Fatal *Clostridium difficile* enterocolitis in Thoroughbred foals

John Gill of Gribbles Veterinary in Dunedin and **Steph Bransgrove** of Murrays Veterinary Clinic in Mosgiel explore the cause and cure of *Clostridium difficile* enterocolitis after the deaths of two new-born foals.

THREE NEW-BORN FOALS on a large Thoroughbred stud developed foetid watery diarrhoea two days after birth. They had foaled during a period of wet, cold weather. The diarrhoea in two of the foals continued in spite of intensive supportive treatment that included broad-spectrum antibiotics, and they died within 12 hours to three days after the first signs were seen.

A necropsy examination of both dead foals revealed similar findings: an extensive, multi-focal ulceration and sloughing of the mucosa of the intestine and colon. An aerobic culture of the faeces from one of the foals revealed a heavy mixed growth from which both *Escherichia coli* and *Streptococcus* sp. were identified.

A histological examination of fixed sections of the ileum from the foal who died after three days of illness showed an extensive, full-thickness necrosis of the mucosa. There was a massive number of short, large, Gram-positive bacilli resembling clostridia over the surface of the necrotic mucosa and a marked submucosal oedema (see Figures 1 and 2). In some areas of the remaining mucosa there were also large numbers of filamentous Gram-negative bacilli resembling *Fusobacterium* sp. A section of mesenteric lymph node showed the sinusoids packed with a large number of Gram-positive cocci, but there were no inflammatory changes. The fusobacteria and cocci were most likely secondary invaders, as sections of the intestine from the foal who died 12 hours after first showing signs showed only a necrotic mucosa covered with clostridial bacilli.

Samples of intestinal contents from both swabs were tested for *Clostridium difficile* enterotoxin A and cytotoxin B by polymerase chain reaction (PCR). Both samples contained significant concentrations of the gene sequences of both toxins, confirming that the severe necrotising enterocolitis in both foals had been caused by a *Cl. difficile* infection (CDI). This sample of intestinal contents tested negative by PCR for the beta toxin of *Clostridium perfringens*.

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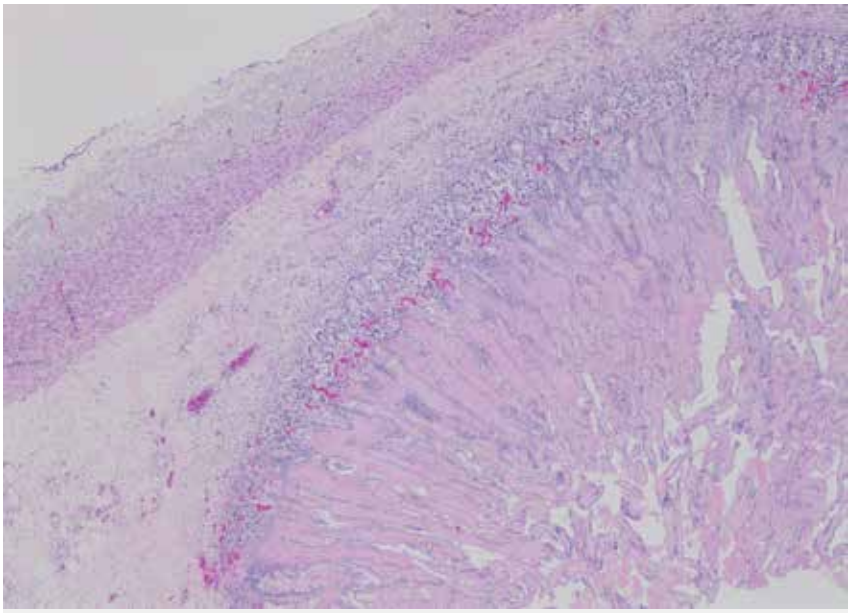

FIGURE 1: Sample from foal one at 100x magnification showing necrotic villi with clostridial bacilli attached.

The third sick foal was treated via a stomach tube with metronidazole and a broad spectrum antibiotic, and they recovered fully.

All mares and their foals were moved from the original paddock, which was very wet and contained puddles of water, to a drier paddock, and no more cases were seen. It is likely that the infections were spread by contaminated water in the paddock where the animals were initially housed.

Cl. difficile is a Gram-positive, strictly anaerobic, sporulating bacillus found in humans, a wide range of animal species and the environment. It is an important pathogen of humans, horses and pigs. In humans it is the leading cause of nosocomial infectious diarrhoea. Symptoms range from mild self-limiting diarrhoea to potentially life-threatening colitis.

CDI occurs when alterations in the gut microbiome, particularly antibiotic-induced disruptions, create conditions favourable for *Cl. difficile* proliferation. Proliferation is followed by the production of one or two enterotoxins, known as toxins A (TcdA) and B (TcdB), and in some cases a binary toxin, *Cl. difficile* transferase, whose inflammatory and necrotic effects on colonic tissue mediate the clinical symptoms of CDI.

In adult horses, *Cl. difficile* is associated with acute colitis also following antibiotic treatment and as a causative agent of diarrhoea in foals both with and without the involvement of antibiotics. Very young foals have also been found to be asymptomatic carriers of *Cl. difficile*. In pigs *Cl. difficile* has been reported as a recognised cause of neonatal enteritis, and enteritis and/or colitis in a range of other animal species. *Cl. difficile* spores (like spores from other clostridial species) are capable of surviving for prolonged periods in the environment, so removing animals from potentially infectious areas is instrumental in containing outbreaks. VS

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FIGURE 2: Sample from foal one at 1,000x magnification emphasising the necrotic villi with clostridial bacilli attached.