COLOSTRUM RELATED DISEASES OF THE NEWBORN FOAL

by Pamela Livesay-Wilkins ’86
With Special Thanks to Dr. S. Gordon Campbell
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The birth of a foal is a special moment for everyone involved, and all the time, money and effort invested in the pregnancy is well-rewarded by the sight of a foal nursing at its mother's side. The foal's need for colostrum from the mother within the first 24 hours of life cannot be emphasized too strongly: without colostrum from its mother or from a donor mare the foal's chances for survival are greatly diminished. Unfortunately, the foal on occasion, have problems receiving this essential colostrum.

FAILURE OF COLOSTRAL TRANSFER:
Perhaps the most common colostrum related problem a foal may encounter is a failure to nurse within the first 24 hours of life. Foals that are born weak (due to premature birth or septicemia) or fail to nurse for any reason will become immunodeficient because they have not received the passive immunity normally transferred to them by the antibodies in the mare's colostrum. Foals only absorb antibodies during the first 24 hours following birth, and a lack of colostrum in this period will make them highly susceptible to life-threatening infection until their own immune systems begin to produce antibodies several weeks down the road. Other circumstances that can result in a failure of colostrum transfer from the mare to the foal include: premature lactation by the mare during which she depletes her colostrum supply prior to parturition; failure of the foal to absorb ingested colostrum, sometimes related to stress; low antibody content of the colostrum itself, a condition found primarily in maiden mares; and rejection of the foal by the mare, again more common in maiden mares.

HEMOLYTIC DISEASE OF THE NEWBORN (Neonatal isoerythrolysis):

Another colostrum related disease is characterized by a normal foal at birth, (often born to a mare that has previously produced a foal), that shows signs of weakness, lethargy, anemia, icterus (jaundice) and labored breathing within 48 hours. Severely affected foals may have hemoglobin in their urine. The disease is called neonatal isoerythrolysis or hemolytic disease of the newborn and occurs when the foal absorbs antibodies from the mare's colostrum that are directed against the foal's own red blood cells, resulting in the destruction of these cells. Affected foals may recover spontaneously, but if not treated promptly the disease usually progresses to severe anemia and death. The condition is similar to erythroblastosis fetalis in human infants that usually involves the human Rh system bloodgroup. Among the many equine blood groups, determinants in the A and Q blood systems are most frequently responsible for neonatal isoerythrolysis. The mare can be sensitized to produce these destructive antibodies in several ways; usually by leakage of red blood cells from a previous fetus across the placenta, or by transfusion of red blood...
cells or other tissues from another horse to the mare.

An accurate diagnosis of the disease can often be made on the clinical signs alone, but a packed cell volume (PCV) and a total red blood cell count are useful in determining the degree of anemia and whether a transfusion of donor cells will be necessary. These parameters should be checked daily in foals that have the disease but do not require transfusion. Avoid stressing the foal. If possible keep mother and offspring in a quiet part of the barn.

Prevention of the disease is directed at finding the anti-foal red blood cell antibodies in the sensitized mare's serum two to three weeks before foaling. If not tested, foals of suspect mares should be muzzled at birth and fed colostrum from a donor mare. Milk substitutes should be fed to the foal every two to three hours for the first 36 hours while the mother is hand milked to remove the offensive antibody containing colostrum. The foals may then be allowed to nurse from Mom.

Although hemolytic anemia of the newborn (neonatal isoerythrolysis) is a genetic disease in that the blood factors involved are inherited, the horse breeder should keep in mind that many foals with the serological potential to develop this disease are born each year without suffering any adverse effects. The actual incidence of clinical disease is low, less than 1% in Thoroughbreds, although it is known to occur in all breeds.

The knowledgeable and watchful horse breeder will insure that all foals receive an adequate amount of colostrum in the first 24 hours of life. Usually the source of this colostrum will be the foal's own mother, but when hemolytic disease is suspected, it should be obtained from another mare and fed along with milk replacer for about 2 days before returning the foal to its mother.

PAMELA LIVESAY-WILKINS bred and raised Thoroughbreds before entering veterinary school. She has a specific interest in immunopathology.

REPRODUCTIVE MANAGEMENT OF HORSES

Wendy Kimmel '85
Special thanks to Dr. Wendell Cooper, VMD
Manager of Lana Lobell Farms

The goal of any breeding farm is to get a healthy strong foal out of every mare on the farm. Unfortunately horses are known as notoriously "poor breeders" with foal crops of only 50-60% each year. This inefficiency is mainly the result of the artificial January 1st birthday set by the Jockey Club. This means that any Standardbred or Thoroughbred born during the year of 1983 will become one year old as of January 1, 1984. Because of the artificial birthday, farm managers are constantly fighting the natural tendencies of the mare to foal in May and June. In order to get early foals, they must overcome both the long gestation period of the mare and the fact that mares are seasonal breeders.

Horses are seasonally polyestrous which means they cycle and show heats only during a limited time of the year. Their seasonality is controlled by the amount of daylight and is centered around the longest day of the year, June 21. The horse's brain recognizes changes in day length and is stimulated by increasing daylight to start the ovaries cycling.

There are three main ways in which this seasonality affects mares and thus a farm manager's ability to get an early foal out of them. First, seasonality affects when the mare begins showing heat cycles. Most mares are in an anestrus state from January until the middle of April which means they are not showing heat and have no ovarian activity. Then in late March to early April, in response to the increasing day length the mare's reproductive tract begins to "wake up" and she starts showing heat cycles. During this early period, called the transitional phase, the mares estrous cycles are irregular and she may have silent heats or prolonged estrus with delayed ovulation. Then she will begin cycling regularly, show estrus, and ovulate about every 22 days until she conceives.

Seasonality also affects the length of the
mare's gestation. On the average, the mares gestation is 340 days. There is allot of individual variation between mares. You could breed two mares on the same day and then have them foal up to one month apart. On top of this individual variation, there is also variation related to the season of the year. Mares that are bred in February have an average gestation of 357 days, while mares that are bred in May have an average gestation of 337 days. The mare is trying to foal at a time of year when the foal is more likely to survive.

The final way that seasonality affects the mare is the interval from foaling to foal heat (the first heat after foaling). A mare who foals in February will take about 12-13 days to come into foal whereas a mare who foals in June may ovulate as soon as 8-9 days after parturition.

These three effects of seasonality all push the mare's natural foaling date toward May and June. This places the farm manager in a dilemma. The mare wants to foal in May and June but he would like to have foals born in February and March so that when they go to the yearling sales they are larger and bring better prices. This desire for early foals may not be as beneficial as was once thought. Recent work has shown that these early foals may not perform as well on the racetracks as foals born later in the year. In light of this and the natural tendencies of the mare, Dr. Cooper suggests that breeding farms concentrate their efforts on the months of April, May, and June. Under this system, the mares foal from March until June 1st. The only problem he finds with this system is the July 4th cut off date for all breeding. Here again you are fighting the long gestation of the mare. Mares foaling in June leave you with only thirty days to get them pregnant again. If a mare has any trouble foaling, or a slight infection, she may not start cycling right away and you may miss her for a season. Even with this drawback, Dr. Cooper's system works with the reproductive physiology of the mare and maximizes the results.

ABOUT OUR GUEST EDITOR ...

Equine Rounds is pleased to have Dr. Robert Hillman, D.V.M. as this issue's guest editor.

Dr. Hillman has been a member of Cornell's Ambulatory Clinic for 25 years. He was one of the founders of the Cornell Equine Research Park's reproduction unit. Twelve years ago this consisted of 6 donated grade mares. Today the program has grown to over twenty mares and six stallions, all of them registered Thoroughbreds and Standardbreds. Fourth year veterinary students benefit from palpating, teasing, breeding and delivering foals from these mares with the help of Dr. Hillman, Dr. Blue and Dr. Woods in a month long theriogenology course.

Dr. Hillman has done research in the areas of induction of partuition, estrogen secretion in mares, inducing abortion in mares and equine semen handling. Most important of all (from a student's point of view) are Dr. Hillman's teaching responsibilities. He teaches the 3rd year obstetrics course as well as equine respiratory diseases, foal diseases and the Horse Herd Health elective.
EMBRYO TRANSFER IN THE MARE

Pat Kenney '85
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Embryo transfer in the mare may soon become a practical solution to a few horse breeders' problems. In the recent past, the primary use of embryo transfer was to obtain embryos from old, infertile mares who would otherwise be unable to carry a foal to term. Today, it is possible to obtain at least three times as many offspring from a valuable mare per year than if she were bred naturally. What is more, this may even be done while the mare is in training. And with recent advances in freezing equine embryos it may be possible sometime in the very near future to avoid the strict quarantine regulations involved in importing or exporting a horse by shipping disease free embryos. From a research point of view, this technique holds the potential for answering many questions about equine infertility.

Embryo transfer is easy to understand. The average mare ovulates an egg every 22 days. A veterinarian can determine the day of ovulation by daily rectal palpations of the mare's ovaries. The mare is bred to the stallion prior to ovulation. Seven or eight days after ovulation, if all goes well, the embryo is ready to travel to his or her foster mother.

The embryo is coaxed out of the uterus by repeated uterine flushes. A catheter is passed through the mare's vagina and cervix and into the body of the uterus. An inflatable cuff in the cervix provides a water tight seal. One liter (about 1 quart) of a sterile fluid rich in nutrients for the developing embryo is run into the uterus by gravity. Once the entire liter is in the uterus, the catheter is lowered and the fluid which contains the embryo runs into a sterile receptacle. The embryo is heavier than the fluid, so it settles to the bottom of the receptacle. Usually the embryo is large enough to be seen with the naked eye. It can be drawn up into a pipette in preparation for the next phase of its journey.

The mares who are to receive these embryos and later carry them to term must be carefully chosen. They, of course, must be healthy and at least as big physically as the donor mare otherwise the foal stands a chance of being born smaller than normal. Most importantly, the recipient mare must have ovulated on the same day or 1-2 days later than the donor mare. If the recipient has ovulated 1 day or more before the donor, then the recipient mare's uterus won't be in the proper state to support the embryo and the embryo will die.

Once a suitable recipient mare has been chosen, the veterinarian can choose one of two ways to transfer the embryo. The nonsurgical method of transfer is similar to artificial insemination in the mare. The pipette containing the embryo is passed through the cervix and into the body of the mare's uterus where the embryo is deposited. The embryo will later implant in the uterine wall and be carried to term as in a normal pregnancy.

The surgical transfer method is more expensive and time consuming, but the chances of success are better. The surgery is performed on a tranquilized mare in the standing position. A local anesthetic is used to desensitize the mare's flank. A vertical incision is made in the area between the point of the hip and the ribs...
The mare's uterus is exposed, an incision is made into the uterus itself, the pipette containing the embryo is inserted and the embryo is deposited.

Eleven months later approximately 50% of these transferred embryos will be happy, healthy foals clamoring for their first meal from their foster mother.

It is possible to get more than one egg from a mare every 22 days, and so, in theory it is possible to obtain more than three foals per mare per year. This technique is called superovulation. A veterinarian can superovulate a mare by treating her with an equine pituitary extract which causes approximately 3 healthy eggs to develop instead of the usual one. At the present time, equine pituitary extract is only available to research institutions, since it is not manufactured commercially. If superovulation could be made commercially feasible and was combined with embryo transfer, a valuable mare could produce more foals in one year (with the help of recipient mares) than she could in her entire lifetime.

Embryo transfer is not without its limitations though. It is a very new technique so veterinarians experienced in this field are few. Also, it is costly to maintain enough recipient mares at the same stage of ovulation as the donor mare. Furthermore, several breed registries (i.e. Jockey Club and U.S.T.A.) will not accept embryo transfer derived foals.

In spite of these drawbacks, equine embryo transfer is being done commercially today. Embryo transfer makes sense for breeders of valuable imported or nonregistered performance horses because those mares can produce foals while staying in competition. With continued research and support, embryo transfer in the mare could become a practical reality in years to come.

PAT KENNEY, Student editor of this issue, will be working for Dr. Woods and Dr. Hillman this summer using embryo transfer to study early embryonic death in the mare.

COLIC DUE TO RUPTURED BLADDER IN THE YOUNG FOAL

by Mary Eagle, '84

With the foaling season upon us it is time to think about those first few days in the lives of the newborn foal. With luck they will all be up and bouncing along beside mom. But, what if a day or two after birth your foal is seen straining, rolling, anxiously looking at his flanks or maybe even rolling up on his back. These are signs of abdominal pain or colic in a young foal.

One cause of colic in a newborn foal is rupture of the urinary bladder. It is believed that the bladder ruptures during parturition as the foal passes through the mare's pelvis. Males are more commonly affected and this may be because the male urethra is long and narrow and may be easily compressed allowing pressure to build up in the bladder to the point where it bursts. Female foals have shorter, wider urethras that are more protected from compression. However, it is possible for female foals to have a ruptured bladder so this should never be overlooked in a newborn filly with colic.

Usually partuition appears perfectly normal as does the newborn foal which will stand and nurse as expected. In 24-48 hours the foal may appear depressed and may not nurse as well. The foal may relax his penis, strain and pass small amounts of urine. Probably the sign of a ruptured bladder most consistently seen by owners is straining to urinate and/or defecate, which is often accompanied by lifting or "flagging" of the tail. It is, however, possible for a foal with a ruptured bladder to urinate in a nearly normal manner. This is because if the hole is small, or in the top of the bladder, there may still be enough urine in the bladder that a fairly normal stream of urine will be produced.

These signs are also the signs commonly seen with meconium impaction in the young foal. Meconium impaction is a much more common ailment. For this reason meconium impaction, is often confused with ruptured bladder. Some people have observed that foals
straining from meconium impaction tend to hold their hind legs together with their backs arched and tail raised whereas foals suffering from ruptured urinary bladder extend their hind legs behind them with their back and loins hollowed out and bend and tail lifted. Others claim that foals with ruptured bladders walk backwards or crouch continually with their tails elevated. It should be remembered that not every foal will have "read the book" and there can be a lot of individual variation in signs exhibited.

In a foal with ruptured urinary bladder, there is a progression of the depression and weakness. Within 3 or 4 days after birth the abdomen appears conspicuously distended. This can also happen to a foal with meconium impaction but in that case the distention is due to gas, which usually accumulates and appears quickly. With a ruptured bladder the distention is slower, and if you push on the abdomen while simultaneously listening to the abdomen with a stethoscope you can often hear fluid sloshing. The next step is surgery to repair the hole in the bladder. This should be undertaken immediately. However, here is where we can run into a problem. By the time the foal has severe abdominal distention, that urine floating around in his abdominal cavity has caused dehydration and mineral imbalances in his bloodstream that make it more difficult to anesthetize him safely. When your veterinarian arrives he or she will have to decide if your foal has one of several possible diseases all of which can cause straining and colic in a newborn foal. Meconium impaction is a far more common and usually less serious problem than ruptured bladder, but it too will have to be treated. Other conditions that can cause straining in a newborn foal include atresia ani or atresia coli, conditions where the gastrointestinal tract does not open to the outside and therefore feces can not be passed. Other intestinal derangements such as twists of the intestines or internal hernias, where a piece of intestine gets caught in a hole in the ligaments that support the intestines will also cause colic. This group of diseases usually produce a much more severe colic than rupture of the urinary bladder but any of these seen in the early stages can mimic ruptured urinary bladder.

Your veterinarian can use several techniques to diagnose ruptured urinary bladder in the early stages. Blood can be taken and blood test performed to assess blood mineral changes. A procedure called an abdominal tap can be performed where a needle is passed through the body wall into the abdominal cavity and fluid removed and tested for changes characteristic of urine floating free in the abdominal cavity. A plastic catheter can be passed up the foal's urethra to the bladder through which dye is injected into the bladder. Then if you perform an abdominal tap 30 minutes later and dye is found in the abdominal cavity the bladder must have a defect in it. Radiographs can also be used in diagnosis as they will show an abnormal accumulation of fluid in the abdominal cavity.

No matter which method your veterinarian chooses the key is early diagnosis so that surgical repair can be performed as soon as possible on a foal that is still in good physical condition. The prognosis is favorable in cases that are promptly diagnosed and treated.

MARY EAGLE is interested in equine practice after graduation and will be giving her senior seminar this spring on ruptured bladders in foals.
THE MANY FACES OF RHINOPNEUMONITIS

by Mary K. Letwin '85

There is nothing so beautiful and gladdening this time of year as the birth of a healthy foal. And there is nothing so terrifying and ugly as a storm of abortions in your herd of pregnant mares. This terror is just one of the many faces of Equine Herpesvirus I, or Rhinopneumonitis. There are four separate manifestations of "Rhino" in horses, each with its own set of symptoms.

The first syndrome is a mild upper respiratory disease in young horses. It is seen when these youngsters are stressed, usually at weaning or when regrouped as yearlings. It starts with a fever and a clear nasal discharge, which becomes thick and yellow-white, giving it the nickname "the snots". The horse may have a cough and some tearing from the eyes. The treatment for this disease in young horses is easy: rest. They should not be stressed by training, shipping, or regrouping. If they are rested, they should recover in about two weeks. If they are stressed before full recovery, they could start to shed the virus into their environment, and serve as a source of infection to other horses, while possibly relapsing and developing pneumonia themselves.

A good way to decrease stress is to provide good nursing care. Try cleaning the discharge off the horse's muzzle several times a day to make them feel better and give them back their appetite. Feed the horse small amounts several times a day to prevent the nasal discharge from building up on the feed and making it unappetizing. It's a good idea to control the dust around the horse while it is sick. The damaged respiratory tract can become sensitized to dust, which can lead to heaves when the horse is older. The ideal would be to keep the horse outside, but if that isn't possible put him in a stall next to an open door, wet his hay, and don't use dusty bedding.

The second syndrome in Rhino's repertoire is abortion in pregnant mares. These mares can be infected at the same time as the weanlings and yearlings, or they may be infected later by one horse shedding the virus. The mare will not show any signs of Rhinopneumonitis at the time of infection, but will abort one to four months later. Abortion can occur any time after the fifth month of gestation, but it is usually during the third trimester. The mare won't be ill at the time of abortion and won't have retained placenta or vaginal discharge. If you don't see the fetus or placenta, you may not even know that the mare has aborted. There is no way to tell beforehand when or even which mares will abort. The only consolation is that these mares should return to breeding soundness after the abortion.

The third possible expression of this disease is the neurological form. Rhinopneumonitis can strike any age and either sex. It may occur with or without abortion. It attacks the spinal cord, causing weakness and incoordination in the hind legs, which may become total paralysis of the hindquarters. The affected horse will usually dribble urine involuntarily even before the legs are totally paralyzed. If this form of the disease strikes a pregnant mare, and she aborts, she may recover totally. Some horses may recover completely with good nursing care, that includes the prevention of urine scalding. Others may be left with urinary incontinence and weak, uncoordinated hind legs, while still others may go down and never be able to rise again. The neurological form usually occurs as isolated cases, but it has been reported as an epidemic on farms and racetracks.

The fourth form of Rhinopneumonitis appears in foals born infected with the virus. If a mare is infected late enough in pregnancy so that the foal survives to be born alive, it too will be infected. The best that can happen is that the foal will live for seven to ten days until it dies of pneumonia. But usually it is born weak and unable to stand and nurse, with difficulty breathing. He may have a fever when born. These foals will die quickly, despite any treatment.

But there is something that you can do to try to prevent the four tragedies of Rhinopneumonitis from happening in your herd.

(Continued on the back page.)
Build up a "herd immunity" in your horses with vaccines. However, vaccination for Rhinopneumonitis or even past infection with the disease, does not confer long-term immunity. Vaccines must be given often, and at the right times.

There are two vaccines on the market right now. The first, made from a "killed" virus, is promoted to protect against abortions, but will control the respiratory form too. Pregnant mares should be vaccinated during their fifth, seventh, and ninth months of pregnancy. To control "the snots" in your young horses, the vaccine should be given annually, starting foals at three months old.

The second vaccine is a "modified live" virus, which is sold only to prevent the respiratory disease. It may prevent abortion, but the manufacturer does not guarantee it. This vaccine can be given several times a year.

If the Rhinopneumonitis vaccine is given too often, there will be a local reaction at the injection site, with pain and swelling. You should ask your veterinarian to set up an appropriate vaccination schedule for your horses, and then stick to it. In spite of vaccination by either type, 1-2% of the vaccinated mares may still be expected to abort. Vaccination also won't prevent a mare from aborting if she is already infected and is incubating the disease. Therefore, the best way to stop the disease is to keep it away from your horses. Keep your broodmares separate from the young stock, and isolate any new horses from the rest of your herd. Practice good sanitation to limit the spread of infection; don't carry the virus between horses on brushes, buckets, tack, trailers, tools, or your hands and boots. As with many other diseases, a good program of vaccination, sanitation, and sound management can protect your horses from the ravages of Rhinopneumonitis.

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IN THE SUMMER ISSUE: A Review of Lower Leg Lameness

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