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Diagnosis, treatment and nursing care of foals with diarrhoea

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ABSTRACT: Foals are often presented to a clinic with diarrhoea with varying clinical signs from moderate to severe. This article outlines the common causes of diarrhoea in foals, separating into infectious and non-infectious categories.
The treatment and nursing care of the patient is discussed in detail covering the topics of analegesia, nutrition, fluid therapy, medications, general nursing care and finally biosecurity and infection control.

Keywords: foal; nursing care; diarrhoea

Introduction

Diarrhoea is a common clinical problem in neonatal and suckling foals and it affects up to 80% of foals within the first six months of life. Some foals with diarrhoea can be mildly affected and can be effectively managed at the stud. Foals that are severely compromised require hospitalisation and intensive nursing care. Supportive care is vital in younger foals especially those less than one month of age. It is essential that the nursing team understand the aetiology of the disease, the biosecurity and infection control policies to be implemented, and the appropriate nursing interventions required to assist in the foal's recovery.

A nurse's role is essential as he or she is usually the primary care giver. It is important that a nurse observes and notes subtle changes in the patient's demeanour, performs regular clinical exams and understands his or her nursing care has a pivotal role in the patient's successful recovery.

Aetiology of diarrhoea in foals

Non infectious diarrhoea

- Foal heat diarrhoea usually occurs in foals aged 5–15 days old. These foals show no signs of systemic disease and continue to nurse from the mare. Normally these foals do not require treatment and the diarrhoea resolves after seven days.
- Nutritional diarrhoea can be a consequence from overfeeding. Examples include; separation of mare and foal for a prolonged period or feeding orphan foals milk replacer particularly of a high concentration. Another less common cause of diarrhoea is if the foal ingests large amounts of sand or other abrasive material which can cause irritation or damage to the intestinal mucosa (Mallicote et al., 2012).
- Perinatal asphyxia syndrome (PAS) can cause gastrointestinal mucosal damage, which may result in reduced mucosal metabolism (Hepburn, 2007). Foals can show evidence of enterocolitis with clinical signs of haemorrhagic diarrhoea and ileus. Necrotising enterocolitis is a serious condition which can rapidly progress to death.
- Gastric ulcers can be associated with diarrhoea in foals. Other clinical signs of gastric ulcers include lethargy, loss of weight and condition, colic and bruxism.

Infectious diarrhoea

Bacterial infections

• ***Clostridium difficile (C. difficile)***

A Clostridium difficile infection can be fatal in neonatal foals. The resulting enterocolitis occurs with watery, haemorrhagic diarrhoea, colic and systemic inflammatory response syndrome (SIRS). C. difficile is isolated from approximately one third of all healthy neonatal foals. Diagnosis can be confirmed by faecal culture or a polymerase chain reaction (PCR) test (Hepburn, 2007).

• ***Clostridium perfringens (C. perfringens)***
Diarrhoea caused by C. perfringens can result in dehydration, colic, SIRS and sudden death in neonates, studies show that foals affected with C. perfringens have an increased likelihood of death (Dunkel & Wilkins, 2010).

• **Salmonella**
Salmonella is a condition that can cause diarrhoea in horses of any age and is zoonotic. In foals it may result in severe diarrhoea and septicaemia. Diagnosis is based on repeated faecal cultures as salmonella intermittently sheds, samples are obtained over a 24–36 h period.

• ***Lawsonia intracellularis***
Lawsonia affects foals aged 3–7 months old and presents as proliferative enteropathy. Animals are quiet and dull with progressive weight loss, diarrhoea, colic, lethargy and peripheral oedema (Hepburn, 2007). These patients generally have hypoproteinaemia, with severe cases exhibiting signs of subcutaneous and ventral oedema. Diagnosis can be established by performing a PCR test on faecal samples.

Viral infections

• **Rotavirus**
Animals affected by rota virus can be aged from a few days old to several weeks. Rotavirus is extremely contagious so swift identification and isolation of these cases is essential. The virus is shed in high concentrations in the faeces of affected animals. A rota virus vaccination is available that can be administered to mares at 8, 9 and 10 months of gestation. This frequency of vaccination is important in stud farms where there is likely to be higher concentrations of the virus in the environment.

Protozoal infection

• ***Cryptosporidium parvum***
Cryptosporidium parvum may causes diarrhoea in foals from 4 to 21 days old and biosecurity measures must be adhered to with these patients as the infection is zoonotic. Diagnosis in confirmed by testing faecal samples.

Parasitic infections

• **Strongyloides westeri**
Foals with an extreme parasite burden of this organism can contract diarrhoea. As a preventative measure, mares can be administered Ivermectin in the last month of pregnancy in high risk environments.

Diagnosis

A full history is obtained and a thorough physical exam is performed on the foal. Diagnostics tools utilised are haemotology, biochemistry profiles ± blood gas analysis. Measuring blood immunoglobulin concentration and blood culture sample is indicated in neonatal foals. A blood culture sample allows for identification of an infectious organism and aids in diagnosing sepsis. Foals at the author's hospital, are aged between 0 and 14 days, are considered neonates.

Ultrasonography examination of the abdomen is generally performed to assess gut function. Radiographs may be taken if sand colic or gas distension is suspected.

Faecal samples should be acquired as soon as possible and sent to the lab in order to identify the pathogen.

Treatment and nursing care

Clinical examination

A full clinical examination must be performed regularly on sick foals at least every two hours. It is important to visually check and palpate joints and the umbilicus at each examination as localised infection can occur due to bacteraemia (Table 1).

Analgesia

Analgesia is administered in foals showing signs of colic. If the pain is persistent, further diagnostic imaging (ultrasound or radiograph) may be required to rule out a surgical lesion. Meloxicam (0.6 mg/kg PO/IV) is commonly used in foals. Use of nonsteroidal anti-inflammatory drugs (NSAIDS) should be used carefully in young foals as they have renal and gastric side effects, particularly in dehydrated patients (Haggett, 2013).

Butorphanol (0.05–0.1 mg/kg IV) is an opioid and can also be used safely in neonatal foals. It has a duration of action of only two hours and is only available in an injectable formulation (Mallicote et al., 2012). It can also be used as a sedative.

Nutrition

Foals with mild diarrhoea and no signs of colic may be allowed to continue nursing. Severely affected, uncomfortable foals, can benefit from a period of gastrointestinal rest. The foals can be separated from the mare, in a separation crate housed next to the mare or the foal can be muzzled. The mare should then be milked out frequently (e.g. every two hours).

After a period of GI rest, if the foal is showing clinical improvement, feeding small volumes of milk can be reintroduced if tolerated well. The volume and frequency can be slowly increased over several days. The volume of milk administered is dependent on the foal's clinical status, a general starting point is 5–10% bodyweight (BW) per day building up gradually to 20% BW maximum. Foals should be fed at least every two hours.

Total parenteral nutrition (TPN) is a method of supplying nutrients to the patient, via an intravenous catheter, when enteral intake is contraindicated. It is especially useful in foals that are unable to receive or tolerate milk. Foals have limited body reserves so prolonged gut rest is undesireable. The goal of TPN administration is to provide nutritional support to stop energy depletion, which will prolong recovery. TPN solution contains dextrose, amino acids and lipids, and must be administered via an infusion pump for accurate delivery rates. Regular blood glucose concentrations should be obtained to ensure glucose levels are within normal limits. Strict IV catheter care is vital in these patients with the solution giving sets and extension lines changed every 24 hours.

Enteral nutrition can be given in older foals as long as the foal is generally well, nursing readily from the mare, only slightly dehydrated and with no evidence of ileus or gastro intestinal reflux. Oral fluids (supplemented with electrolytes) can be administered via a naso-gastric tube. Care must be taken to prevent over extension of the stomach, which can result in immediate colic.

Fluid therapy

Severely affected neonatal foals will require intravenous (IV) fluid therapy. An indwelling intravenous, polyurethane, long stay catheter is placed aseptically into the

Table 1. Clinical signs of diarrhoea

Mild to moderate cases			Severe and advanced cases
Dull	Pyrexic ± Hypothermia	Dehydration: Sunken eyes Delayed skin tenting	Congested mucus membranes Weak pulses Tachycardia Tachypnea Cool extremities
Weak	Colic		
Anorexic	Hypermotile gastrointestional sounds		
Salivation	± Abdominal Distension	Bruxism	

Table 2. Nursing care plan: Foal X 2019 Day1 reason for admission: diarrhoea (Oliver-Espinosa, 2018).

Activity	Problem	Nursing intervention	Evaluation
Mobility	Lethargy	Assist to stand and encourage to walk q 2 h	Very weak, needs assistance to stand.
Breathing	Oxygenation	None needed	Arterial blood gas samples to be taken SID to evaluate electrolytes and oxygenation levels
Temperature	Hypothermia on admission	Stable top door closed Place rug on foal Turn on heat lamps	Monitor Temperature q 2 hour
Nutrition	Diarrhoea (D+)	Gut rest: Starve foal for 24 h	Separated from mare in cage to prevent nursing. Milk mare q 2 h
Urination	Adverse urine concentration	Passing urination normally	Monitor urine output/ colour/ amount/ urinary specific gravity
Defecation	Watery D+	Clean perineum & tail regularly.	Apply lubricant to protect skin from irritation Continue to monitor ouput/consistency/ frequency
Sleep	Normal exercise, sleep cycle	Keep noise levels down outside/ try not to stimulate the foal unnecessary/ lower lights	Foal sleeps well for approximately 1.5 h after exercise
Hydration	D+ / no oral intake of milk allowed	Administer of IVFT and TPN	Monitor PCV/TP/Urine output & specific gravity/ Non invasive blood pressure
Pain	Colic	Administer analgesia as per VS. Monitor for signs of pain and comfort levels	Foal appears more settled after analgesia administration

Figure 1. Foal lying down in stable.

jugular vein. If the foal is expected to require total parenteral nutrition (TPN), a double lumen IV catheter is indicated. This is so the TPN solution can be delivered in the smaller lumen and the larger lumen can be used for other IV fluids and drugs. This is to prevent the TPN and fluids precipitating in the intravenous catheter (IVC).

In older foals that are ambulatory and suckling well, with no evidence of reflux or ileus, oral fluids spiked with electrolytes via a nasogastric tube may be sufficient to correct mild dehydration.

Ideally, similar to TPN administration, IV fluids should be administered on a constant rate of infusion, particularly in young neonatal foals. For older foals that are not separated from the mare and continuing to suckle, these can receive fluid boluses (Hartmann's solution) to replace ongoing loses. Severely affected foals may have profound electrolyte imbalances and need additional IV or oral supplementation of bicarbonate, sodium and potassium (Barr, 2018). Once fluid deficits are reversed, maintenance rates in a foal are 5 ml/kg/h.

Hyperimmune plasma is generally used as a colloid in foals with hypovolaemic shock. This will help improve oncotic pressure over the short term and is a source of immunoglobulins.

Antimicrobials

Broad-spectrum antimicrobial treatment is generally administered to foals with diarrhoea, especially those under a month old who may be at risk of bacteraemia/sepsis.

The choice and duration of antimicrobials is dependent on the severity of the case and the causative pathogen. For example, metronidazole is recommended for suspected or diagnosed clostridial infections.

Gastrointestinal protectants

Bismuth subsalicylate (Pepto-Bismol™) is often used in mild cases of diarrhoea as it is thought to line and protect the intestinal mucosa, and has some anti-inflammatory effect. There is evidence that Di-tri-octahedral smecite (Biosponge®) absorbs clostridial toxins (Mallicote et al., 2012).

Sucralfate, as a gastro protectant, works by protecting the lining the stomach and if ulcers are present it will protect them from stomach acids and enzymes.

The use of omeprazole in neonatal foals is controversial, as studies have shown they have an increased risk of the foals developing diarrhoea.

Nursing care

Excellent nursing care is very important in the success of the foal's recovery (Table 2). Cleanliness and good hygiene are essential in minimising the spread of infectious agents but also important in preventing secondary complications. For example, thrombophlebitis and perineal skin irritation from faecal scalding are some of the more common complications.

Weak foals may need assistance to stand every couple of hours and if the foal is on restricted oral feeding, the mare must be milked out every two hours. Ensuring the stable has deep bedding and it is changed regularly aids in the prevention of decubitis ulcers and accommodates in the absorption of diarrhoea and urine.

The foals perineum and tail should be cleaned regularly and a lubricant for example baby oil or Vaseline® may be applied to protect the skin from irritation. If the skin appears red and sore, Sudocrem® or Flamazine® may be applied to ease irritation.

Intravenous catheters should be monitored closely in sick foals as they are a potential entry point for pathogens. The site should be checked regularly (minimum four times a day) for signs of heat, pain, swelling and patency. If identified, the IVC should be removed immediately and if needed, replaced in an alternative site. The tip of the IVC can be sent for culture. A light covering should be placed over the IVC, for example tubigrip, to protect the site particularly as foals tend to lie down. This covering should be changed once it becomes soiled or daily. It is reported that catheter related complications (thrombophlebitis) occur more frequently in foals that receive total parenteral nutrition (Burgess & Morley, 2014).

Biosecurity and infection control

The mare and foal should be isolated with strict infection control protocols in place to prevent the spread of contagious organisms throughout the hospital. Where, or if possible, depends on staffing levels, as a dedicated nurse should be assigned to isolated patients on each day/shift. This would reduce the risk of cross transmission to the rest of the hospitalised patients.

If it is not possible to move the patient to a separate isolation facility, strict barrier nursing protocols should be adhered to with separate clinical, feeding, grooming and mucking out equipment used. Separate clothing, ideally waterproof overalls, boot covers and gloves should be donned when dealing with these patients. Disinfectant footbaths, signage or chains in front of the box illustrate to all staff that this patient is receiving barrier nursing.

Once the patient has been discharged, the stable is emptied and steamed clean with an appropriate disinfectant. It is then left to dry naturally and fogged with another disinfectant appropriate to the pathogen. Ideally, environmental swabs are taken once the stable is cleaned and sent to a diagnostic lab for bacterial culture to ensure cleaning protocols have been adequate.

Conclusion

Equine nurses may often see foals presenting at practice with diarrhoea of varying aetiologies. Clinical signs may range from mild to severe with those severely compromised requiring hospitalisation. Nurses play an essential role in the management of these cases, as the primary care giver they should ensure that regular clinical examinations and observations are recorded accurately. General nursing care applies such as fluid therapy, nutrition, hygiene and assisted standing. Consideration should also be given to the mares who may require milking every two hours if the foal is on restricted oral feeding. Whilst these cases may require intensive nursing, the care given by the nurse is pivotal in the foal's successful recovery.

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