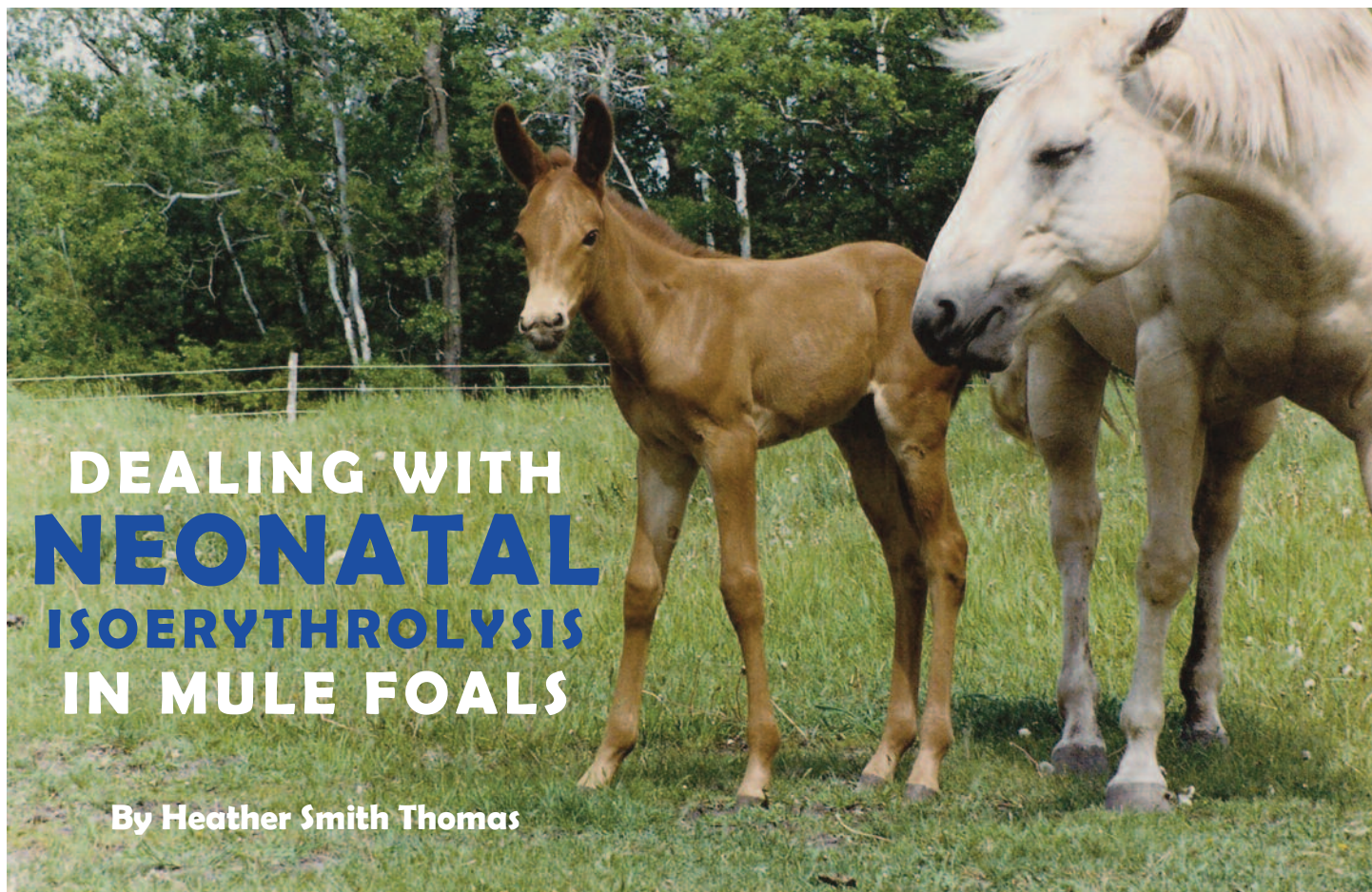




DEALING WITH NEONATAL ISOERYTHROLYSIS IN MULE FOALS

By Heather Smith Thomas

Incompatibility between blood type in sire and dam can create a lethal situation for the newborn foal. If the foal inherits certain blood components from the sire that are not part of the mare's blood make-up, her immune system recognizes his red blood cells as "foreign" and creates antibodies against them. Since there may be some blood transfer between the dam and fetus, the mare is exposed to the foal's red blood cell antigens and this triggers her immune system to attack and destroy them. The antibodies she creates do not affect the fetus, however, because they are too large to slip through the placental barrier. The foal is safe until he is born. He is at risk as soon as he drinks her colostrum.

During the final phase of pregnancy, the mare creates colostrum that is rich in antibodies, to be absorbed by the foal when he first nurses. This gives him instant protection against diseases he might encounter. All the antibodies the mare has developed (via natural exposure to diseases, or via vaccination) will be represented in the colostrum, including antibodies against the foal's own blood cells if he inherited a blood type from his sire that is not compatible with that of the dam.

Since the foal's ability to absorb antibod-

ies through the gut wall and directly into his bloodstream and lymph system is greatest during the first four hours of life and then gradually diminishes (as the intestinal lining thickens) during the next twelve hours, the foal is most at risk from his dam's deadly colostrum during his first day of life. After his intestine can no longer absorb antibodies, and after the mare's regular milk comes in, it is safe for him to drink her milk.

Blood-type incompatibility that results in the mare's antibodies attacking the foal's red blood cells is called neonatal isoerythrolysis (NI). Since it is similar to Rh sensitivity in human infants, some people have called them Rh foals. Another term is foal jaundice. Jaundice is a common sign; the yellow color of gums and other mucous membranes (such as whites of the eye) is due to breakdown of red blood cells and some of their pigment ending up in the tissues. This problem occurs occasionally in horses and more frequently in mule foals because of the dissimilarity between the blood type of the jack and the mare.

ONE BEEDER'S EXPERIENCE

Rodney Michael, a mule breeder in Gliddin, Iowa, has experienced several instances of NI (2 mares, 3 foals) in the mule foals he's

raised. He raises his mules from Belgian mares. "The first time I had an NI foal was the spring of 2009, from a mare named Barbie. I didn't expect problems because the foal was born easily at about 10:00 a.m. and everything went well. It got right up and nursed. The next morning, when the foal was less than twenty-four hours old, I discovered she was very sick and wouldn't get up. She was very lethargic. It was Sunday morning, and I thought maybe I'd give her a little penicillin and go to church and check her again when we got back. But the more I thought about it, even before I got the penicillin out, the more I realized this situation wasn't quite right and that I'd probably need some help," says Michael. He called his vet, Dr. Todd Bettin, in Lake View, Iowa.

Dr. Bettin told him to bring the mare and foal to the clinic. "He met me there and ran some blood tests. He was in the lab looking at the blood, and we were in the stall area with the mare and foal, and he came running out and told us to get that foal away from the mare and don't let it nurse. He'd diagnosed it as an NI problem," says Michael.

"It was too late to help the foal by just substituting some other milk. We had to

give her a blood transfusion and we were able to save her. That was my first experience with this problem, and the vet told me that I could prevent this from happening to a foal—and not have to resort to a blood transfusion—if I could be there when the mare foals.” A simple test could be done, to find out if the foal would be at risk.

“Dr. Bettin told me I could take blood from the foal’s navel and some colostrum from the mare, to do a quick test before the foal nurses. He said to mix the blood and the colostrum together. If they separate—looking clumpy like cottage cheese—you’ve got a problem. But if the mixture looks smooth and creamy pink, then the colostrum is ok for the foal to nurse. This can be a good first check,” explains Michael.

“I really liked the mare, and I like her foals, so I decided to breed her again, but used a different jack. Then as time went on I tried to think of ways to keep the foal from nursing, in case Barbie foaled when no one was there to watch her.” Michael was hoping the next one would be ok, if he used a different jack, but he wanted to play it safe.

“Then I learned that with jacks, once this happens to a mare, it will happen every time she has another mule foal, no matter which jack you breed her to. With stallions, you can have a different situation and the foal might be fine. But the jack’s blood is so much different from the mares’ anyway, that she is very sensitized and it will happen again each time she foals. The lab in Kentucky that my vet clinic uses said that a mare could be bred to a stallion and never have a problem, even after having NI mule foals, but she could not be bred again to a jack or she’d have another NI foal,” he explains.

“I realized I must find a way to keep Barbie’s foal from nursing when it was born. I had a camera system so I could watch from the house, but a person can still fall asleep. You might wake up and look at the camera and the foal is born and already up nursing. We looked at systems like the Foalert, and even though they are very effective, they seemed a little too expensive for just a one-time use. So I thought I could cover the mare’s udder, and this would cost less. Then the foal could be born even if I’m asleep, and wouldn’t be able to nurse,” he says.

He put a blanket on the mare, after sewing D-rings in the flank area and behind, so he could hang a cover underneath for the udder. “I had a canvas cover made, with drawstrings made of bungee cords. I put it

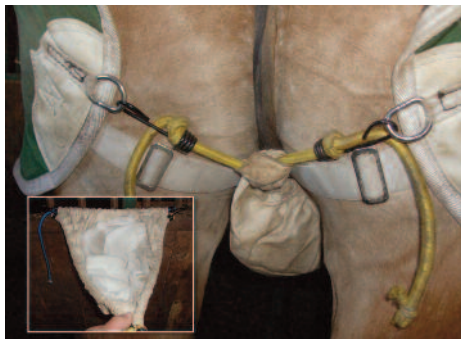
MULE FOALS ARE OFTEN AT RISK

Dr. Todd Bettin, Breda Lake View Veterinary Services, in Lake View, Iowa says virtually one hundred percent of mule pregnancies have the potential for NI. “Donkeys possess a certain blood component that the mare does not have,” he explains. If the mule foal inherits the donkey component, the mare will create antibodies against it, if any of the fetal blood gets into the mare’s blood stream.

“Normally there is very little blood going back and forth from mare to foal, across the placenta (unless there is placental disease that allows passage of blood between them), but there is an increased amount of exchanged blood in mule foals,” says Bettin.

When you realize that almost all mule foals inherit the “foreign” blood component from the jack and that some blood exchange through the placenta between mare and fetus is likely to happen, it’s easy to see how NI can occur. “Statistically this problem occurs in about ten percent of mule births. We don’t know why it doesn’t happen with more, but it may be because the amount of red blood cell antigen present in the colostrum varies from mare to mare. If there’s not a lot, the foal may have such a mild case that you’d never notice,” says Bettin.

“We speculate that there’s actually a high percentage of mule babies that have NI but in many cases is very subclinical. They recover and no one ever suspects they had it. It’s just the cases that are affected more adversely that we notice.”



Canvas cover with diaper liner for mare’s udder

tight up against the mare and had her wearing it at night, getting used to it. Then I thought that if she starts dripping milk, I want something to absorb the milk. So I put a baby diaper in it, as a liner,” he says.

“I had milked colostrum from different mares, the spring before, and froze it—so I’d have some safe colostrum on hand to feed the foal.” He realized he would need to do a lot of milking on Barbie after she foaled, to get rid of all her unsafe colostrum until her regular milk came in.

“I bought one of the Udderly EZ milkers from Buck Wheeler, the guy who makes them. His milker was a huge time-saver.



Udderly EZ milker with pint size bottle

When you’re milking that often, this makes a big difference. When milking out a little colostrum to freeze, anybody can do it by hand; you just have to be patient. But after collecting colostrum by hand, I think this milker is wonderful,” says Michael. It’s easily and quick, and doesn’t bother the mare.

“Buck asked me how I was going to keep the foal away from the mare so it couldn’t nurse, after it’s born. I told him I had a box stall with a feeder in it, and I took the feeder door out and made a little place for the foal,” says Michael. That way the mare could stick her head over and smell the foal, but the foal couldn’t nurse.

“Buck told me I should try a muzzle for the foal, and keep the mare and foal together. So I got a muzzle from him while I was waiting for Barbie to foal. She was overdue—she went 366 days—so we were watching her all the time, and not sleeping much. The night she foaled, it was a weekend and my son-in-law was here. He volunteered to take shifts. We knew she was close to foaling, because she’d waxed up real well that day. He woke me up in the night and said she was having the foal. We were both there, and the mare had the foal and I put the muzzle on it right away,” he says.



Wax on teat of mare

When the mare stood up, the udder cover came loose. “Her sides were smaller then, after foaling, and there was slack in the attachments. When she broke her water, it all ran down inside the udder bag, and the diaper soaked up a bunch of it, adding weight. This stretched the bungee cords, so the udder cover was hanging about eight inches below the udder. If we hadn’t been there at birth, I am sure the foal would have been able to stick its nose right in between the udder and that bag and nurse. But it turned out ok because we were there,” says Michael.

He may try to improve on his udder-cover idea, maybe using some kind of harness. “You wouldn’t want to use a horse blanket during hot weather. Most mule foals are born in the summer. I only has Barbie wear my blanket udder-cover at night because we were there watching her during the day. This idea seemed ok at first, but it needs some work to perfect it,” he says.

The muzzle for the foal worked very well, compared with separating the mare and foal. “We milked her every hour. I’d just tie her up and milk her with the EZ milker, and discard the colostrum. I’d have some frozen colostrum thawed and warm, to feed the foal after I milked the mare. I’d take the muzzle off and feed the foal, then put the muzzle back on. That worked very well because all the while I was milking the mare, the foal was hungry, and working around the sides of the mare, trying to nurse. I think that made the mare more cooperative and she stood more calmly for milking,” he says.



It’s nice to have good help available to feed the hungry foal

The one time he decided to feed the foal first, it didn’t work as well. After the feeding, the foal went over to a corner and lay down. “Then the mare got fidgety and didn’t want to be milked. So it worked best to milk the mare, then feed the foal, and put the muzzle back on—and everyone was happy,” he says.

Michael milked Barbie every hour for twelve hours, then ran out of frozen colostrum to feed the foal. “I started using a commercial milk replacer, and continued to milk the mare, but stretched it to every 1.5 hours. Doing it every hour was hectic



Muzzling the foal works well

SYMPTOMS

It is important to watch foals closely during the first hours and days of life, to be aware of any signs of weakness or jaundice. The more serious the case, the sooner it shows up. Often the foals that only show a little jaundice by five or six days of age will be fine without treatment. “The basic rule of thumb, for mule owners, is if you have a mule baby that starts acting weak or sick within the first week of life, NI should be high on the list of things to check,” says Bettin.

“There are many other things that can affect young foals, such as E. coli infections and other types of foalhood illness, but if an owner calls me about a sick mule baby that’s less than a week old, this will be one of the first things I suspect, until proven otherwise. If a three-day-old foal comes in and its packed cell volume (number of red cells) is only one-third of what it’s supposed to be, that’s a really good clue. It’s not hard to diagnose, if a person knows what to look for,” says Bettin.

The foals that get a large dose of colostrum antibodies will probably have signs of disease within twenty-four hours or less, and may become ill even before they have time to show jaundice. “Those are the worst. Even if we take them away from the source and they can’t get any more colostrum, there are still antibodies in their bloodstream, and you have to treat them and bide your time until the foal can get on top of it.”

because there’s no time to take a nap.” He wanted to make sure the milk would be safe, and called Dr. Bettin to ask about sending some to him to check. “I wanted to see if the mare had quit giving colostrum. That was what I was concerned about, but Dr. Bettin said the foal wouldn’t be able to absorb it by then, even if there was still some colostrum left,” says Michael. The vet explained about the size of the antibody molecules and how they can’t slip through after the intestinal lining starts to close up. After twenty-four hours you’d be ok.

“I hated to take a chance, so I continued milking Barbie for thirty-six hours before I let the foal nurse her. I took the muzzle off after that last milking and feeding. I had them in a round pen and we could see them from the house; we sat in lawn chairs in the yard watching them. I didn’t want to interfere with the nursing process and wanted to wait and see if the foal could do it.”

Some people think that if you feed the foal with a bottle, then he won’t want to go to his mother. That’s not the case. He wasn’t hungry at first because we’d just fed him, but when he got hungry he went right to that mare just like he’d always done, and within two hours he was nursing strongly,” says Michael.

“I didn’t breed Barbie again. I know you can save these NI foals, but it takes a lot of time and work. I think it’s a good idea to always have some frozen colostrum for emergencies, and if you can be with the mare when she foals, go ahead and try the simple test—the colostrum-blood mix. If you think you’ve got trouble, call your vet, and don’t let the foal nurse in the meantime until you find out,” he says.

“It’s usually in the middle of the night when a mare foals, and dark. When my mare foaled this year, I tried to do that test outside, with a flashlight, and I just wasn’t sure, so I brought it all in the house under good light. I took three different samples that had been frozen, from the three different mares that foaled the year before, and also the fresh sample from the mare that just foaled, and tested them all,” he says.

“Dr. Bettin said it would look cottage cheese if the colostrum wasn’t safe. It does separate, but I’d say it looks like tapioca. It doesn’t really feel lumpy, but it looks lumpy. It’s not smooth. The other samples were creamy, but the longer the blood stayed with the milk, eventually every single one of those samples showed a little lumpy separation in the margins, but nothing as bad as the sample from the mare that had the NI foal.”

The problem with this test with mule foals is that nearly all of them have the potential to react positively, according to Bettin. "It shows up more strongly in some than in others. The predictive value of this test for mules is less than it is for horses. If you did this test on every newborn mule baby, a high number will show positive, so you have to try to guess which ones will be significantly affected. It's still a good idea to do the test—because it may indicate a severe problem—but it may not be the perfect answer. It's just a rough type of test," explains Bettin. This can be a good first test if a person is suspicious, however, because you can do it right there in the stall, right after foaling.

Michael has had two mares produce NI foals. He's talked to other breeders that raise mules, and some have lost foals, but they don't always know the cause. "Some breeders admit to losing a foal once in awhile. A lot of people just pass it off as 'one of those things' and never check to see why it died," says Michael.

"We've saved both mule foals from Barbie, and then saved the foal from Amy. Her foal acted a little different, acting colicky the day after it was born. It was rolling something terrible in the stall. I took Amy and her foal to the vet clinic and was surprised when Dr. Bettin said this foal had the same thing. We ended up giving that one a blood transfusion. I think we got onto it a little quicker, but if we'd done the blood test with the colostrum we might have saved the expense of a blood transfusion," he says.

"I was with this mare when she foaled, but she is very protective of her new foals and she told me to leave the stall right now, and she meant it! It was during the night and

I was by myself, so I waited for the foal to stand and move around, and when it got close to the stall door I snatched it out the door to examine and treat its navel. Amy is a kind, good-natured mare after a few days,

but it wasn't safe to milk her by myself, so I didn't check her colostrum." So the foal nursed before the colostrum was checked, and ended up with a problem.

TREATING THE NI FOAL

If symptoms occur, the foal must be taken away from the colostrum and not allowed to nurse. "Usually if a foal is going to be seriously affected, it will be from the first few hours of nursing. If a foal develops a mild case, he needs regular milk from that point on, and no more colostrum," says Bettin.

Another option is to use another mare's colostrum, as from an emergency supply of frozen colostrum. "This may not be possible, unless you have some mares that are not raising mule foals, and can collect extra colostrum from them. You'd need some mares that give a lot of milk, to do this effectively," he says.

"The good thing about this problem in mule foals is that almost any horse, even a gelding, would be a good blood donor if you need to give the foal a transfusion. We have a lot of horses here at the clinic, so if a baby is really sick, we just pull blood from one of those horses. We don't worry about cross matching, because the problem is caused by donkey factor. The blood from any horse will be safe for that foal," explains Bettin.

"We also keep a supply of fresh frozen horse plasma on hand. If you are really concerned about NI, you could be there when the mare foals and not let the baby nurse at all. We can then IV the foal with this plasma, and this would basically give the foal the antibodies he needs, to protect him from disease," says Bettin. The plasma he gets from a company in Ames, Iowa costs about \$175 per unit.

If a sick foal comes in to his clinic, the first thing he does is take it off the colostrum. "Then I check IgG levels (for antibodies) to see if the foal got enough protective antibodies along with the dangerous ones. Many times they do have enough, because usually the ones that get sick are the ones that got a good big dose of colostrum. They have both the good and the bad antibodies. If they didn't get enough good antibodies, we cover that base by giving plasma," he says.

If it's a mild case and the owner doesn't want to spend a lot of money, he may just keep the foal on IV fluid therapy to try to dilute all the breakdown products in the blood. "The broken-down red blood cells can be really hard on the kidneys, plugging up the kidneys. So we try to flush this debris out of there."

It's a delicate fluid balance, however, because if you give too much fluid IV, this will dilute the remaining blood cells and the foal will become anemic. "If the foal does become anemic we give whole blood from a donor horse. It's a simple procedure; we put the donor horse in the stocks, fill the collection bag with blood, walk over and hang it on the mule foal," he says. It only costs about \$75 to pull blood from the donor horse and give it to the foal, and is easy to do. This will replace the red blood cells the foal has lost, if he is really sick and down.

MILKING THE MARE

The dam of an NI foal must be milked frequently, and the colostrum discarded, until it is safe for her foal to nurse. Milking a mare this often can be a chore and she may not want to cooperate because her teats become sore from the friction of milking with your fingers. A quicker, easier, safer way is to milk her with the Udderly EZ mare milker. This is a hand-held trigger-operated pump. The soft-edged flange fits over the teat, and a few squeezes of the trigger create a vacuum that draws milk from the teat into the collection bottle underneath. It fills the bottle much more quickly than milking by hand, and is comfortable to the mare.

It only takes one hand to operate, and doesn't make the teats sore. One person can usually do this alone by standing alongside the mare holding the pump with one hand and the mare's lead shank with the other. You don't have to bend down under the mare to milk her with one hand and hold a container with the other. It's safer for the person milking, and easier on the mare; she's less inclined to kick. Nervous mares tolerate it better than hand milking because it can be done so easily and quickly.



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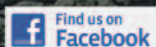
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