Do not tie bag lines for closure. This is not an air-tight seal. Always choose the smallest unit available in this scenario. This should be done wearing gloves and with strict aseptic technique.
 - c. Apply patient label with date and time of puncture/administration and new expiration to unused product and return to refrigerator. Once punctured, the new expiration is 24 hours. Unless utilizing a hood and tube welder, all punctured products have an expiration of 24 hours.

12. Use a **filter** for administration of ALL blood products.

- a. **Blood administration set with in-line filter (170-260- μ m):** recommended for dogs when larger volumes are administered (e.g. >60-75mL). Similar, smaller volume in-line filter administration sets are also available for use in cats and small dogs, however, the loss of RBC volume in the filter may be significant and lead to smaller volumes transfused than prescribed.
- b. **18- μ m micro-aggregate filter (Hemo-Nate filters):** It is preferred to use these in cats only. These filters have not been shown to affect hemolysis of RBCs in cats. In dogs, a marked decrease in post-transfusion RBC lifespan within 24 hours has been observed. It is recommended to follow manufacturer guidelines and prefilter blood by drawing blood through the filter prior to administration using the appropriate syringe size. Draw the blood slowly with consistent pressure. These filters have a volume limit (~50mL of Whole Blood & pRBC; ~20mL of pRBC without additive solution). Always change the filter if there is excessive pressure or clots observed. No additional filtration is needed when using this method of pre-filtering. [Hemo-Nate Product Guide](#)
- c. **150- μ m filter:** This may be used for both feline and canine RBC transfusions. The filter can be placed at any point in the infusion line and has a volume limit of 250mL. This is the recommended minimum filter size for canine RBC transfusions. It should be used if you are not using a blood administration set with an in-line filter (see above). It is ideal for cats and small dogs and is designed for small volume blood transfusion via a syringe pump. It can also be used on standard fluid lines (i.e. administration sets that do not contain an in-line filter). [IAS SA150](#). Available through HemoSolutions and MILA.
- d. [Guide to choosing your in-line filter](#)

13. **Pre-filtration of blood**

- a. Blood may be pre-filtered through a 170-260- μ m filter prior to administration via a syringe pump, however pre-filtration with syringe administration should be limited to small volume transfusions (single syringe) to limit exposure to air. Larger volumes should be administered as outlined in #14. No additional filter is necessary following a prefiltration technique.
- b. Hemo-Nate recommends pre-filtration.

14. **Administration technique**

- a. **Gravity flow** with a standard transfusion line (170-260- μ m filter), is associated with the least amount of hemolysis. If you are comfortable setting and monitoring flow rates by counting drops/mL, or if rapid administration is necessary, this is an excellent option to limit physical damage to RBCs. Gravity administration is not preferred in small dogs and cats due to the small volumes transfused and potential loss of RBCs in in-line filter systems.
- b. **Volumetric/Piston** (e.g. [Plum A/360](#)) are preferred to peristaltic (e.g. Heska) and rotary pumps to reduce hemolysis. Peristaltic pumps have been used successfully with minimal hemolysis; however volumetric/piston is recommended.
- c. **Syringe pumps** are typically reserved for cats and small volume canine transfusions (single syringe, <60mL).

15. **Assess hemolysis** before administration (especially in units >28 days old).

- a. Hemolysis should be <1%. Hemolysis increases the risk of a transfusion reaction. It is recommended to discard products with hemolysis that exceeds 1%.
- b. After bleeding your administration line, collect a sample using a hematocrit tube and centrifuge. Do not use pigtails.

- c. Assess using either a quantitative analyzer ([Hemocue Plasma/low Hb](#)) or a colorimetric scale (scale from [BSA](#) previously provided to hospitals).
 - d. Colorimetric scales are subjective and intended to act as a guide. Blood products may be administered at clinician discretion.
16. **Administration Rate:** A starting rate of 1-2 mL/kg/h for the 1st 15 minutes is typical, however there is not strong evidence to suggest starting a transfusion at slower rates decreases the risk of transfusion reactions. Blood should be administered within 4 hours of removal from the refrigerator regardless of the starting rate. The final rate is determined based on volume and the prescribed timeframe of administration.
17. **Complete a blood transfusion monitoring sheet**
- a. The sheet should include patient information, patient blood type, blood product details, reason for transfusion, baseline vitals, initial PCV/TS, hemolysis, etc.
 - b. It is recommended to monitor temp, heart rate, respiratory rate/effort, and blood pressure during a transfusion. Based on patient status and tolerance, multi-parameter monitors can be used for ease.
 - c. Measure and record the recommended parameters at 0, 5, 15, 30 then every 60 min.
 - d. Be sure that all monitoring is captured via Instinct and/or in the medical record (e.g. scan paper sheets into the patient's record)
 - e. The patient should be visually evaluated throughout the transfusion for signs of reaction such as hives, drooling, vomiting, diarrhea, and increased respiratory rate.
 - f. Alert the doctor immediately of any signs of a transfusion reaction or concerns and document transfusion reactions in the medical record and Repleni-Trac.
 - g. AVHTM/ACVECC [TRACSpack](#) can be purchased that provide algorithms for recognizing and treating transfusion reactions in addition to monitoring sheets.
18. **Post-transfusion PCV** can be assessed as early as at conclusion of transfusion.
19. **Continue to monitor** the patient closely for 24 hours as delayed reactions can occur in that timeframe. There are, however, rare reactions that can present up to 28 days post transfusion. Log all transfusion reactions in Repleni-Trac.

***Consider making separate blood transfusion kits for small dogs, large dogs, and cats based on recommendations and hospital supplies.*

TRANSFUSION MONITORING SHEET

RECIPIENT DETAILS

Name: _____
Signalment: _____
Case no: _____
Blood type: _____
PCV/TS: _____ Serum/plasma colour: _____
Body weight: _____
Previous transfusions: _____
Reason for transfusion: _____

PRODUCT DETAILS

Blood product ID: _____
Date of collection: _____
Expiry date: _____
Blood type: _____
PCV/TS: _____ Serum/plasma colour: _____
Unit volume: _____

Clinician: _____ Signature: _____

(Please circle) PRBC FFP FWB Other (specify): _____
Canine Feline Canine Feline Canine Feline Canine Feline

Administration plan (volume & rate): _____
Name: _____ Signature: _____

Cross-matched? Compatible Incompatible Not evaluated Method of admin: Gravity Syringe driver Fluid pump

Correct patient (initialled by 2): _____ Correct unit (initialled by 2): _____ IV catheter checked: _____

Start time: _____ Date: _____ Person starting transfusion: _____

	Time	Infusion rate ml/hr	Resp. rate	Pulse rate	MM Colour & CRT	Temp °C	Mentation	S/D/M blood pressure	Serum/plasma/urine colour	Angioedema/Erythema/Pruritis (Y/N)	Vomit or diarrhea (Y/N)	Other concerns
Pre-transfusion												
5 mins												
15 mins												
30 mins												
60 mins												
2 hours												
3 hours												
4 hours												
15 mins post transfusion												
1 hour post transfusion												
24 hour post transfusion												

Finish time: _____ Volume infused: _____ Post-transfusion PCV & time: _____

Comments: _____

FOLLOW TRANSFUSION REACTION GUIDELINES IF YOU SUSPECT A REACTION

Reference

- Davidow EB, et al. Association of Veterinary Hematology and Transfusion Medicine (AVHTM) Transfusion Reaction Small Animal Consensus Statement (TRACS) Part 2: Prevention and monitoring. *J Vet Emerg Crit Care*. 2021;31:167-188.