Foals: The Critical First Two Days

The highest death rate for horses is in the first two days following birth so it is a critical period. Experienced owners and veterinarians describe three things that can dramatically increase your foal’s chance of survival.

1. PREPARATION
2. PROBLEM RECOGNITION
3. PROMPT INTERVENTION
(the three Ps of young foal management)

ADDENDUM:
1. Failure of Passive Transfer Fact Sheet from Horse.com
2. Rhodococcus equi Fact Sheet from Horse.com
I. PREPARATION

To avoid the potential for panic should something go wrong it is best to be well prepared. A number of things can be performed before, during and immediately after birth.

Before Birth
• Identify high risk mares and provide appropriate veterinary care during pregnancy
• Vaccinate (5th, 7th, 9th month and 30 days prior to birth) and worm the mare
• Provide good nutrition to the mare (avoid fescue)
• Prepare a foal emergency kit (see below)
• Clean the stalls and use clean bedding materials (not sawdust)
• Install a foal (birthing) monitor
• Understand how to perform foal CPR (close off one nostril and breathe into the other ensuring that the lungs inflate)
• Prepare a frozen colostrum bank, or the easier option
• Have frozen plasma on stock
• Observe the mare for colostrum leakage and vaginal discharge (signs of placentitis)
• Wash down the mare’s hindquarters before delivery

During Birth
• Be unobtrusively present and observant during the birth process
• Observe for “red bag” delivery (an emergency)
• Keep and weigh the placenta (normal is 10% of foal weight – approximately 5kg)

Following Birth
• Call your veterinarian to ensure the foal is examined within 12-24 hours of birth
• Wash down the mare’s hindquarters before suckling
• Observe foal for colostrum ingestion, or the easier option
• Ensure the veterinarian administers a liter of plasma
• Perform an enema
• Leave umbilicus intact for as long as possible. It is usually broken by the foal attempting to stand. If you must break it pull the cord apart while holding close to the abdomen
• Turn out the mare and foal for one hour per day increasing per day. By 10-12 days the mare and foal can run with other mares and foals.
2. PROBLEM RECOGNITION

The key to problem recognition is having an understanding what is normal. The following tables provide a general guideline to normal and abnormal foal signs in the first 48 hours.

**Normal Foal Signs**

<table>
<thead>
<tr>
<th>Sign</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breathing</td>
<td>Within 30 seconds of birth</td>
</tr>
<tr>
<td>Standing</td>
<td>Within one hour of birth (some heavy breeds are slower)</td>
</tr>
<tr>
<td>Suckling</td>
<td>Within two hours of birth</td>
</tr>
<tr>
<td>Pulse rate</td>
<td>130/minute in first hour. 95/minute up to 48 hours (at rest)</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>70/minute in first 10 minutes. 35/minute for first 48 hours (at rest)</td>
</tr>
<tr>
<td>Passing of meconium</td>
<td>Black, dry and tarry stools within 12 - 24 hours of birth</td>
</tr>
<tr>
<td>Nursing frequency</td>
<td>3-5 times per hour</td>
</tr>
<tr>
<td>Placental weight</td>
<td>10% of foal weight (average is 5kg)</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Alert, active, suckling</td>
</tr>
<tr>
<td>Urinating</td>
<td>Straw coloured within 12 hours and every time it suckles</td>
</tr>
</tbody>
</table>

**Abnormal Foal Signs**

<table>
<thead>
<tr>
<th>Sign</th>
<th>What it might mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk coming from nose</td>
<td>Cleft palate, risk of pneumonia, too much milk in one session</td>
</tr>
<tr>
<td>Orange fluid from nose</td>
<td>Meconium aspiration, risk of pneumonia</td>
</tr>
<tr>
<td>Behavioural changes</td>
<td>Dummy foal (lack of oxygen during birth)</td>
</tr>
<tr>
<td>Milk on face</td>
<td>Not nursing</td>
</tr>
<tr>
<td>Yellow gums</td>
<td>Neonatal isoerythrolysis, jaundice</td>
</tr>
<tr>
<td>Brick red gums</td>
<td>Septicemia</td>
</tr>
<tr>
<td>Eyes sunken or teary</td>
<td>Dehydration, malnutrition or an eye problem</td>
</tr>
<tr>
<td>Swollen joints</td>
<td>Infection, septicemia</td>
</tr>
<tr>
<td>Bloat</td>
<td>Colic</td>
</tr>
<tr>
<td>Weak or lethargic</td>
<td>Sick, septicemia</td>
</tr>
<tr>
<td>Urine from umbilicus</td>
<td>Patent urachus</td>
</tr>
<tr>
<td>Abdominal enlargement</td>
<td>Ruptured bladder</td>
</tr>
<tr>
<td>Arched back</td>
<td>Straining to defecate, meconium retention</td>
</tr>
<tr>
<td>Sunk back</td>
<td>Straining to urinate</td>
</tr>
<tr>
<td>Pain on breathing</td>
<td>Potential broken ribs</td>
</tr>
</tbody>
</table>
3. PROMPT INTERVENTION

Once a problem has been identified it is always best to err on the side of caution and intervene quickly. Having an emergency foal kit available will help, as will a routine examination by your veterinarian within the first 12-24 hours of birth.

It is also important to know that the biggest cause of death in foals is related to infection – through wounds, trauma, injuries and failure of passive transfer. Foals are born with an immune system that is largely a “blank slate” incapable of fighting infection and they absolutely must have colostrum, or if that fails, intravenous plasma until their own immune system matures. Colostrum provides essential infection-fighting antibodies and administration of plasma, high in antibody content and other infection-fighting agents, provides extra insurance and peace of mind.

Emergency Foaling Kit Contents

<table>
<thead>
<tr>
<th>Item</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Umbilical tape</td>
<td>Tie the umbilicus if it is bleeding</td>
</tr>
<tr>
<td>Antiseptic navel dip (not neat iodine)</td>
<td>Twice daily immersion of the umbilical stump</td>
</tr>
<tr>
<td>Large syringe with the end cut off and reversed</td>
<td>Obtain colostrum from the mare</td>
</tr>
<tr>
<td>Small syringe or bottle with nipple</td>
<td>Administer colostrum to the foal</td>
</tr>
<tr>
<td>Examination gloves</td>
<td>Handling umbilicus and placenta</td>
</tr>
<tr>
<td>Large plastic bag with tie</td>
<td>For keeping the placenta</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>For administration twice daily for 3 days</td>
</tr>
<tr>
<td>Enema materials-warm soapy water and catheter</td>
<td>Prevention of retained meconium</td>
</tr>
<tr>
<td>Towels</td>
<td>Drying the foal</td>
</tr>
<tr>
<td>Clean containers</td>
<td>Collection of colostrum</td>
</tr>
<tr>
<td>Bucket of warm water</td>
<td>Cleaning of mare’s perineum and legs</td>
</tr>
<tr>
<td>Elasticised bandage</td>
<td>Tying up the placenta off the mare’s hocks</td>
</tr>
<tr>
<td>Frozen colostrum</td>
<td>Administration to foal</td>
</tr>
<tr>
<td>Frozen plasma</td>
<td>Administration to foal</td>
</tr>
<tr>
<td>Scales</td>
<td>To weigh the placenta</td>
</tr>
<tr>
<td>K-Y</td>
<td>Lubrication for enema</td>
</tr>
</tbody>
</table>
KEy POINTS

• The highest rate of death for horses is in the first 2 days of life
• The key to managing your foal through this period is:
  Preparation, Problem recognition and Prompt intervention (3Ps)
• Have a veterinarian examine your foal within 12-24 hours of birth
• The biggest killer of foals relates to infection
• Make sure your foal gets colostrum
• Make sure your veterinarian gives your foal plasma (stock some yourself)

www.foalsbeststart.com
Failure of Passive Transfer

If foals don’t get the necessary antibodies from their dams, they are at risk of developing serious medical conditions.

Overview

Newborn foals are born with virtually no infection-fighting antibodies. Foals obtain these antibodies, also referred to as immunoglobulins, from their dam’s colostrum—a special type of milk that is produced by the mare during the last one or two weeks of gestation. Most foals nurse from their dams and obtain at least 1 liter of good-quality, antibody-rich colostrum within the first eight hours of life. This process by which mares pass antibodies on to their foals via the colostrum is referred to as passive transfer of immunity. When foals don’t get any or enough of these important antibodies, it is called failure of passive transfer.

In addition to antibodies, the calorie-dense colostrum also contains growth factors and white blood cells and possesses laxative properties to help the foal pass the meconium (first feces).

It is imperative that foals ingest and absorb colostrum within the first few hours of life because foals are only able to absorb antibodies during the first 18-24 hours of life. Beyond one day of life, the specialized cells that line the foal’s gastrointestinal tract and assist in absorbing the life-saving antibodies cease to function.

Studies have shown that absorption of maternal antibodies from colostrum is greatest within 6-8 hours of birth. Since the average foal has a sucking reflex within 2-20 minutes of birth, can stand within one hour, and can nurse from its mother within two hours, this is normally not a concern. In fact, it is currently estimated that only 10-20% of newborn foals are diagnosed with failure of passive transfer.

Depending on both the amount of colostrum ingested and the quality of the dam’s colostrum, failure of passive transfer can be either complete or partial. Foals with either complete or partial failure of passive transfer are at-risk for developing serious medical conditions such as pneumonia, diarrhea, and joint infections.

Causes

There are numerous causes of failure of passive transfer. Some of the most common include:

- Mares that drip or run milk for several hours prior to parturition. These mares are actually losing the antibody-rich colostrum that foals require to survive.
- Orphaned or rejected foals and foals that are unable to rise and nurse (due to dysmaturity, prematurity, postmaturity, weakness, or limb deformities, for example) all lose the opportunity to ingest the much-needed colostrum from their dams.
- Mares that have poor-quality colostrum that does not contain the type or amount of antibodies needed to protect the foal can result in failure of passive transfer. This occurs if a mare is not properly vaccinated or is moved to a new environment too close to the time of foaling.
- Foals that do nurse, but are unable to absorb the antibodies from the colostrums, can also have failure of passive transfer.

Diagnosis

To diagnose failure of passive transfer a veterinarian performs a physical examination on the neonate and takes a blood sample to measure the foal’s antibody levels. The specific antibody measured is immunoglobulin G (IgG).

Foals with IgG levels less than 200 mg/dl are diagnosed with complete failure of passive transfer, whereas IgG levels between 200 and 800 mg/dl is considered a partial failure of passive transfer. Normal foals generally have IgG levels between 1,000 and 2,000 mg/dl.

There are several commercial test kits that can be used on the farm to measure foal IgG levels to diagnose failure of passive transfer. In general, these tests provide relatively reliable results in approximately 10 minutes. Results are not quantitative (i.e., the test do not give the exact mg/dl of IgG), but simply indicate if the foal’s IgG levels are above or below a certain cut-off value. To obtain an exact value, the sample needs to be sent to a laboratory for analysis, which will take approximately 24 hours. Obviously, this is not a practical option for foals that are in dire need of colostrum.

Treatment

Foals diagnosed with either complete or partial failure of passive transfer require an alternate source of immunoglobulins. There are three main ways to achieve this goal. First, foals can be administered fresh or frozen colostrum. For example, if the mare is leaking colostrum prior to parturition, the colostrum can be stripped from the mare and frozen until the foal is born. Upon the arrival of the foal, the frozen colostrum can be thawed (not in a micro-
wave! and immediately bottle fed to the foal. Alternatively, if another more on the farm lost her foal during parturition, the colostrum from that mare can be stripped and frozen for future use.

Second, dried IgG products are available that can be mixed with water and bottle-fed to the colostrum-deprived foal. These products are stable at room temperature and have a longer shelf-life than fresh or frozen colostrum, but they are expensive and have variable absorption. That is, their efficacy is somewhat questionable.

Finally, equine plasma high in IgG can be administered intravenously. This option is used for foals that: have very low IgG levels (less than 200 mg/dl); are too old to absorb orally administered immunoglobulins; or have abnormal gastrointestinal function that would preclude the absorption of the immunoglobulins. Post-supplement testing of blood IgG levels is recommended.

**Prevention**

The most important means of preventing FTP is to ensure the foal stands and nurses shortly after birth. This is most successfully achieved on farms that have birth attendants that can witness the birth and assist the mare and foal when necessary.

Other important factors that can help minimize failure of passive transfer and post-natal infections is to maintain a clean foaling environment (including the mare), to properly vaccinate the mare (e.g., according to the AAEP vaccination guidelines), and to keep the mare in one environment (not move her) within the last month of gestation. This will ensure that the mare has had sufficient time to develop antibodies specific to the types of microorganisms that are present in the environment in which the foal will be born.

**Prognosis**

The prognosis for foals diagnosed with failure of passive transfer is variable. Not all foals with failure of passive transfer will become sick, and not all foals that achieved passive transfer of immunity are guaranteed to be healthy. Nonetheless, almost all foals that develop life-threatening infections have at least partial failure of passive transfer. Therefore, it is imperative that foals with failure of passive transfer are diagnosed and treated as soon as possible.

**Fast Facts**

- Within 8 hours after birth, a foal should stand and nurse from its dam to ingest and absorb the antibodies (immunoglobulins) that are in the mare’s first milk called colostrums.
- This process is referred to as passive transfer of immunity.
- Foals that fail to nurse or are unable to absorb the antibodies are classified with failure of passive transfer.
- Failure of passive transfer is diagnosed based on a veterinarian’s examination and a blood test that measures the foal’s immunoglobulin (IgG) levels.
- Foals with IgG levels less than 800 mg/dl are considered to have either a partial or complete failure of passive transfer.
- Foals with failure of passive transfer can be treated with either fresh or frozen colostrum, a commercial form of IgG, or by the intravenous administration of plasma products that have a high concentration of immunoglobulins.
- Prognosis of foals with failure of passive transfer is variable; however, good foaling management strategies can help prevent many cases of failure of passive transfer.
Rhodococcus *equi*

**Overview**

*Rhodococcus equi* is well known for its ability to cause severe pneumonia in young foals. In addition, *R. equi* can cause septic arthritis (infection of joints), osteomyelitis (infection of bones), neonatal diarrhea (enterocolitis), abdominal lymphadenitis (inflammation of the lymph nodes), spinal cord abscesses, and immune-mediated disease such as polysynovitis. It can also cause sudden death in foals that appear to be healthy.

*R. equi* is a ubiquitous gram-positive bacterium that lives in the soil and feces of herbivores. In North America, pneumonia caused by *R. equi* tends to occur only sporadically except on some farms where pneumonia caused by *R. equi* is endemic (i.e., occurs more frequently). On farms where *R. equi* is endemic, approximately 10-20% of foals develop clinical signs of pneumonia. In moist environments, *R. equi* can live in the soil for approximately one year.

Foals are thought to become infected when they ingest or breathe in the bacteria in soil, dust, and fecal particles. The bacteria then multiply inside macrophages (a type of white blood cell that normally kill bacteria) and, in some cases, cause pneumonia.

While most foals are exposed to *R. equi* at some point, not all foals develop disease. It remains unclear why some foals develop pneumonia caused by the pathogenic strains of *R. equi* while other foals do not. It is likely that a combination of the foal's immune status, environmental factors, and farm management practices all play a role.

*R. equi* is a particular problematic bacterium in the equine industry because of its high prevalence and mortality rate (approximately 28%), associated economic losses to the breeding industry, and potential negative impact on future athletic performance in foals that recover.

**Clinical Signs**

It is currently hypothesized that foals become infected with *R. equi* before two weeks of age; however, clinical signs of infection are not obvious until the foal is 30 to 90 days old. In general, it is accepted that *R. equi* can cause pneumonia in foals as young as one month and as old as six months.

Common clinical signs include cough, a mucopurulent (thick, greenish-white) nasal discharge, fever, lethargy, an increased respiratory rate, and progressive respiratory distress. On auscultation of the lungs, crackles and wheezes are easily noted in both lungs. These clinical signs tend to develop rapidly.

Pneumonia is a common medical condition in foals and is a major cause of illness and death in this age group. *R. equi* must be differentiated from other causes of pneumonia, including respiratory tract infection due to other bacteria or infection with other microorganisms such as fungi. In many cases the causative organism(s) of undifferentiated respiratory tract infections is/are not identified.

**Diagnosis**

Diagnosis of *R. equi* is challenging, particularly during the early stages of disease. A positive diagnosis of *R. equi* is achieved in young foals with clinical signs consistent with *R. equi* that have evidence of pulmonary abscesses on radiographs (X rays) and ultrasound and a positive *R. equi* culture from a sample obtained by a transtracheal aspirate. This is a procedure that involves passing a thin, sterile tube down the trachea to the lungs to obtain a sample of cells and bacteria.

Routine blood work is usually non-specific and simply reveals a high fibrinogen level (a marker of inflammation) and a high white blood cell count. A DNA test (polymerase chain reaction, PCR) for *R. equi* exists, but it has not been widely adopted. Bacterial isolation from the transtracheal aspirate is more helpful in achieving a positive diagnosis.

**Treatment**

Foals diagnosed with *R. equi* are prescribed a variety of antibiotics, including a combination of doxycycline, cephalosporins, and clindamycin. Foals with severe disease may require aggressive supportive care, including oxygen therapy, fluid therapy, and artificial ventilation.
A combination of erythromycin estolate and rifampin. This combination of antibiotics allows the drugs to penetrate the lung abscesses and the macrophages where the bacteria are multiplying.

Treatment should continue for at least 30 days, and prolonged treatment of six to eight weeks or more is often required. Fibrinogen levels and radiographs are used to help determine when to stop treatment. Foals are administered the antibiotics until there is no longer any evidence of pneumonia on repeat radiographs.

Antibiotic-associated side effects for the foal include hyperthermia and a mild diarrhea that is usually self-limiting. In some cases the foal might require a short interruption in erythromycin administration until the diarrhea subsides.

Dams of affected foals can develop a potentially fatal diarrhea that is thought to be caused by ingestion of the active erythromycin metabolite either by drinking water contaminated with erythromycin by the foal or by ingesting the foal’s feces.

**Prevention**

Because *R. equi* is widespread, it is a difficult bacterium to control. Good farm management and sanitation strategies can help minimize infection. For example, mares and foals can be kept on grassy pastures rather than dry, dusty paddocks. Frequent removal of feces to minimize bacterial exposure is recommended. Any foal with clinical signs of respiratory disease should be seen by a veterinarian.

At present, no vaccine is available against *R. equi*. The only proven preventative medical strategy is the intravenous administration of *R. equi* hyperimmune plasma (HIP), which contains high levels of antibodies (immunoglobulins) against *R. equi*. HIP provides passive immunity to treated foals against *R. equi* and reduces the incidence of pneumonia caused by this bacterium. Nonetheless, HIP is expensive, labor-intensive to administer, and not universally effective.

**Note** that *R. equi* is a zoonotic disease, which are diseases transmissible between animals and people, but tends to only cause disease in immunocompromised humans, such as those with human immunodeficiency virus (HIV) or acquired immunodeficiency syndrome (AIDS).

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