Diarrhoea in Foals

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Diarrhoea or scouring in foals is the most common medical problem, besides worm infestation, which affects young foals up until 2 – 3 months of age. It is the most frequently treated condition in foals of all ages.

The severity of diarrhoea can range from the acute, rapidly debilitating form to a chronic low-grade scours or loose droppings which can persist despite treatment, draining a foal's vitality, reducing its growth rate and increasing its susceptibility to secondary gastrointestinal or respiratory infection due to its compromised immune system.

Often diarrhoea is a multi-cause condition, complicated by other debilitating problems, such as septicaemia, respiratory disease, arthritis, internal parasite burdens and certain inflammatory diseases. Prompt recognition, targeted treatment with fluids and other medications can help to minimise the risk of ill-thrift and the mortality rate from diarrhoea.

Handy Hint

Check all New Born Foals for Signs of Stress

Any new born foal which has suffered systemic stress prior to or at birth, or appears immature with stained hooves and mucous membranes, should be isolated with its mother. Its temperature, sucking reflex and dehydration state should be monitored three times daily. If it becomes depressed and loses its suckling urge, then veterinary advice should be sought immediately.

The risk of diarrhoea leading to death is highest in young foals less than 2 – 3 weeks of age, as their resistance and reserves are often overwhelmed by the loss of fluids and reduced digestive function. However, in all cases of diarrhoea, the disruption to stud routine and the risk of spread of infectious organisms within a group of foals, increases both the cost and loss of production by way of reduced growth rate in all foals.

Although 'physical' causes of diarrhoea, which include increased flow of digesta through the gut, are common in young foals due to milk overload from suckling and scours due to a laxative effect and inability to digest fibre overload from 7 – 10 days of age when young foals start to nibble grass, the infective forms of diarrhoea are usually much more debilitating as the continuous scouring saps fluid as well as energy, protein and other nutrients which are normally used for growth, resulting in a dry, rough coat common with the ill-thrift syndrome.

However, where a foal develops a chronic form of irritatory or 'overload' diarrhoea, the scouring can drain its reserves of fluids, electrolytes and diminish its immune response, making it more susceptible to pathogenic bacteria or viruses which are normally present, but suppressed in the digestive tract of a healthy, robust foal.

Did You Know That...

- Up to 48% of Thoroughbred foals develop diarrhoea within the first 4 months of age.
- 33% of foals develop scours on more than one occasion.
- The direct annual cost of diarrhoea is estimated at $1 million to the Thoroughbred breeding industry in Australia. However, indirect costs including reduced growth rate, susceptibility to other diseases and costs of preventative management are estimated to be as high as $3 million per year.
- Infectious forms of diarrhoea are a major cause of wastage in young foals.
- Rotavirus infection is responsible for up to 40% of diarrhoea cases in foals.
- At present there is no vaccine available in Australia to protect against infectious forms of diarrhoea in foals.

Browning & Begg 1998
RIRDC Equine Research Seminar, Scone 1998

The most common single cause of infectious diarrhoea is Rotavirus, with pathogenic bacteria often becoming secondary invaders once a foal's gut immunity is weakened. The risk of infection is relative to the stocking rate and foal numbers, the environmental contamination with the causative organisms, or the burden of migratory roundworm larvae and the degree of vigour and vitality of an individual foal.

Diarrhoea from Neonatal Stress

In many cases, foals which are immature at birth due to inflammation of the placenta (placentitis), can be identified by the appearance of yellowish staining of the hooves and eye membranes (conjunctiva) with meconium. They often develop diarrhoea within 2 – 3 days of birth because their digestive tracts are not fully functional and they are born in a stressed state.

Dr. Reg Pascoe of Oakey, Queensland, points out that characteristically these foals are born late in the breeding season and are subjected to heat stress, overcrowding with older foals, fly worry in hot weather, and a falling milk supply from the mare as pastures dry off and lactation volume is reduced.

Affected foals develop a **watery yellow scour**, with severe dehydration due to fluid loss. They are less interested or stop nursing, become depressed and quickly become too weak to follow their mothers and spend most of the time laying down. They may also have an elevated temperature, although not all have an acute systemic infection.

Many of these foals do not receive a sufficient volume or quality of colostrum if dropped early because reserves have not had an opportunity to build-up in the milk prior to foaling. This is a particular problem in foals of older mares over 18-20 years of age where the colostrum may be lower in immunoglobulin content as the mare ages.

Foal Heat Diarrhoea

About 80% of foals develop a form of **green to yellowish, watery diarrhoea** at about 7 – 10 days after foaling. Although it often coincides with a newly foaled mare's 'foal heat' season, it is not due to changes in hormone levels as was historically postulated. Even orphans and other foals reared in isolation from mares develop the characteristic type of scours between 4 – 14 days of age. **In younger foals less than 7 days of age, it is likely that a rise in secretion of fluids from the small intestine as milk intake increases and digestive function is established, floods the poorly developed large intestine. It is unable to resorb the large amounts of fluid and electrolytes initially, but can adapt over a 5 - 10 day period.** As the digestive processes are more fully established and the secretion and fluid excess is reduced, the scouring usually dries up by 12 – 14 day of age.

Often the intake of fresh, green grass in a foal over 7 days of age, can lead to an intolerance and poor digestion of fibre in the immature hindgut, resulting in a **green tinged scour** containing visible clumps of undigested grass.

Handy Hint

Check if the Foal's Temperature is above 38.4 0 C

In contrast to an infective form of diarrhoea, a foal with either milk overload, foaling stress or 'foal heat' diarrhoea will have a normal temperature and suckling urge, although it may develop scalded buttocks due to the overflow of digestive secretions down the sides of the tail area below its anus. Isolation or treatment is usually not necessary if the animal's temperature is normal and it is able to drink and maintain its fluid balance and vitality, and it does not become clinically dehydrated despite fluid loss from scouring. However, prolonged scouring may irritate the hindgut mucosa and increase the risk of secondary infection with bacteria. It will also have a more serious affect on the foal's health and vitality, especially during hot weather if the foal becomes dehydrated due to scouring.

Nutritional Diarrhoea

There are various forms of 'physical' gut overload due to ingestion of excessive milk. Often a foal drinking from a heavy milking mare, a sudden change in the mare's diet or increase in grain mix in feed to boost energy for milk production, or when mares accustomed to hay and grain mix are turned out onto lush green pasture after foaling, will trigger a 'milk overload' form of diarrhoea, often within the first 3 – 7 days of life.

Handy Hint

Check the Colour and Consistency of the Diarrhoea

The colour and consistency of the scour is relative to the degree of milk overload, ranging from yellow watery motions, to white runny or even 'pasty' diarrhoea in a foal suckling on a well fed mare with above average milk production.

Although the foal's temperature is usually normal as it is not an infective form of diarrhoea, the scouring foal may exhibit signs of colic and gut pain, often attempting to kick its belly or lying down with its head turned to its flank.

Did You Know That...

- Foals suckle about 4 times per hour, or up to 105 times daily, during the first week of life. They stay within 1 metre of their mothers up to 85% of the time, rarely venturing more than 5 metres away during the first 2 weeks after birth.
- Foals suckle for only 30 - 40 seconds at a time, taking in 50 - 60mL of milk at each drink.
- The high frequency of suckling has five main benefits-
  - Stimulates the milk flow and volume produced by the mare to develop her lactation.
  - Provides security for the foal by being near and in contact with the mother.
  - Facilitates continuous 'bathing' of the developing digestive tract with IgA immunoglobin to provide surface gut protection against bacterial contamination.
  - Enables the foal's developing digestive system to function without risk of overload.
  - Allows the mare to imprint on her foal due to sight contact at birth and recognition by odour of her own milk passed in the foal's droppings by 2 days of age.

Management includes reducing the mare's feed intake. This can be achieved either by reducing the hard feed ration by 25% and feeding more hay to a heavy milking mare for 3 – 5 days, or restricting grazing time on lush pasture by shifting mares and foals to a shorter pasture overnight for 5 – 7 days until the foals can adapt to the increased milk supply. However, it is important to avoid restricting a mare's feed intake by more than 25% in the critical first 5 – 14 days of lactation, as it may suppress milk production to a lower level, and reduce a foal's normal ability to double its birth weight in the first month of life.

Worm Related Scours

There are two internal parasites which can cause intestinal irritation, sap nutrients and vitality, and cause diarrhoea in foals up to 4 – 6 weeks of age.

Intestinal Threadworms

Heavy burdens of **Intestinal Threadworms**, or *Strongyloides westeri*, can cause severe irritatory diarrhoea, debilitation and dehydration in young foals from 2-4 days of age. It is more common on studs where foals are restricted to highly stocked pastures, particularly after spring rains. The larval forms of Intestinal Threadworms are ingested in the milk from mares which are harbouring the adult worms. They can also gain entry if a foal eats fresh droppings of the mare containing eggs and hatched larvae. It is normal for a foal to consume droppings to colonise its hindgut with digestive bacteria from 2-3 weeks of age. External entry can be due to skin penetration of infective larvae as a foal lies on the ground in contaminated yards, around fed bins or sleeping areas. Foals can also become infected prior to birth by way of larval migration through the membranes. The eggs passed in the droppings of 'carrier' mares hatch on the pasture and female worms can develop and produce eggs to increase contamination in an environmental form of lifecycle within the faecal debris around feed bins and under trees where foals are likely to rest or nibble at contaminated grass.

A **brownish, smelly type of scour** can develop as early as 2 days of age, which is usually persistent and with only a slight rise in temperature can signal high threadworm burdens. Heavily infected foals may exhibit symptoms of low-grade colic and abdominal discomfort.

Samples of fresh droppings must be examined within 2 hours after collection for the characteristic embryonated eggs before they hatch to larvae.

Worming of affected young foals with an appropriate dose of paste wormer and management to prevent dehydration is recommended, as supervised by your vet.

Large Roundworms

Foals can also develop burdens of Large Roundworms, or *Parascaris equorum*, within 7 – 14 days of ingesting eggs which accumulate and can remain viable in the faecal debris in yards and resting areas for up to 5 years. Uptake of infective eggs leads to diarrhoea, coughing, nasal discharge, depression, lack of appetite and ill-thrift due to migration of large numbers of larvae through the liver and into the lungs as they complete their lifecycle.

It is also suspected that other pathogenic bacteria, such as *Salmonella spp* and *Clostridia spp*, can gain entry to the blood stream through the small tracts left by migratory Large Roundworm larvae as they complete their internal lifecycle phase before returning to the small intestine to develop into egg laying adult stages. Heavy burdens of migratory larvae have been associated with diarrhoea in foals as young as 4-6 weeks of age where they are kept on highly contaminated pasture.

In young foals, the combined symptoms of diarrhoea and coughing may suggest Large Roundworm infection, and in older foals of 12 – 13 weeks of age, samples of flotation fluid from the manure can be examined under a microscope for the characteristic thick walled eggs of the Large Roundworm. Again treatment with a paste wormer on a body weight dose basis is recommended under veterinary supervision for all the foals in a group.

Bacterial Diarrhoea

Dr. Reg Pascoe links stress, milk and pasture overload and travelling to an increased risk of bacterial scours and septicaemia as normal bacteria establish in the bowels of a young foal. The various forms of bacterial diarrhoea are summarised in Table 1. Again, prompt recognition and faecal cultures on fresh droppings or sample of the scour, will help to reduce the mortality rate in some forms of bacterial diarrhoea.

Handy Hint

Larvae can Migrate up a Foals' Legs and Penetrate the Skin of a Young Foal

Active larvae of the Intestinal Threadworm can migrate on the pasture surface or on bare areas around feed bins. **The larvae can irritate the legs of foals and cause young foals to bite their legs and stamp their feet when in a yard or standing around feeders or under trees in sheltered areas.** Often these signs are observed when foals are held in teasing yards or other highly contaminated areas or paddocks.

A young foal passing blood-tinged diarrhoea must be isolated immediately and samples of blood and droppings taken for culture. Supportive therapy with fluids and broad-spectrum antibiotics may be instigated prior to a conclusive laboratory diagnosis of the type of bacterial bowel infection, because foals can dehydrate rapidly and other complications can develop within 6-12 hours in severe cases.

As a young foal's gut is sterile at birth, both good and pathogenic bacteria colonise its gut from its first drink of milk. Routine dosing with a probiotic culture to all young foals is claimed to help colonise the hind gut with digestive microbes to avoid poor adaptation and help to control diarrhoea due to bacterial infection. There is very little evidence to support the use of probiotics to control diarrhoea, although probiotic cultures are often recommended during and following any form of antibiotic therapy administered to young foals as a result of injury.

Handy Hint

Recognising Bacterial Diarrhoea in Young Foals

The colour, odour and consistency of the diarrhoea, as well as the degree of rise in body temperature, colicy signs and age of the foal can give a clue to the possible cause of bacterial scours. However, as the immature bowel is readily damaged and compromised by bacterial infection and toxins, the microbes can quickly gain entry to the blood stream and result in septicaemia and severe debilitation in young foals under the stress of cold or wet weather, or other injury. If a foal has an elevated temperature, colicy signs and is rapidly dehydration and losing its ability to drink, then bacterial scours are the most likely cause and appropriate treatment should be instigated by a veterinarian.

In young foals, concurrent umbilical infection when housed in highly contaminated yards or foaling paddocks can result in diarrhoea and 'joint-ill' or severe joint infection from *Salmonella spp* or *E. Coli* infection spread in the bloodstream and localising in fetlocks, hocks and stifle joints.

TABLE 1 - Causes of Bacterial Diarrhoea

Described by Pascoe 1994

Organism	Symptoms
Salmonella spp	Severe watery, very smelly (rotting tissue odour) diarrhoea with flecks of blood, rapid dehydration, weakness, loss of appetite and death within a few hours in severe cases.
Rhodococcus equi	Organism that causes "Rattles" and chronic pneumonia. Usually foals 2- 4 months of age, with coughing, respiratory "rattles" and chronic diarrhoea.
Actinobacillus equuli	Often sudden, acute scouring in the first 24 hours of life with blood septicaemia, depression, coma and death.
Clostridial spp (underlying cause of 'Colitis X')	Usually related to stress and transmitted from the mare or on the soil. Extremely "rotten" odour with yellowish scouring, changing to brown and fresh blood (strawberry jam like) in a few hours. Severe colic and blown out belly due to gas accumulation. Toxin results in sudden death.
E.coli	Watery yellow to white pasty scour, often related to stress in foals of all ages.
Cryptosporidium	Watery diarrhoea, usually in foals with low colostrum immunity and secondary to other infection. Often results from drinking contaminated water in a dam or creek.

Did You Know That...

- Although *E.coli* are often isolated from scouring and non-scouring foals alike, most common strains are not the primary cause of diarrhoea. However, some highly virulent forms can cause diarrhoea, and samples of scours should be tested for pathogenic, virulent strains of *E. coli*.
- 70% of the outbreaks of diarrhoea on studs were found to be caused by Rotavirus infection, with over 40% of foals carrying Rotavirus in their bowels.
- In a survey of studs, multiple outbreaks of Rotavirus diarrhoea occurred on 30% of studs in successive years.
- Rotavirus outbreaks in 1993 and 1994 in Australia were associated with gastrointestinal ulceration in young foals. This likely to be due to nutritional and systemic stress and interruption of suckling in affected foals.

Viral Diarrhoea

Although Equine Herpes Virus can cause respiratory disease and often a form of intractable diarrhoea in young foals from 1-10 days of age, it is not as common as diarrhoea due to Rotavirus infection, which often becomes endemic on studs and persists from season to season in carrier animals.

Rotavirus Diarrhoea

Studies by Drs. Glen Browning and Angela Begg, published in 1998, indicate that Rotavirus infection is the primary cause of 40% of the diarrhoea cases in foals from 28 – 60 days of age in Australia. Dr. Pascoe has observed that Rotavirus appears as an explosive outbreak in foals of all ages, with an elevated temperature and profuse watery diarrhoea.

Drs Browning and Begg point out that contrary to popular belief that Rotavirus infection follows introduction of a 'new' reservoir of virus onto a stud, most animal populations have resident Rotavirus contamination, with the majority of animals being exposed to the virus relatively early in life and establishing adequate immunity.

The risk of a foal succumbing to infection is relative to the 'dose' of virus taken in and the immune status and health of the foal. Contact with low levels of Rotavirus on a stud will not usually cause diarrhoea in healthy foals, and early low-grade challenge after 6 weeks of age will help develop immunity against re-infection at a later age.

Handy Hint

Foals can Act as Carriers of Rotavirus.

Relatively healthy foals can act as carriers, multiplying the virus without signs of diarrhoea and increasing the 'shed' of Rotavirus onto pasture. Foals dropped later in the season are therefore exposed to a higher rate of contamination, and if they consume a sufficiently large number of virus particles, it will result in diarrhoea, particularly if the foal is stressed by sickness or injury. Once the first case of Rotavirus diarrhoea develops, the greatly increased 'shedding' of virus from the infected foal onto the foal grazing areas increases the likelihood of an outbreak in a group of young foals, which then spreads quickly to other foals as pasture contamination rapidly builds up.

Scouring may commence 48 hours prior to the virus particles being passed in the droppings, and although scouring may continue for up to 2 weeks, overseas studies have shown that the infective virus may be 'shed' for only 2 days during this period.

Although an outbreak on a stud is often associated with a newly introduced foal carrying Rotavirus, with or without symptoms of diarrhoea, it is not a 'new' virus in most cases. However, the sudden increase in total Rotavirus contamination encourages the subsequent spread of infection and outbreak of diarrhoea in other foals.

In most years, Rotavirus is caused by the same strain which is endemic on a stud, but outbreaks are usually triggered by carrier foals introduced to the stud.

Vaccination

Although a vaccine used for cattle provides effective antibody levels in milk when given to lactating mares, it is not available or registered for use in Australia. Most mares on Australian studs pass limited levels of antibodies against Rotavirus in their colostrum milk. However, this only provides gut protection for the first few days of life, necessitating exposure to higher levels of infection to induce diarrhoea. Antibody absorbed from colostrum during the first 12-16 hours of a foal's life provides only limited protection, as it is less effective than IgA antibodies passed in milk which establish better intestinal defence against the virus as it is ingested by the young foal.

Handy Hint

Serum Antibody Infusions help Control Rotavrus Infection in Young Foals

Vaccinating a young foal in the first 4 - 6 weeks of age is unlikely to establish any immunity as the immune system is not functional until at least 6 weeks of age and does not respond to vaccination. The low point of immunity in a foal occurs between 4 - 6 weeks of age when the immunity provided by colostrum intake wanes and the body's immune response is not fully active. Foals between 4 - 6 weeks of age are unlikely to be able to mount immune defence against over whelming bacterial or viral infections and concentrated serum collected from a immunised horse, or one that has been recently challenged by the disease organism, may need to be administered.

Control of Rotavirus Diarrhoea

Drs. Browning and Begg in their 1998 review, provide guidelines for the control of diarrhoea caused by Rotavirus in foals, as it is the most common underlying cause of scours in foals of all ages.

Many of these management suggestions can be adopted in principle to help prevent the spread of other bacterial or infective forms of diarrhoea.

A control and prevention program to limit the risk of Rotavirus diarrhoea in young foals should include the following:

- Adopt strict hygiene in foal boxes and when handling foals suffering from Rotavirus diarrhoea, including washing with disinfectants and washing hands and instruments. Only formalin, glutaraldehyde and phenolic disinfectants

are effective on stall floors etc. and 10% iodophor type disinfectants on hands and equipment.

- Quarantining of newly introduced foals and mares for 1 – 2 weeks may reduce the level of contamination and prevent 'triggering' of an outbreak. This includes early recognition and isolation of affected foals to minimise the increase in contamination once a number of foals in a group exhibit symptoms.
- Rotation of foal paddocks to reduce level of contamination and risk of a Rotavirus reservoir being established from season to season, as well as minimising stocking density to prevent overcrowding and stress.
- Although there is no specific treatment for Rotavirus diarrhoea, symptomatic treatment is recommended under veterinary supervision.

Recovery can be accelerated by maintaining the appetite and vitality without overloading the digestive system.

An initial injection of B group vitamins, followed up by a convenient oral paste preparation, over the tongue every day for 5 – 7 days, then every second day is useful. The paste is preferred to injectable B group vitamins, as foals do not like repeated injections. A paste is easy to administer and is a good standby for any foal which needs a metabolic boost as it recovers from ill thrift, illness or injury.

Although intravenous fluid administration is absolutely essential in acute cases of dehydration, once corrected, additional electrolytes given over the tongue morning and evening, such as 10mL of a rehydration fluid per 10kg body weight if a foal is drinking, often helps maintain hydration and vitality during the recovery phase.

Although hyperimmune serum containing Rotavirus antibodies may have some benefit, it has to be administered at least twice daily by stomach tube to provide effective direct gut protection.

Summary

Diarrhoea is the most common medical condition which affects young foals. If diarrhoea is not promptly treated and management carried out to reduce its spread, outbreaks can result in depression, debilitation, dehydration and death in young foals. The underlying cause of diarrhoea can be recognised by relative to the age of the foal, the elevation in temperature, the colour and odour of the scour, colicy signs and the degree of dehydration.

Intravenous fluid therapy is the most important form of supportive treatment to prevent dehydration, debilitation and depression and it should be instigated during the acute phase of any form of diarrhoea.