



AgMOOC Course on Fluid Therapy and Management of Clinical Syndromes in Cattle and Small Ruminants

Unit : Anemia and Blood Transfusion in Ruminants

Lesson : 3

Bovine Blood Groups & Blood Collection from Donors

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Introduction to Blood Types

- Blood types (or groups) are determined by specific antigens found on the surface of erythrocytes.
- In humans, there is the ABO system of blood types, whereas animals have a variety of different blood types.
- Knowledge of blood types in the different species is important as transfusion of incompatible blood can result in severe hemolytic transfusion reactions and even death, in some instances.

Wide variation in Blood groups

- The number of blood group determinants varies considerably between species (eg, greater than 80 in domestic cattle to only 1 in the new world Camelidae).

Types of antibodies to blood group antigens

- There are two types:
 - Naturally occurring antibodies and
 - Antibodies acquired after exposure to the blood group antigen.
- Naturally occurring antibodies occur in most species and vary in their pathological significance,
 - *i.e. some will not produce a transfusion reaction.*

Acquired antibodies

- They are produced after exposure to an incompatible blood type, which is from exposure to blood or products containing erythrocytes or their antigens.
- The most common route of exposure is from previous blood transfusions, however there are less obvious sources of exposure, such as vaccinations that contain foreign red blood cell antigens.
- Antibodies that are pathogenic (i.e. induce a hemolytic reaction) can cause agglutination and/or hemolysis of red cells.

Blood Typing

- Blood typing available only for the most common blood groups.
- It is offered by a few specialized veterinary diagnostic laboratories only.
- Ideally, any animal that is routinely used as a blood donor should be blood typed for the most common antigens that produce a hemolytic reaction and (ideally) should be negative for these antigens.

Blood Type Compatibility

- Blood type compatibility (or incompatibility) is determined in the laboratory using cross matching procedures.
- Since administration of typed negative blood will not prevent a transfusion reaction to less well-characterized red cell antigens, cross matching should always be performed in an individual that has been previously exposed to blood group antigens.

Blood groups

- From a clinician's point of view, these are the antigens to which the veterinary practitioner should be most familiar.
- However, many other blood group factors and systems have been described and the lack of commercially available typing sera does not diminish the potential significance of these other systems in veterinary transfusion medicine.

Blood groups

- Blood groups are named according to the species-specific antigens present on the surface of erythrocytes.
- These antigens play an important role in inducing immune-mediated reactions and can cause complications while transfusing blood from different blood groups.
- Antigens coupled with platelets, leukocytes and plasma proteins may also induce immune mediated reactions in host animals during transfusion therapies.
- Plasma also has some naturally occurring all antibodies that can act against other blood groups without any prior exposure to the erythrocyte antigens.
- Erythrocyte antigens can induce production of antibodies when animals get exposed via blood transfusion, transplacental exposure or in the case of neonatal isoerythrolysis (NI), through colostrum.

Cattle Blood Groups:

- Recognized blood groups in cattle are:

A, B, C, F, J, L, M, R, S, T and Z.

- Out of these 11 groups, group B and J being the most clinically relevant.
- B group itself has more than 60 antigens, thereby making closely matched blood transfusions difficult.

J Antigen

- J antigen is a lipid that is found in body fluids and is adsorbed onto erythrocytes (therefore, it is not a “true” antigen).
- Newborn calves lack this antigen, acquiring it in the first 6 months of life.
- Some animals have only a small amount of J antigen on erythrocytes and none in serum; these so-called “J-negative” animals can develop antibodies against the J-antigen and develop transfusion reactions if transfused with J-positive blood.

Neonatal isoerythrolysis

- Neonatal isoerythrolysis is not a naturally occurring phenomenon in cattle.
- Bouts of NI have occurred secondary to blood-derived vaccines (e.g. against anaplasmosis, babesiosis).
- The most common antigens that cattle were sensitized to were the A and F systems.



Donor Blood Collection in Bovines

Who are the Potential donor cows

- Use the small animal blood donation rules as guidelines:
 - Young (4-5 years old) and either dry or 1+ month post calving
 - Large sized, BCS 5+ are preferable
 - Tender Loving Care after blood donation is completed
 - No specific treatment needed for donor, after donation.
 - Do PCVs on potential donors: Cows can go as low as PCV 15 before looking sick.

Anticoagulants for Bovine Donations

- 12 grams of Sodium Citrate dissolved in 300 mL saline is enough for 5 liters of blood.
- 9. 5 liters of blood is enough to keep a cow alive (even 3 is). We need to aim for at least 5 liters.
- Stored whole blood with anti-coagulant may only last 24 hours (similar to small animals).
- Therefore collect blood from donors only when needed.
- A cow with PCV of 8, who is still standing, will still be alive tomorrow; so decide based on the real need.

Collection at Clinical Settings

- Donor Cow should be large, quiet, empty if possible, or as far away from calving as possible.
- Use sedation if necessary; Take 4-5L from donor cow.
- Clip & do basic preparation of Jugular Vein
- Use 14 g needle or catheter for collection
Infuse 400ml of 3.8% Sodium Citrate solution into a 4L collection bag
(or a bucket if you don't have one).
- A good formula to use is 38g of Sodium Citrate into a 1L Hartmanns and that can support for 2 COWS.



Limitations

- No more than 20% of a donor animal's blood should be collected at one time.
- Collection, storage, and transfusion of blood must be done aseptically.



*Thank
you*