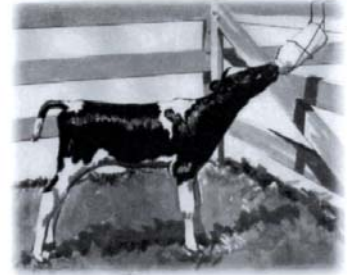


FrontLine®

TECHNICAL INFORMATION FOR TODAY'S FEED PROFESSIONAL



Intestinal Disorders Caused By Protozoa Part 1

PROTOZOA

Protozoa are monocellular organisms. These most primitive of organisms constitute the stage of transition from plants to animals. They measure more than 1 micrometer ($1 \mu = 1$ micrometer = one thousandth part of a millimeter) in diameter. Their cell structure includes one or more nuclei, organ-like structures (organelles) and a metabolism. Some species propel themselves by ciliary or pseudopodial movement. Reproduction is both asexual by simple division or multiple division (schizogony) and sexual (gamatogony). Protozoa form resistant cysts. A great variety of protozoa occur in the body of cattle, especially in the rumen where—as benign representatives of their species they play an important role in the digestion of cellulose, and are the most important protein source for ruminants. Two types of protozoa parasitize in the intestinal region of the calf: coccidia and cryptosporidia which cause intestinal diseases.

CRYPTOSPORIDIOSIS

Cryptosporidiosis is an intestinal disease in very young calves in which monocellular intestinal parasites are involved. Pronounced diarrhea quickly leads to dehydration of the body tissue with the animal wasting away.

Incidence

Cryptosporidia in conjunction with rota and corona viruses and bacteria are often the cause of diarrhea in newborn calves. The causative organisms of this intestinal infection, cryptosporidia, are primitive single cell organisms (protozoa) which were

discovered in 1907 and were first mentioned in 1971 as the causative organism of diarrhea in a young heifer. They have been found with increasing frequency in diarrhea in young calves during the past 10 years.

Transmission/Route of Infection

The development cycle of cryptosporidia in the calf is not yet fully understood. However, transmission into the livestock and the route of infection should be similar to those of coccidia. Examinations under the electron microscope have shown that different development stages of cryptosporidia are attached to the brush-shaped limbus of the villi of the small intestine and have "burrowed" leaving crater-like hollows. They usually sit on short villi, at the side or on the tip of the villus. The parasites are outside the epithelial cells, but are firmly attached to them (extracellular protozoa). However, the pathogens are also found unattached or connected to shedded intestinal cells in the intestinal contents or the feces. The oocysts may be passed outside the animal body in the feces and provoke new infections.

Since cryptosporidia are often found together with rota and/or corona viruses and also with coli bacteria in fecal samples from calves suffering from diarrhea, it is possible that protozoa can attach themselves more easily to the previously damaged intestinal wall. This is proven by microscopic findings where the cryptosporidia are usually attached to short intestinal villi with irregular cell layers, which points to previous damage of the intestinal villi by viruses.

Course and Symptoms of the Disease

Since cryptosporidia become attached to the epithelial cells of intestinal villi, this would explain functional damage to the intestinal wall. Large parts of the mucosal surface of the microvilli are impaired in their production of intestinal juice and digestive enzymes. As a result of the enzyme deficiency, proteins and sugar can only be split insufficiently, and the chyme is no longer adequately processed and broken down, leading to decomposition and fermentation and thus to a shift in the pH in the intestine. The animal organism tries to maintain the degree of acidity by releasing more fluid salts from the body tissue. The feces are greatly diluted, and the increased filling of the intestine as well as the shift in the pH stimulates bowel movements. Diarrhea appears. The feces become thin pappy to aqueous or mucoid with flaky admixtures. The presence of blood in the feces is rarely seen.

At the same time, as with any severe diarrhea, a continuous decline in the general condition is observed: The calves appear apathetic and exhausted. Increasing weight loss and dehydration weaken the animals more and more. The body temperature decreases to well below normal.

Treatment

If the diarrhea can be shown to be due to cryptosporidia, depending on the calf's condition, supportive, alleviating and life-preserving measures should be carried out.

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Fig. 1. Photo (taken under a scanning microscope) of an intestinal villus infested with cryptosporidia: The prominent white dots are parasites which are attached to the surface of the mucosa. The black crater-like depressions are remainders of the mucosal lesion following the loss of the microvilli and the bursting of cryptosporidia in various stages of development (photo: POHLENZ).

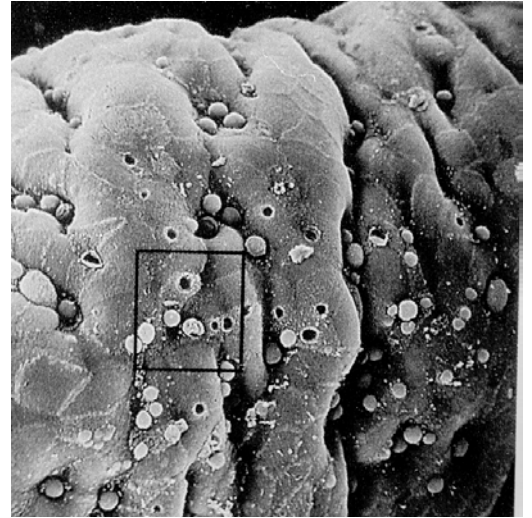


Fig. 2. Histological section of the tip of a villus: Cryptosporidia in various stages of development are attached to the epithelial cells (arrows) (photo: POHLENZ).

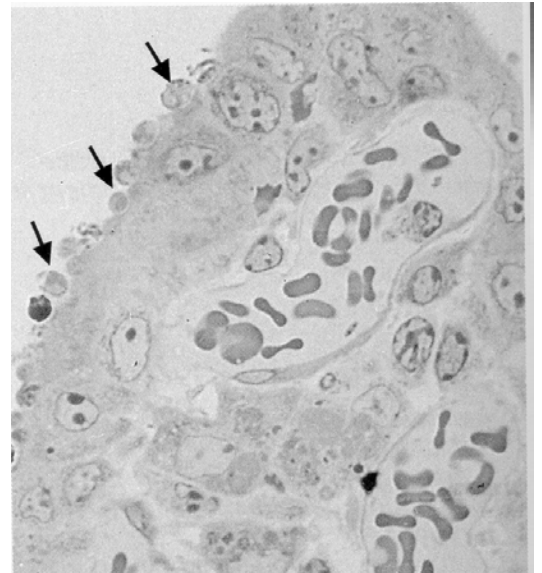


Fig. 3. Enlargement of the photo from Fig. 1 taken under a scanning electron microscope: Craters with remainders of microvilli are clearly visible. In the center of the photo banana-shaped schizonts in opened-up parasites can be seen. On the left there is a parasite just opening itself (photo: POHLENZ).



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