

# Neonatal Isoerythrolysis in Horse and Mule Foals

Antibodies to red blood cells (often referred to as anti-erythrocyte antibodies) can be transferred to another horse through either colostrum (as from dam to foal) or through transfusion, or they may develop to a horse's own red blood cells. When anti-erythrocyte antibodies are transferred from a mare to its foal, a syndrome called neonatal isoerythrolysis (NI) may develop. Anti-erythrocyte antibodies transferred through transfusion may cause several types of adverse reactions, called transfusion reactions. When a horse develops antibodies to its own erythrocytes autoimmune hemolytic anemia (AIHA) may occur.

## Neonatal Isoerythrolysis (NI) in Horse Foals

Neonatal isoerythrolysis is a disease of newborn horse foals and mule foals that occurs within the first week of life. (See below for information on the condition in newborn mules.) It is caused when the mare produces antibodies against the foal's red blood cells and transfers those antibodies to the foal through colostrum during the early stages of lactation and nursing. This syndrome may occur when the blood type of the mare is different than that of the stallion and the foal inherits the sensitizing red blood cell type from the stallion. Mares that are negative for red blood cell factors have the potential to develop antibodies against those factors. Mares may become sensitized as a result of exposure to blood of a fetus with incompatible blood type as a result of placentitis, difficult parturition, or from exposure to blood containing the foreign blood factors from a previous blood transfusion. Horses have 8 different blood group systems, each of which has different factors. Some of the red blood cell factors associated with NI are Aa, Ab, Ac, Ka, Pa, Pb, Qa, Qb, Qc, and Ua. In some cases, a mare may produce sufficient antibody during a first pregnancy which can cause NI in her foal. Increased risk of developing NI occurs with subsequent pregnancies due to breeding to that stallion or another stallion with the same red blood cell factor. After ingestion of colostrum containing antibodies to red cell factors, the antibodies are absorbed into the foal's blood. This is unlike the situation in humans where the antibodies (which most frequently are anti-Rh antibodies) cross the placenta during late pregnancy. The antibodies attach to the factors (antigens) on the foal's red blood cells, and through a series of reactions, cause the foal's red blood cells to rupture (erythrocyte lysis, which describes the syndrome's medical name, neonatal isoerythrolysis).

## Neonatal Isoerythrolysis (NI) in Newborn Mules

The reported incidence of NI in newborn mules is about 10%, which is higher than the incidence in horses. All donkeys possess the red blood cell antigen known as donkey factor, therefore every donkey/horse breeding has potential for NI. Mules suffering from NI frequently manifest thrombocytopenia (low platelet count) as well as anemia, presumably because of the presence of anti-platelet antibody as well as anti-red cell antibody. Alloimmune thrombocytopenia (platelet destruction due to anti-platelet antibody) may occur without NI as well.

## Determining the Potential for Developing NI

A mare that has produced a foal that developed NI is likely to produce others. The risk of producing another NI foal is greater if the mare is bred to the same stallion or a stallion with the same inciting blood type as that of the original stallion. Mares that have previously produced a NI foal are excellent candidates for anti-erythrocyte antibody screening in subsequent pregnancies. Some breeds have a higher risk of having a NI foal, such as Friesians. In addition, mares bred to a donkey are at risk of producing a NI newborn, and they are also excellent candidates for anti-erythrocyte antibody screening to test for the anti-donkey factor.

# Neonatal Isoerythrolysis in Horse and Mule Foals

## Prevention of NI

The mare's serum should be tested for anti-erythrocyte antibodies 1 to 2 weeks before she is scheduled to foal. The results of this testing determines whether a foal will develop NI. Anti-erythrocyte antibody testing is performed using a panel of red blood cells from 11 horses and one donkey. In addition, if the stallion or jack's red blood cells are available, crossmatching with the mare's serum is also performed at no extra charge. If the antibody screen is positive for lytic antibodies we recommend muzzling the foal for 24-48 hours after birth and administering an alternate source of colostrum under the advisement of a veterinarian.

Blood typing of the mare and potential stallions can provide information that is useful for preventing NI. For mares that have had a foal that developed NI, this information can be used to select a sire that is negative for the blood group factor to which she has antibodies. Currently, the following blood factors are determined: A (a,b,c), Ca, Ka, P (a,b), Q (a,b,c), and Ua.

## Diagnosis of NI

Clinical signs of red blood cell lysis in the affected foal usually occur within 6-72 hours after birth. The major clinical signs are lethargy, elevated pulse (heart rate), increased respiratory rate, anemia and jaundice. If mild, the foal may recover without treatment, however the disease may progress to severe anemia and organ dysfunction leading to death. Diagnosis is supported by demonstrating anti-red cell antibodies in the colostrum or serum of the mare.

## Samples for testing

For NI antibody screen of the mare, a minimum of 2 ml of serum is required. Allow the blood from a 10 ml red top tube to clot for at least 30 minutes, spin and separate the serum into another tube. If the mare has had a previous NI foal, submitting EDTA (purple top) whole blood from the mare and stallion is recommended. For blood typing of the mare or stallion, whole blood either in EDTA (purple top) or ACD (yellow top) is necessary.

The samples should be stored in a refrigerator until shipment. For an antibody screen (serum) or blood type (whole blood in EDTA or ACD), send samples overnight with an ice pack. Protect the samples from direct contact with the ice pack. Please ship the samples overnight via FedEx, Monday – Thursday only.

**Send the samples to:** Central Lab Receiving, VMTH Room 1033  
Attn: Hematology  
One Garrod Drive  
University of California, Davis  
Davis, CA 95616

**Contact Information:** Central Lab Receiving (530) 752-8684  
UCDVetClinicalLabs@ucdavis.edu  
Hematology (technical questions only) (530) 752-1303

**Website:** [www.vetmed.ucdavis.edu/clinical-laboratory](http://www.vetmed.ucdavis.edu/clinical-laboratory)

## Results Reporting

Generally, testing turn-around-time is 1-2 business days after sample receipt. Results will be transmitted through fax or email.