

Cryptosporidiosis Environmental Contamination and Zoonosis

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The previous issue of Colorado Dairy News discussed the clinical syndrome of Cryptosporidiosis in dairy cattle. While this is an important pathogen in dairy calves, Cryptosporidiosis is also an important public health concern due to its zoonotic potential. Human Cryptosporidia outbreaks have received extensive press coverage, the most notable being the 1993 outbreak in Milwaukee, Wisconsin where more than 403,000 people were affected. With each human outbreak comes renewed focus on animal agriculture as a potential source for contamination of watersheds and foodstuffs. It is imperative that we as animal producers and veterinarians remain knowledgeable about potential zoonotic diseases and what we can do to minimize their impact on people.

This article will provide information regarding the sources of Cryptosporidium on the dairy, methods of control, potential for contamination of watersheds, and sources involved in human outbreaks. Much of this information comes from recently published research, however, there remain many questions that need to be investigated before a complete understanding is available.

What are the sources of Cryptosporidia on the dairy?

Infected animals can shed Cryptosporidia at extremely high levels and thus contaminate the environment. In a dairy situation, the major source is believed to be infected cattle that are shedding. Because calves become infected at a very early age, it was suspected that the initial exposure occurred in maternity pens due to fecal shedding from the dam. Two recent studies, one in dairy cattle and one in beef cattle, suggest that adult cattle are not a major source of Cryptosporidia. In addition, the dairy study clearly demonstrated that periparturient cows rarely shed Cryptosporidia and that, in the dairy studied, Cryptosporidia were not detected in the maternity pen area. However, high levels of oocysts were found in the walls and floors of the calf hutches in spite of cleaning and drying practices. This study suggests that the major source of infection for calves is the calf hutch environment. Infected calves maintain contamination of these areas. Fecal shedding in calves can be as high as 1010 oocysts per day. Once shed, these oocysts are immediately infective to another individual.

Other sources of spread include wild rodents, fomites, and humans. As many as 30% of wild mice and 60% of brown rats trapped on farms shed oocysts. These animals may serve as reservoirs that can contaminate the environment or foodstuffs. Thus, an important aspect of Cryptosporidia control is rodent control and making sure rodents do not have access to calf starter grain and milk replacer mixes. Fomites such as water buckets, cleaning instruments, esophageal calf feeders, milk bottles and nipples may also transmit infection. Infected humans can also shed the organism and transmit it to calves.

How well does Cryptosporidia survive in the environment?

Cryptosporidia is extremely hardy in the environment and survives for months in a cool, moist environment such as the interior of a calf hutch. Oocysts are susceptible to freezing and drying. However, the calf hutch serves to protect the oocysts from these extreme conditions unless special effort is made to expose the contaminated surfaces.

How can Cryptosporidia be controlled on the dairy?

Control of Cryptosporidia is extremely challenging. Like all neonatal enteric diseases, the major emphasis should be placed on basic animal husbandry and environmental hygiene. Adequate immunoglobulin transfer via maternal colostrum is crucial. Thorough cleaning, disinfection, and drying of calf hutches between calves can help decrease the incidence and spread of enteric pathogens. Cryptosporidia is particularly resistant to many disinfectants including bleach. Recommended disinfectants include 5% ammonia solution, 10% formaldehyde, hydrogen peroxide, and Exspor (a Cl-dioxide base cold sterilant). Prior to disinfection, the surface of solid materials must be thoroughly cleaned with a detergent to remove solid debris. Wood hutches may be more difficult to clean and disinfect than plastic hutches since the oocysts can embed into the wood surfaces.

Currently, there are no reports of effective measures to disinfect soil surfaces other than freezing, drying, direct sunlight, and time. It is important to note that simple cleaning and disinfection of milk bottles and nipples with detergent and bleach will not kill Cryptosporidia. Some researchers recommend designating milk bottles and nipples to individual calves or freezing them between feedings to help limit the spread from calf to calf.

Does animal agriculture pose a risk for Cryptosporidia contamination of watersheds?

Yes, however, fairly simple measures can dramatically decrease the extent of watershed contamination. The major risk is from direct fecal contamination of watersheds from calves less than 6 months of age. Adult cattle do not shed significant numbers of Cryptosporidia oocysts and thus pose minimal risk to watersheds. However, adult cattle should still be restricted from direct access to surface water for many other environmental and health reasons. Housing facilities should be designed such that natural drainage from fecal contaminated facilities and pastures is minimized. Currently, several studies are investigating the ability of Cryptosporidia oocysts to migrate through soil and contaminate both surface and groundwater. These studies should help provide more specific recommendations for managing this problem.

What are the sources of human Cryptosporidia infection?

There are two distinct Cryptosporidia parvum genotypes. Genotype 1 appears to only infect humans while genotype 2 can infect cattle, wild animals, and humans. Serious human outbreaks have been observed with both genotypes. Genotype 1 outbreaks result from human contamination of water supplies (recreational or municipal). Genotype 2 outbreaks originate from either direct contact with infected cattle or exposure to contaminated water (recreational or municipal) or foodstuffs. Outbreaks of both types can then be amplified through additional human to human transmission. Unfortunately, the press tends to incriminate livestock as the likely source in the majority of human Cryptosporidia outbreaks. In fact, the worst outbreak to date occurred in Wisconsin where more than 403,000 people were affected. Genotype evidence suggests that this outbreak originated from a human source rather than a bovine source. Due to the public relations issue, it is imperative that livestock producers make a conscious effort to understand Cryptosporidia zoonosis and take appropriate steps to minimize human exposure.