

Neonatal diarrhoea

Neonatal diarrhoea is often a multifactorial problem involving colostrum, nutrition, husbandry, climate and infectious agents. The age of the animal is of utmost importance. In many instances, the infectious agents suspected can be ruled out based on this knowledge.

CALF DIARRHOEA

The following table provides a guide for matching ages of scouring calves with the most likely causes.

Calf age	Aetiology
<7 days	<i>E. coli</i> (K99), Salmonella, Cryptosporidium, Rotavirus, Coronavirus, failure of colostrum transfer, poor quality milk powder
1-4 weeks	Salmonella, Cryptosporidium, Rotavirus, failure of colostrum transfer, poor quality milk powder
4-8 weeks	Salmonella, Coccidia

Gribbles Veterinary laboratories offer calf diarrhoea test packages (**only for faecal samples**) for relevant pathogens based on these ages.

Note: Individual tests for the listed agents can also be requested.

Specific information for some agents:

- Escherichia coli* – Apart from histology and culture, enterotoxigenic *E. coli* in calves can be diagnosed by antigen K99 detection with ELISA. This antigen can also cause diarrhoea in piglets and lambs. K88 antigen detection is also available and this antigen is specific for piglets.

Gribbles Veterinary laboratories offer culture for the diagnosis and confirmation of K88 infection and a faecal immunoassay for the diagnosis of K99 infection.

Strain typing is not available at Gribbles Veterinary –so cases negative for K88 and K99 are not necessarily negative for *E.coli* infection. Besides fresh intestine for culture and formalin fixed intestine for histopathology, formalin-fixed tissues of liver and lung may help in diagnosing enteropathogenic *E.coli* cases.

Please be advised that even with both culture and histopathology, a small percentage of *E.coli* cases can still be missed.

- Yersinia* sp. is not included in the calf scour panels; therefore, consider requesting it in addition to the calf scour panels above; in calves that are getting close to weaning.
- Cryptosporidium: Pathogenic infections with *Cryptosporidium* sp. are uncommon in >3 week-old calves; therefore, we routinely do not recommend testing for *Cryptosporidium* sp. in >3 week-old calves.

Other tests:

- GGT – levels of GGT are directly proportional to the quantity of colostrum absorbed. We recommend taking 5-10 serum samples from affected and in-contact calves. The half-life of GGT in serum is relatively short and so this test can only be interpreted in calves less than 15 days of age.
- Serum protein - Recent research in New Zealand has demonstrated a strong correlation between serum total protein and IgG using a cut-off of 53 g/L, below which is consistent with failure of passive transfer. Serum total protein can be measured at the laboratory or in-house using portable refractometers or digital Brix meters. This study was performed on healthy calves therefore the correlation may be different with dehydrated, diarrhoeic or sick calves.
- Milk powder testing - curd testing gives an assessment of the powder's casein content/quality. Powders that give poor quality may contribute to cases of diarrhoea. The curd test is only a valid test if it is known

that the predominant protein in the milk powder is casein, as non-casein proteins can be can be successful in raising healthy calves, even they do not tend to form good curds.

Other analyses include milk fat, carbohydrate and protein levels alone, or assessment of presence and quality of other sugars such as glucose and sucrose, individually or in combination as “total sugars”. Total carbohydrates, including oligo- or polysaccharides can also be assayed (this test is subcontracted to an external laboratory, so please indicate the depth of the analyses required when submitting the sample).

Testing for fat, protein and lactose allows an assessment of feed quality. Although it does not define the digestibility of type of protein sources, it can indicate if high lactose is present and how much of the energy is supplied by the fat fraction.

SAMPLE COLLECTION

Many of the causative infectious agents are transiently present, or produce villous atrophy that is obscured by autolysis; therefore, it is important to keep in mind that intestinal mucosa show histological signs of autolysis within 15 minutes of death, hindering diagnosis.

If fresh samples cannot be obtained, think carefully before requesting histopathology interpretation.

For histology, take multiple 2cm long cylinders AFTER flushing the lumen with formalin using a 50mL syringe and 18G needle. Alternately, cut the wall of the intestine; at least 1cm along its length, to allow proper fixation. Minimal handling of the fresh tissue is advised as the mucosa is very fragile and susceptible to manipulation.

NOTE: Fixed GIT tissues should be taken FIRST after opening the abdomen on post mortem examination to minimise the effects of autolysis.

We suggest you collect the following range of samples, depending on the age of the animals affected. You can nominate your own tests or let us select the appropriate tests for you.

- Faeces or colonic content
- Fixed small and large intestine (including spiral colon), abomasum, ventral rumen, liver, spleen, kidney, lung, mesenteric lymph node from freshly dead animal.
- Fresh liver, spleen, kidney (together), lung (separate) and lymph node (separate).
- Serum
- Dried milk powder feed

NEONATAL DIARRHOEA IN OTHER SPECIES

Neonatal swine:

Agent	Age	Notes
<i>Escherichia coli</i> , Coronavirus (transmissible gastroenteritis), Rotavirus, <i>Isospora suis</i>	<3 weeks of age	<i>E. coli</i> - No gross lesions <i>Isospora</i> sp. >5-6 days
<i>Clostridium perfringens</i> type C and <i>Clostridium difficile</i>	<3 weeks of age	

Note: *Bacteroides fragilis*, Salmonella and *Klebsiella* sp. have rarely been implicated as a cause of diarrhoea in neonatal pigs. *Strongyloides ransomi* may infect young piglets causing diarrhoea.

Small ruminants:

- Lambs - causes identified in neonatal lambs are *E.coli*, Rotavirus and Cryptosporidium, overfeeding and very occasionally, milk replacer contaminated with bacteria at manufacture. Outbreaks of diarrhoea in colostrum deprived orphan lambs held in sheds and fed milk supplements are not unknown.

Salmonellosis may occur rarely in young lambs. *Bacteroides fragilis* producing enterotoxin, has been implicated as a cause of diarrhoea in neonatal lambs.

- Goats - causes of undifferentiated diarrhoea are poorly defined, but appears to be minor under usual conditions of husbandry. A similar spectrum of agents that affects lambs may be expected and sought. *Clostridium perfringens* type B in lambs and kids under 8-10 days can be recognized as severe haemorrhagic enteritis, occasionally with necrotic ulcers. To date, this disease has not been confirmed in New Zealand. Coccidiosis due to *Eimeria* sp. in lambs and kids may occur in animals as young as 3 weeks of age. *Strongyloides* may also be associated with diarrhoea in ruminants only a few weeks old.

Foals:

The most common causes are foal heat diarrhoea, *Strongyloides westeri*, Salmonella, *E. coli*, *Rhodococcus equi* (1-4 months), Cryptosporidium and Rotavirus. Enterotoxigenic *E coli* and Coronavirus are not proven to cause diarrhoea in foals. *Actinobacillus equuli* may cause severe diarrhoea and haemorrhagic enteritis, with lesions of bacteraemia in other organs. Fibrinonecrotic enteritis in foals less than 1 week of age may be due to *Clostridium perfringens* type B or C, or *Clostridium difficile*. *Rhodococcus equi* may cause chronic diarrhoea and wasting in foals. *Clostridium piliforme* (Tyzzer's disease) which is restricted to foals under 6 weeks of age may be associated with diarrhoea; however, the liver lesions predominate.

Fawns:

Outbreaks of diarrhoea and death in <1 year old unweaned fawns on pasture have been caused by Cryptosporidium. Diarrhoea outbreaks have also been recorded in slightly older fawns exposed to wallows heavily contaminated with faecal bacteria.

References:

Cuttance EL, Mason WA, Denholm KS, Laven RA. *Comparison of diagnostic tests for determining the prevalence of failure of passive transfer in New Zealand dairy calves*. NZ Vet J. 2017, 65, p6-13.

Jubb, Kennedy and Palmer's Pathology of Domestic Animals. Grant Maxie, 2007, Volume 2, p129-131.

Thompson JC, Pauli JV. *Colostrum transfer of gamma glutamyl transpeptidase in calves*. NZ Vet J 1981, 29.

E. COLI K99 ANTIGEN ELISA

Species: Ovine, porcine, bovine

Specimen: Faeces

Container: Sterile container

Collection protocol: Collect a 1-2g faecal sample

Special handling/shipping requirements: Standard

General information about the disease: Enterotoxigenic *E. coli* (ETEC) is one of the major causes of diarrhoea in neonatal pigs, calves and lambs. K99 refers to one of the specific pilus adhesin antigens in ETEC diseases. Bacteria possessing K99 adhesins adhere mainly to the jejunum and ileum mucosa.

General information about when this test is indicated: Diarrhoea in young animals in the first week of life. The test determines the presence or absence of antigen in faeces

Comparison with other related tests: Although pigs can be affected by *E. coli* K99, the main cause of ETEC neonatal diarrhoea in piglets is *E. coli* with K88 adhesins.