

Cattle, sheep, and goats

# Blood Transfusion in Livestock

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#### Cattle, sheep, and goats

• The 11 recognized blood groups in cattle are A, B, C, F, J, L, M, R, S, T, and Z with groups B and J being the most clinically relevant. The B group itself has more than 60 antigens, thereby making closely matched blood transfusions difficult. The J antigen is a lipid found in plasma that is not a true erythrocyte antigen; it is usually acquired to varying degrees early in life. Cattle with anti-J antibodies, despite having erythrocytes with a small amount of adsorbed J antigen that apparently type negative, can develop transfusion reactions when receiving J-positive bloodVaccinations of blood origin (some anaplasmosis and babesiosis vaccines) may sensitize cattle to erythrocyte antigens that could result in NI in subsequent calves

#### Seven blood groups have been identified in sheep (A, B, C, D, M, R, X). The B system has more than 52 factors .The R system is similar to the J system in cattle (i.e., antigens are soluble and passively adsorbed to erythrocytes). The M-L blood group in sheep is related to active potassium transport in reticulocytes

• the blood groups of the goat (A, B, C, M, J) are very similar to those of sheep, with the B system equally complex .Many of the reagents used for blood typing of sheep also have been used to type goats.

## Donor selection

# • Ruminants can donate 10–15 mL/kg of body weight. Closely matched transfusions are very difficult in cattle; first transfusions are generally low risk, but ideally a donor would be negative for the J antigen

 Similarly, typing and matching blood for sheep or goat transfusions is impractical. Prion diseases have been shown to be transmitted by blood transfusion in sheep and should, therefore, be a consideration for disease screening prior to blood transfusion in ruminants

### Horse blood transfusion

- The seven internationally recognized blood groups in the horse, A, C, D, K, P, Q, U, include more than 30 antigens
- Because of various antigenic combinations, no universal donor exists. To minimize transfusion reactions, blood typing of the donor and recipient is ideal but often impractical. An earlier report indicating short transfused cell life span and limited utility of compatibility testing in horses has recently been refuted
- At the very least, crossmatching prior to transfusion is recommended

 Aa and Qa alloantigens are extremely immunogenic; both are hemolysins, and most cases of NI are associated with anti-Aa or -Qa antibodies. In addition, anti-Aa a Ca are agglutinating antibodies. It is important to note that Qa will not be detected with an agglutination test



 Blood types vary among horse breeds, with Thoroughbreds and Arabians having a high prevalence of antigens Aa or Qa compared to other breeds, and Standardbreds lacking the Qa antigen

 A unique donkey and mule erythrocyte antigen (donkey factor), not found in the horse, puts all mule pregnancies at risk for NI

- Although erythrocyte antigens Aa or Qa have been associated with approximately 90% of equine NI case
- other antigens including Ab, Dc, Db, De, Dg, Pa, Qc, and Ua have rarely been associated with NI in foal
- the anti-Ca antibody does not cause NL and, in fact, may actually prevent NL by removal of potentially sensitizing cells from the circulation

 Adult horses can safely donate approximately 6– 8 L of blood. Whole blood (WB) can be collected every 2–4 weeks and plasma collected every week if the erythrocytes are returned to the donor **Donors should be in good health**, and male donors may be preferred as they are less likely to have been previously sensitized Additionally, screening for equine infectious anemia and ensuring PO and plasma protein concentrations are within normal limits are recommended. Mares that have been pregnant or foaled and horses that have received blood or erythrocyte-contaminated plasma transfusions should be excluded as potential donors. A totallycompatible blood transfusion is unlikely to be achieved in the horse. **Crossmatching to identify the least incompatible donor is** recommended to minimize adverse transfusion reactions but will not identify all donor/recipient incompatibiliti

 Because Aa and Qa erythrocyte antigens are extremely immunogenic, Aa- and Qa-negative dono are the best choice as donors to recipients of unknown blood type. In cases of NI, the dam's v erythrocytes may be used for transfusion to severe anemic foals, whereas a transfusion from the sire to foal would be contraindicated

• While blood transfusion can be life-saving to foals with NI, number and volume of transfusions must be limited; one study demonstrated that each administration of a blood product to a foal with NL increased its likelihood of nonsurvival by greater th eightfold, and administration of 4 or more liters (total volume) of blood products significantly increased the risk for liver failure in foals.

• Mule foals with NI could receive a transfusion from a horse not previously sensitized by pregnancy against donkey factor, since horses are known to be free of naturally occurring antibodies against donkey factor, the inspirated antigen in cases of NI in mules.

Species	Major immunogenic antigens	Naturally occurring alloantibodies	Recommended donor type	First transfusion risks and recommendations	Matched transfused RBC half-life (d)
Dog	DEA 1	Rare; DEA 3, 5, 7; cold reacting	DEA 1 type-matched or DEA 1 negative for first transfusion. Crossmatch-compatible for repeat transfusions. No prior transfusion.	Low. Use of universal donor minimizes sensitization risk. Crossmatch if ≥4 d since prior transfusion.	24 [1]
Cat	A most common	Common. Anti-B, usually mild in type A cats.	Type A	Low if A/B type-matched. High if A/B type mismatched.	29–39 [2]
	B rare except select breeds.	Common. Anti-A, strong in type B cats.	Type B	Crossmatching always recommended.	
	AB very rare – in breeds that also have B.	No anti-A or anti-B	Type AB if available (rare); Type A		
	Mik	Anti- <i>Mik</i> reported in DSH	A/B type-specific crossmatch compatible	6% in type A/B-matched blood. Crossmatch recommended.	
Horse	Complex system of 30+ antigens in seven blood groups. Donkey RBC antigen.	Occur. Anti-Aa, -Qa most important. Probably none.	None. Aa/Qa negative or same breed class is best starting choice.	Considerable; use least incompatible. High neonatal isoerythrolysis risk for mule foals.	9 [3], 24–43 [4]
Cattle	Eleven blood groups: B and J most important. B very complex in ruminants.	Occasionally anti-J.	J-negative.	Low for first transfusion. Close match difficult. Hemolytic crossmatch recommended.	12–20 [5]
Sheep Goat	Seven blood groups in sheep: sheep R similar to	Weak. Goat anti-R.	Not defined	Low for first transfusion. Hemolytic crossmatch	16 [6]

**CHAPTER 18** 

#### حجم خون مورد نیاز برای انتقال خون در اسب

بيمار PCV-طبيعىPCV طبيعى PCV بايد 30 درصد ميزان خون از دست رفته جبران شود

• یک اسب ۴۰۰ کیلوگرمی در اثر همولیز شدید دچار کم خونی شده و PCV آن ۱۰درصد می باشد. PCV یک اسب سالم بالغ ۳۵ درصد است. میزان طبیعی خون یک اسب نیز NT ml/kg وزن بدن است. تعیین کنید میزان خون لازم برای جایگزینی حجم خون از دست رفته در این اسب چقدر است؟

